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Nursing resource utilisation in hospitalised cancer patients: Implications for psychosocially informed supportive care

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Abstract: This retrospective observational study analysed administrative data from 7448 hospitalised oncology admissions. Nursing cost was used strictly as a proxy indicator of nursing resource utilisation and was further normalised by length of stay to derive nursing resource utilisation per inpatient day. Descriptive statistics were used to summarise patient characteristics and utilisation patterns. Differences in nursing resource utilisation across discharge outcome categories were examined using non-parametric methods. The median length of hospital stay was 5.0 days (IQR: 3.0–9.0). The mean nursing cost per admission was 496.03 (SD 2502.83), with a median of 156.06 (IQR: 78.00–339.10). When normalised per inpatient day, the mean nursing resource utilisation was 39.91 (SD 28.26), with a median of 29.10 (IQR: 26.00–43.23), displaying a markedly right-skewed distribution. Nursing resource utilisation per inpatient day differed significantly by discharge outcome ($p < 0.001$), with higher utilisation observed among patients experiencing adverse outcomes, including death and ineffective treatment, compared with those discharged with improvement or cure. Nursing resource utilisation among hospitalised oncology patients is heterogeneous and closely linked to inpatient care trajectories. These findings highlight the importance of recognising nursing resource use as an indicator of care distribution and psychosocial care visibility, rather than economic burden, within inpatient oncology services.

Keywords: administrative data; cancer nursing; discharge outcomes; inpatient oncology; nursing resource utilisation; psychosocial supportive care; retrospective study; workload distribution

1. Introduction

Advancements in cancer detection and treatment over the past few decades have significantly enhanced survival rates, leading to a growing population of individuals requiring hospital-based oncology care. As cancer increasingly becomes a chronic condition for many patients, inpatient hospitalisation remains a critical component of the care continuum, particularly during periods of diagnosis, treatment initiation, complication management, and end-of-life care [1]. Despite improvements in therapeutic outcomes, hospitalised oncology patients continue to experience considerable physical symptom burden and psychological distress throughout their inpatient stays, regardless of tumour type or treatment intent [2]. Symptoms such as pain, fatigue, dyspnoea, nausea, and sleep disturbance frequently co-occur with emotional responses including anxiety, fear, uncertainty, and existential distress, creating a complex care environment that extends beyond biomedical management alone.

The hospital setting itself may further amplify these challenges. Hospitalisation is often characterised by unfamiliar routines, limited privacy, restricted autonomy,

and dependence on healthcare professionals for basic and complex needs. For oncology patients, these conditions are compounded by uncertainty surrounding prognosis, treatment response, and future functioning [3]. Previous research has highlighted that prolonged hospital stays and repeated admissions can exacerbate psychological vulnerability, intensifying feelings of helplessness and loss of control [4]. Consequently, inpatient oncology care represents a period during which patients are particularly reliant on supportive and relational aspects of care, alongside clinical interventions.

Within this context, nursing care occupies a central and distinctive role. Nurses provide continuous bedside presence and act as the primary interface between patients, families, and the wider healthcare system [5]. Their responsibilities encompass not only technical and clinical tasks such as medication administration, symptom monitoring, and coordination of treatment but also emotional reassurance, patient education, advocacy, and communication facilitation [6]. Through repeated interactions across shifts and days, nurses often become the most accessible and trusted healthcare professionals for hospitalised oncology patients. This sustained engagement positions nursing care as a key determinant of patients' inpatient experiences and their capacity to cope with illness-related stressors [7].

Despite the recognised importance of nursing in oncology care, many dimensions of nursing work particularly psychosocial and relational care remain difficult to quantify using conventional clinical or administrative metrics [8]. Emotional support, presence, listening, and family engagement are essential components of supportive care, yet they are rarely documented explicitly in routine datasets [9]. As a result, the contribution of nursing to psychosocial wellbeing may remain partially invisible within hospital systems that prioritise measurable outputs and economic indicators. This invisibility poses challenges for workforce planning, care evaluation, and the development of supportive care models that adequately reflect the complexity of nursing practice in oncology settings [8].

1.1. Nursing resource utilisation and care visibility

Discussions of nursing resource utilisation traditionally focus on staffing levels, workload intensity, efficiency, and cost containment [10]. These perspectives are essential for operational planning and ensuring safe care delivery; however, an exclusive emphasis on such metrics risks overlooking the relational and supportive dimensions of nursing practice that are particularly salient in inpatient oncology care. Nursing engagement is not static but fluctuates in response to patient trajectories, intensifying during periods of clinical deterioration, heightened symptom burden, emotional distress, or end-of-life transitions [9].

In this regard, administrative indicators such as nursing cost while imperfect offer a pragmatic means of examining how nursing resources are distributed across inpatient populations. When interpreted cautiously, nursing cost may function as a proxy for nursing input and care attention, reflecting the cumulative intensity of nursing activities delivered during hospitalisation rather than serving as a direct measure of financial burden [4]. Importantly, normalising nursing cost by length of stay allows for comparison of nursing resource utilisation across admissions of

differing durations, enabling a more nuanced understanding of care distribution across inpatient trajectories [11].

Such an approach shifts the analytical focus from cost containment to care visibility, highlighting where nursing input is concentrated and how it varies across clinical outcomes. By framing nursing resource utilisation as an indicator of care distribution rather than efficiency alone, it becomes possible to explore how nursing work aligns with patients' supportive and psychosocial needs during hospitalisation [12]. This perspective is particularly relevant in oncology, where psychosocial care is integral to quality outcomes but often remains under-recognised in quantitative analyses.

1.2. Gaps in the existing literature

A review of the existing oncology nursing literature reveals a strong emphasis on staffing adequacy, nurse-patient ratios, burnout, and outcomes associated with specific nursing interventions or care models. While these studies provide valuable insights, relatively little attention has been paid to how nursing resources are distributed across routine inpatient oncology admissions, especially when viewed through a psychosocial or supportive care lens [2]. Moreover, research examining inpatient nursing resource utilisation has predominantly adopted economic or efficiency-driven frameworks, with limited exploration of how nursing input corresponds to patients' experiential and psychosocial needs.

Notably absent from the literature are empirical studies that examine variation in nursing resource utilisation across different discharge outcomes, which may reflect distinct inpatient care trajectories ranging from recovery and stabilisation to treatment failure or death [13]. Discharge outcomes offer an important contextual lens through which to understand nursing work, as they often encapsulate cumulative clinical complexity, symptom burden, and emotional intensity experienced during hospitalisation. Understanding how nursing resource utilisation varies across these trajectories is essential for making psychosocial nursing contributions more visible within hospital systems and for informing supportive care models that are responsive to patient vulnerability during inpatient care.

1.3. Study aim

In response to these gaps, the present study aims to examine patterns of nursing resource utilisation among hospitalised oncology patients using routinely collected inpatient administrative data. Specifically, the study seeks to describe overall nursing resource utilisation, assess its distribution when normalised by length of stay, and explore differences in utilisation across discharge outcome categories. By reconceptualising nursing cost as a proxy for care distribution rather than economic burden, this study aims to enhance understanding of nursing input and the visibility of psychosocially informed supportive care within inpatient oncology settings [10]. Generating data-driven insights into nursing resource utilisation may support more holistic evaluations of inpatient oncology care and contribute to the development of nursing practices and policies that explicitly recognise the psychosocial dimensions of supportive care.

2. Methods

2.1. Study design and data source

This study employed a retrospective observational design using routinely collected inpatient administrative data from the 903rd Hospital of the Joint Logistics Support Force of the Chinese People's Liberation Army, a tertiary level hospital providing comprehensive oncology services. The dataset comprised anonymised records of hospitalised patients with tumour-related diagnoses who received inpatient care during the study period. All data were extracted from the hospital information system and de-identified prior to analysis.

2.2. Study population

The study population comprised all hospitalised oncology admissions recorded in the administrative database during the study period. Eligible admissions met the following inclusion criteria: (1) a documented diagnosis of a benign or malignant tumour; (2) admission to an inpatient clinical department; and (3) availability of nursing cost and length-of-stay data.

Admissions with missing, zero, or implausible length-of-stay values were excluded from analyses involving nursing resource utilisation per inpatient day, as valid normalisation could not be performed. Each hospital admission was treated as an independent observation, reflecting discrete episodes of inpatient care rather than individual patients.

2.3. Variables and definitions

2.3.1. Primary outcome variable

The primary outcome of interest was nursing resource utilisation, operationalised using nursing cost recorded in the administrative dataset. In the context of this study, nursing cost was interpreted strictly as a proxy indicator of nursing input and care attention, encompassing cumulative nursing activities delivered during hospitalisation. It was not interpreted as a measure of financial burden, economic efficiency, or cost-effectiveness.

To account for variation in hospital stay duration, nursing resource utilisation was additionally expressed as nursing cost per inpatient day, calculated by dividing nursing cost per admission by the length of stay (in days). This normalised measure enabled comparison of nursing resource utilisation across admissions of differing duration and facilitated assessment of care distribution across inpatient trajectories.

2.3.2. Key explanatory variable

The primary explanatory variable was discharging outcome, as documented in the administrative records. Discharge outcomes were categorised as: improved, cured, not treated, ineffective treatment, or died. Discharge outcome was used to contextualise nursing resource utilisation patterns across different inpatient care trajectories, reflecting variation in clinical course and care demands during hospitalisation.

2.3.3 Secondary variables

Secondary variables included length of stay (LOS), recorded in days, which served both as a descriptive characteristic and as the denominator for normalising nursing resource utilisation. Discharging department was included to describe the clinical context in which inpatient care was delivered, reflecting the multidisciplinary nature of oncology hospitalisation. Diagnosis type (benign versus malignant tumour) was used descriptively to characterise the study population.

Variables related to total hospital cost, physician fees, medication expenditure, or other non-nursing costs were explicitly excluded from the analysis to maintain focus on nursing resource utilisation.

2.4. Statistical analysis

Statistical analyses were conducted to describe patterns of nursing resource utilisation and to examine variation across discharge outcome categories. Descriptive statistics were used to summarise patient characteristics, length of stay, and nursing resource utilisation. Continuous variables were assessed for distributional characteristics using numerical summaries and graphical inspection.

Given the skewed distribution of nursing resource utilisation measures, results were reported using both mean (standard deviation, SD) and median (interquartile range, IQR) to provide complementary information on central tendency and dispersion. Nursing resource utilisation per inpatient day was used as the primary analytic metric to allow meaningful comparison across admissions with varying lengths of stay.

Comparisons of nursing resource utilisation per inpatient day across discharge outcome categories were performed using the Kruskal–Wallis test, a non-parametric method appropriate for comparing continuous variables across multiple independent groups when normality assumptions are not met. This approach enabled identification of overall differences in nursing resource utilisation across inpatient care trajectories without imposing parametric assumptions.

Graphical methods, including histograms and box plots, were used to visualise the distribution, variability, and dispersion of nursing resource utilisation and to support interpretation of summary statistics and group comparisons. All statistical analyses were conducted using Python-based statistical software, including established libraries for data manipulation, numerical computation, and statistical testing. A two-sided p -value <0.05 was considered statistically significant.

2.5. Ethical considerations

This study utilised secondary anonymised administrative data. All personal identifiers were removed prior to analysis, and data were analysed in aggregate form only. Institutional approval was obtained in accordance with local governance requirements, and the study was conducted in compliance with ethical standards for research involving human data.

3. Results

3.1. Sample characteristics

A total of 7448 hospitalised oncology admissions were included in the analysis. The median length of hospital stay was 5.0 days (interquartile range [IQR]: 3.0–9.0), while the mean length of stay was 8.35 days (SD 16.82), indicating substantial variability in inpatient duration (**Table 1**).

Table 1. Length of hospital stay among hospitalised oncology patients ($n = 7448$).

Length of stay	Median (IQR)	Mean (SD)
Length of hospital stay (days)	5.00 (3.00–9.00)	8.35 (16.82)

Patients were discharged from a wide range of clinical departments, reflecting the multidisciplinary nature of inpatient oncology care. As shown in **Figure 1**, the largest proportions of admissions originated from the Respiratory and Critical Care Medicine Department (18.7%), Surgical Departments (16.96%), and Respiratory and Digestive Medicine (10.82%). Additional admissions were distributed across urology, endocrinology, orthopaedics, cardiovascular medicine, and other specialty departments, each accounting for smaller proportions of the cohort.

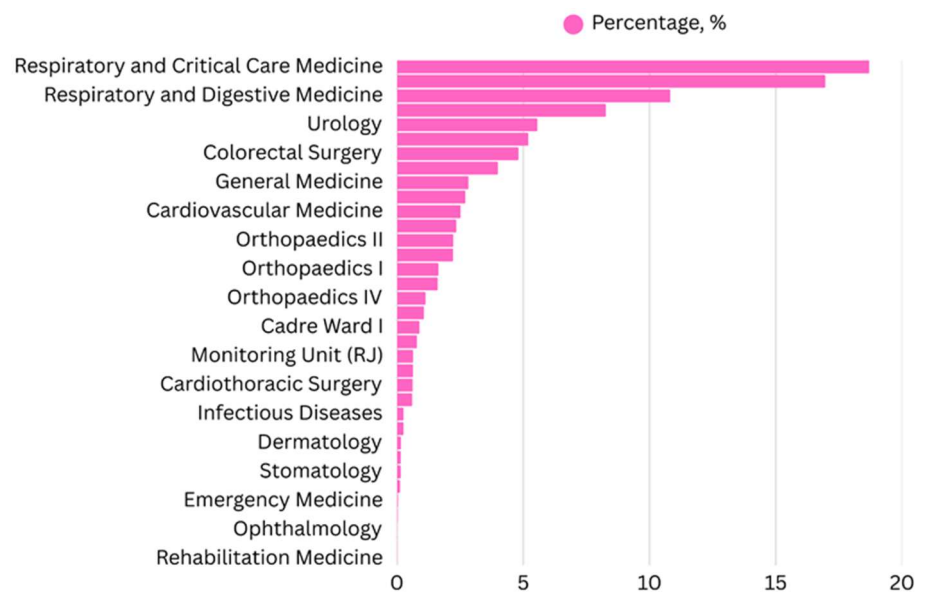


Figure 1. Distribution of hospitalised oncology patients by discharging department.

Discharge outcomes are summarised in **Figure 2**. More than half of patients (53.02%) experienced clinical improvement at discharge, while 44.52% were recorded as cured. Adverse discharge outcomes were relatively uncommon, with 1.14% of patients dying during hospitalisation, 1.10% discharged without treatment completion, and 0.20% experiencing ineffective treatment outcomes.

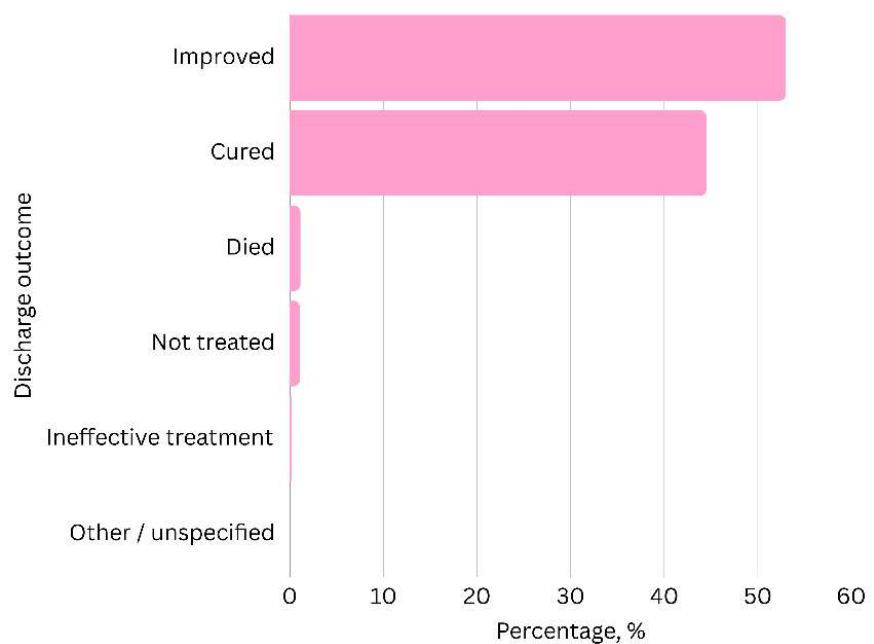


Figure 2. Distribution of discharge outcomes among hospitalised oncology patients.

3.2. Overall nursing resource utilisation

Across the study cohort, in **Table 2** the mean nursing cost per admission was 496.03 (SD 2502.83), with a median of 156.06 (IQR: 78.00–339.10). When normalised by length of stay, the mean nursing cost per inpatient day was 39.91 (SD 28.26), and the median was 29.10 (IQR: 26.00–43.23). Nursing cost was used in this study as a proxy indicator of nursing resource utilisation, reflecting nursing input and care attention rather than economic burden. To account for variation in hospital stay duration, nursing resource utilisation was additionally expressed as nursing cost per inpatient day, calculated by dividing nursing cost by length of stay. Given the non-normal distribution of nursing resource utilisation, results are presented using both mean (standard deviation, SD) and median (interquartile range, IQR). Differences in sample size between admission-level and day-level analyses reflect exclusions due to missing or invalid length-of-stay values.

Table 2. Overall nursing resource utilisation per admission and per inpatient day.

Measure	n	Mean (SD)	Median (IQR)	Minimum	Maximum
Nursing cost per admission	7448	496.03 (2502.83)	156.06 (78.00–339.10)	6.20	62,393.75
Nursing cost per inpatient day	7418	39.91 (28.26)	29.10 (26.00–43.23)	6.20	343.72

As shown in **Figure 3**, the distribution of nursing resource utilisation per inpatient day was markedly right-skewed, with most admissions clustered at lower daily utilisation levels and a smaller proportion of admissions exhibiting substantially higher values, indicating considerable heterogeneity in nursing resource use across inpatient episodes.

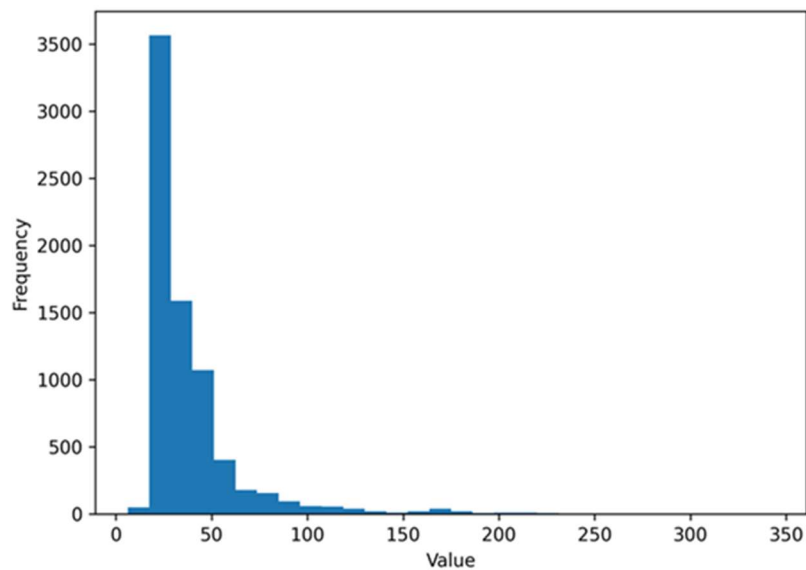


Figure 3. Distribution of nursing resource utilisation per inpatient day among hospitalised oncology patients.

3.3. Nursing resource utilisation by discharge outcome

Nursing resource utilisation per inpatient day varied across discharge outcome categories (**Table 3**). Patients who were discharged with clinical improvement or recorded as cured demonstrated comparable levels of daily nursing resource utilisation. In contrast, admissions associated with adverse outcomes showed substantially higher nursing resource utilisation per inpatient day.

Patients who died during hospitalisation exhibited markedly higher nursing resource utilisation, with both the median and interquartile range exceeding those observed among patients with favourable discharge outcomes. Similarly, patients classified as having ineffective treatment outcomes demonstrated the highest levels of nursing resource utilisation per inpatient day, although this group represented a relatively small proportion of the cohort.

These distributional differences are visually illustrated in **Figure 4**, which highlights not only higher median nursing resource utilisation among adverse outcome groups, but also greater dispersion and a higher concentration of extreme values compared with patients who improved or were cured. A Kruskal–Wallis test confirmed statistically significant differences in nursing resource utilisation per inpatient day across discharge outcome categories ($p < 0.001$), supporting the presence of heterogeneous nursing resource use patterns across inpatient care trajectories.

Table 3. Nursing resource utilisation per inpatient day by discharge outcome.

Discharge outcome	<i>n</i>	Mean (SD)	Median (IQR)	Minimum	Maximum	Discharge outcome
Improved	3949	39.12 (29.86)	26.00 (26.00–41.50)	6.20	321.85	Improved
Cured	3316	38.45 (20.09)	32.20 (26.00–43.59)	6.20	271.83	Cured
Died	85	119.31 (55.33)	111.35 (84.87–162.98)	25.40	329.87	Died
Not treated	82	29.74 (15.84)	27.60 (26.00–31.90)	24.10	115.62	Not treated
Ineffective treatment	15	156.36 (86.39)	156.46 (96.43–218.77)	77.50	343.72	Ineffective treatment

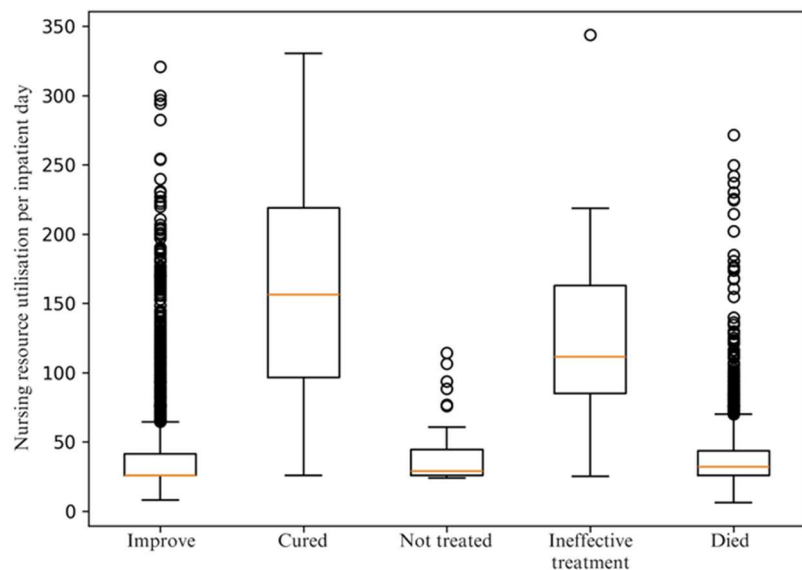


Figure 4. Nursing resource utilisation per inpatient day across discharge outcome categories.

3.4. Summary of key result patterns

Overall, nursing resource utilisation varied substantially across hospitalised oncology admissions, both in absolute terms and when normalised by length of stay. While most patients exhibited relatively modest daily nursing resource utilisation, a subset of admissions particularly those associated with adverse discharge outcomes demonstrated markedly higher nursing input per inpatient day.

4. Discussion

4.1. Interpretation of key findings

This study examined patterns of nursing resource utilization among hospitalized oncology patients, using nursing cost as a proxy indicator of nursing input and care attention. Several key findings emerge. First, overall nursing resource utilization per inpatient day was characterized by substantial variability and a markedly right-skewed distribution, indicating that while most admissions required relatively modest daily nursing input, a smaller subset of patients consumed disproportionately higher levels of nursing resources. This pattern is consistent with previous observations that nursing workload in oncology settings is unevenly distributed and influenced by patient trajectories rather than diagnosis alone [14,15].

Second, nursing resource utilization differed meaningfully by discharge outcome. Patients who experienced adverse outcomes, including death or ineffective treatment, exhibited substantially higher nursing resource utilization per inpatient day compared with those discharged with improvement or cure. These findings suggest that nursing input intensifies in response to clinical instability, symptom burden, and end-of-life care needs, even within administrative datasets that do not directly capture psychosocial or symptom-level information [16,17]. Importantly, patients discharged with favourable outcomes accounted for the majority of admissions but did not demonstrate uniformly low nursing resource utilization,

underscoring that nursing care extends beyond clinical recovery to include ongoing monitoring, education, and supportive interactions during inpatient treatment [18].

4.2. Psychosocial care visibility across care trajectories

Although this study did not directly measure psychosocial outcomes, the observed patterns of nursing resource utilization provide indirect insight into the visibility of psychosocial care within inpatient oncology services. Nursing care represents the primary interface through which psychosocial support is delivered in hospital settings, including emotional reassurance, symptom communication, family engagement, and end-of-life support [19,20]. The finding that patients with adverse discharge outcomes demonstrated higher daily nursing resource utilization suggests that psychosocial needs may become more visible and resource-intensive during periods of clinical deterioration or treatment failure. Conversely, patients undergoing protocol-driven treatments with favourable outcomes may receive substantial psychosocial support that remains less visible within administrative indicators, potentially leading to under-recognition of psychosocial care demands during routine inpatient treatment [21,22]. Differences in nursing resource utilization should therefore not be interpreted solely as reflections of physical acuity, but rather as composite indicators encompassing clinical, emotional, and relational care demands. This perspective aligns with psycho-oncology frameworks that emphasize the inseparability of physical and psychosocial care in cancer nursing practice [23,24].

4.3. Implications for psychosocially informed supportive care

The findings of this study have several implications for the delivery of psychosocially informed supportive care in inpatient oncology settings. First, variability in nursing resource utilization across discharge outcomes highlights the need for flexible nursing workflows that can respond dynamically to fluctuating psychosocial and clinical demands. Staffing models that rely on average workload assumptions may inadequately capture the intensity of nursing input required during critical or end-of-life phases of care [25,26].

The use of nursing cost as a proxy for resource utilization underscores the potential value of administrative data in identifying patterns of care distribution that warrant further qualitative or patient-reported investigation. Integrating routine administrative indicators with psychosocial assessment tools may enhance the recognition and documentation of psychosocial care needs across the inpatient trajectory [24,27]. Recognizing nursing resource utilization as an indicator of care visibility rather than economic burden reframes discussions of efficiency toward quality-oriented supportive care, potentially supporting the development of inpatient oncology models that explicitly acknowledge psychosocial nursing work as a core component of high-quality cancer care [28,29].

4.4. Strengths and limitations

This study has several strengths. The large inpatient cohort and use of routinely collected administrative data enhance the generalizability of the findings within hospital-based oncology settings. Normalizing nursing resource utilization by length

of stay further strengthens the interpretability of care distribution patterns across admissions of varying duration. However, several limitations should be acknowledged. Nursing cost was used as a proxy indicator and does not capture specific nursing activities or the qualitative dimensions of psychosocial care [30]. Additionally, the absence of direct measures of symptom burden, emotional distress, or patient-reported outcomes limits causal interpretation of the observed associations. Finally, the retrospective design precludes examination of temporal changes in nursing resource utilization across the course of hospitalization [31].

4.5. Future research directions

Future research should seek to integrate administrative nursing utilization data with patient-reported psychosocial outcomes and observational measures of nursing activity. Such approaches may clarify how nursing resource allocation aligns with patients' emotional and supportive care needs across different treatment phases. Longitudinal designs may further elucidate how nursing resource utilization evolves concerning treatment response, symptom trajectories, and end-of-life transitions in inpatient oncology care [32,33].

5. Conclusion

This study demonstrates that nursing resource utilisation among hospitalised oncology patients is unevenly distributed and varies meaningfully across inpatient care trajectories. When expressed as nursing resource utilisation per inpatient day, substantial heterogeneity was observed, with higher utilisation concentrated among patients experiencing adverse discharge outcomes. These patterns suggest that nursing input intensifies in response to complex clinical and supportive care demands during periods of deterioration, treatment failure, or end-of-life care. Importantly, the findings indicate that nursing resource utilisation reflects more than physical acuity alone. As the primary conduit of psychosocial support in inpatient oncology care, nursing work encompasses emotional support, communication, coordination, and relational care that may not be fully captured through routine clinical indicators. The observed variability in nursing resource utilisation therefore underscores the need to recognise and account for psychosocial care demands that are embedded within everyday nursing practice but remain largely invisible in administrative records. By reframing nursing cost as a proxy for care distribution rather than economic burden, this study contributes to a more nuanced understanding of how nursing resources are allocated across inpatient oncology populations. Such reframing shifts the focus from efficiency-driven interpretations toward recognition of care complexity and patient vulnerability, particularly during clinically unstable or emotionally demanding phases of hospitalisation. From a service planning perspective, these findings highlight the importance of flexible nursing workforce models that can accommodate fluctuating care demands across different inpatient trajectories rather than relying solely on average workload estimates. Future research should seek to integrate administrative indicators of nursing resource utilisation with patient-reported psychosocial outcomes and qualitative assessments of nursing care. Longitudinal approaches may further elucidate how nursing input evolves across the

course of hospitalisation and how it aligns with changing supportive care needs. Collectively, these efforts may enhance the visibility of psychosocial nursing work and support the development of inpatient oncology care models that explicitly value and incorporate psychosocially informed supportive care.

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Conflict of interest: The authors declare no conflict of interest.

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