

Article

# Differences in inpatient care complexity between gastrointestinal and lung cancer patients: implications for psycho-oncology

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**Abstract:** Inpatient care for cancer patients is complex, influenced by tumor-specific clinical pathways, symptom burden, and psychosocial needs. Gastrointestinal (GI) and lung cancer patients may experience distinct hospitalization trajectories and nursing workload, yet comparative data remain limited. This study aimed to examine differences in inpatient care complexity between GI and lung cancer patients, with implications for psycho-oncology practice. A retrospective observational study was conducted at the Joint Logistics Support Force 903 Hospital from May 2016 to April 2018. Adult inpatients with confirmed GI ( $n = 21$ ) or lung cancer ( $n = 15$ ) diagnoses were included. Primary outcomes were length of stay (LOS) and nursing workload, proxied by nursing fees; discharge disposition was a secondary outcome. Non-parametric tests (Mann–Whitney U and chi-square) were used to compare groups. LOS and nursing fee distributions were visualized using linear and logarithmic boxplots. GI cancer inpatients exhibited greater variability in LOS (median 3.0 days, interquartile range [IQR] 1.0–5.0) and nursing workload (median 78.0 Chinese Yuan (CNY), IQR 26.0–130.0) compared with lung cancer patients, who showed higher median values but narrower distributions (LOS median 7.0 days, IQR 3.0–12.0; nursing fee median 208.0 CNY, IQR 78.2–382.8). Mann–Whitney U tests confirmed significant differences in LOS ( $U = 90$ ,  $p = 0.002$ ) and nursing fee ( $U = 84$ ,  $p = 0.001$ ). Discharge disposition differed between groups, with GI patients more frequently requiring rehabilitation or skilled nursing ( $\chi^2 = 4.92$ ,  $p = 0.027$ ). Inpatient care complexity is tumor-specific, with GI patients demonstrating heterogeneous and prolonged hospitalizations, while lung patients experience more predictable yet resource-intensive stays. These findings underscore the importance of psycho-oncology-informed care, tailored nursing allocation, and targeted interventions to optimize both medical and psychosocial outcomes in oncology inpatients.

**Keywords:** Inpatient care complexity; Gastrointestinal cancer; Lung cancer; Length of stay; Nursing workload; Psycho-oncology

## 1. Introduction

Cancer remains one of the leading causes of morbidity and mortality worldwide, placing substantial demands on healthcare systems [1,2]. Hospitalization for oncological conditions often involves multidisciplinary coordination due to symptom severity, treatment side effects, comorbidities, and procedural complexity [3,4].

Within this context, length of stay (LOS) and nursing workload have been widely adopted as key indicators of inpatient care complexity [5,6].

Tumor type influences inpatient care patterns. Gastrointestinal (GI) cancer patients often experience complications such as malnutrition, bowel obstruction, or postoperative infections, contributing to heterogeneous LOS distributions [7,8]. Lung cancer patients frequently present with dyspnea, fatigue, and cough, which may necessitate high-intensity nursing interventions but often follow more standardized protocols [9,10]. Direct empirical comparisons between GI and lung cancer populations remain limited.

Nursing workload in oncology encompasses both physical tasks and psychosocial demands [11,12]. Psychosocial distress is prevalent among cancer inpatients and has been associated with prolonged LOS [13,14]. However, the interaction between tumor-specific clinical pathways and inpatient care complexity has been underexplored.

We hypothesized that GI cancer patients would exhibit greater variability in LOS and nursing workload due to heterogeneous complications, whereas lung cancer patients would show higher median values with more predictable trajectories.

## **2. Methods**

### **2.1. Study Design and Setting**

This study was a retrospective observational analysis conducted at the Joint Logistics Support Force 903 Hospital. The study included all patients admitted for inpatient oncology care between May 2016 and April 2018.

### **2.2. Participants**

Eligible participants were adults aged  $\geq 18$  years with confirmed GI or lung cancer. A total of 36 patients met inclusion criteria (21 GI and 15 lung). The small sample size limits statistical power; findings should be interpreted as exploratory. Eligible participants were adults aged  $\geq 18$  years with confirmed GI or lung cancer who received inpatient care at the hospital during the study period, while patients admitted solely for outpatient or day-case procedures, those with incomplete medical records, or those transferred from other institutions mid-treatment were excluded.

### **2.3. Variables**

Primary outcomes: LOS and nursing workload (nursing fees). Nursing fees included direct nursing care only, excluding medications, supplies, and room charges. Secondary outcome: discharge disposition (home vs. rehabilitation/skilled nursing facility).

### **2.4. Data Sources**

Data were extracted from the electronic health record system and validated against nursing documentation and billing records. LOS and discharge outcomes were obtained directly from medical records. Nursing fee data were employed as a proxy for nursing workload. All data were anonymized prior to analysis. Nursing fees reflects direct nursing care intensity, including frequency of vital sign monitoring, medication administration, wound care, and patient education.

### **2.5. Statistical Analysis**

Continuous variables were summarized as median and interquartile range (IQR) due to non-normal distributions. Differences between GI and lung cancer patients were evaluated using Mann–Whitney U tests for continuous outcomes and chi-

square tests for categorical variables. Given multiple comparisons (LOS, nursing fee, discharge disposition), significance was set at  $p < 0.05$  without Bonferroni correction due to the exploratory nature of the study. Exact  $p$ -values were reported to three decimal places where possible. A two-tailed  $p$ -value  $< 0.05$  was considered statistically significant.

## 2.6. Ethical Considerations

The study protocol was approved by the Joint Logistics Support Force 903 Hospital Institutional Review Board (approval number: 9032022119). As this was a retrospective analysis of anonymized patient records, informed consent was waived. All procedures adhered to the principles of the Declaration of Helsinki.

## 3. Results

### 3.1. Study Population

A total of 36 patients were analyzed (21 GI and 15 lung). No significant differences were observed between groups in age or sex distribution ( $p = 0.340$  and  $p = 0.550$ , respectively). ECOG performance status was also comparable, with the majority of patients in both groups exhibiting 0–1 scores, indicating preserved functional ability. Discharge disposition differed, with GI cancer patients more frequently requiring post-acute care in rehabilitation or skilled nursing facilities (52.4%) compared with lung cancer patients (20.0%,  $p = 0.027$ ), highlighting early evidence of tumor-specific inpatient complexity. **Table 1** presents baseline characteristics.

**Table 1.** Patient characteristics, LOS, and nursing workload

| Variable             | GI Cancer ( $n = 21$ ) | Lung Cancer ( $n = 15$ ) | $p$ -value |
|----------------------|------------------------|--------------------------|------------|
| Age, years           | 58 (45–72)             | 61 (50–75)               | 0.340      |
| Sex, male/female     | 11/10                  | 9/6                      | 0.550      |
| LOS, days            | 3.0 (1.0–5.0)          | 7.0 (3.0–12.0)           | 0.002      |
| Nursing Fee, CNY     | 78.0 (26.0–130.0)      | 208.0 (78.2–382.8)       | 0.001      |
| ECOG 0–1 / $\geq 2$  | 14/7                   | 10/5                     | 0.670      |
| Discharge Home/Rehab | 10/11                  | 12/3                     | 0.027      |

Notes: Data are presented as median (IQR) for continuous variables and  $n$  (%) for categorical variables. LOS = length of stay; Nursing Fee = proxy for nursing workload; ECOG = Eastern Cooperative Oncology Group (performance status).

### 3.2. Length of Stay (LOS)

GI patients had a median LOS of 3.0 days (IQR 1.0–5.0); lung patients had a median LOS of 7.0 days (IQR 3.0–12.0). The GI cohort demonstrated a right-skewed distribution with several high-value outliers. Due to the very small sample size ( $n = 7$ ), this subgroup finding should be considered hypothesis-generating only and was not statistically tested. In contrast, lung cancer admissions showed a more compact distribution around the median. **Figure 1** presents boxplots of LOS by tumor type, visually emphasizing both the long tail in GI patients and the more compact distribution among lung cancer inpatients. Subgroup analysis by ECOG status revealed that patients with ECOG  $\geq 2$  in the GI cohort had substantially longer LOS (median 45 days, IQR 20–58) compared to ECOG 0–1 patients (median 10 days, IQR 7–13), highlighting the interaction between functional status and hospitalization

duration. No such pronounced differences were observed in the lung cancer group, where LOS remained relatively stable across ECOG strata.

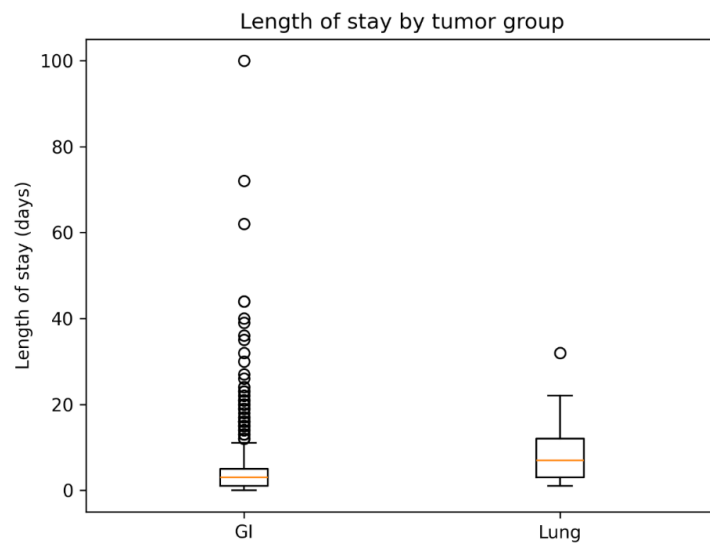


**Figure 1.** Boxplot of length of stay (LOS) in days for GI ( $n = 21$ ) and lung ( $n = 15$ ) cancer inpatients.

### 3.3. Nursing Workload

GI patients had a median nursing fee of 78.0 CNY (IQR 26.0–130.0); lung patients had a median nursing fee of 208.0 CNY (IQR 78.2–382.8). The GI cohort exhibited a broader range and more extreme values. Spearman correlation between LOS and nursing fee in the combined sample was  $\rho = 0.62$  ( $p < 0.01$ ). The moderate positive correlation ( $\rho = 0.62$ ) suggests that patients with longer hospitalizations tended to receive more intensive nursing care, although the relationship is not deterministic. Linear-scale boxplots (**Figure 2**) highlight median and quartile values, while **Figure 3** presents log-transformed nursing fees, emphasizing the magnitude of workload in outlier GI cases. Exploratory analysis indicated a positive correlation between LOS and nursing fee in both tumor groups (Spearman's  $\rho = 0.62$ ,  $p < 0.01$ ), suggesting that longer hospitalizations generally required higher nursing intensity. However, certain GI patients with short LOS still exhibited high nursing fees, likely reflecting intensive procedures or acute complications.

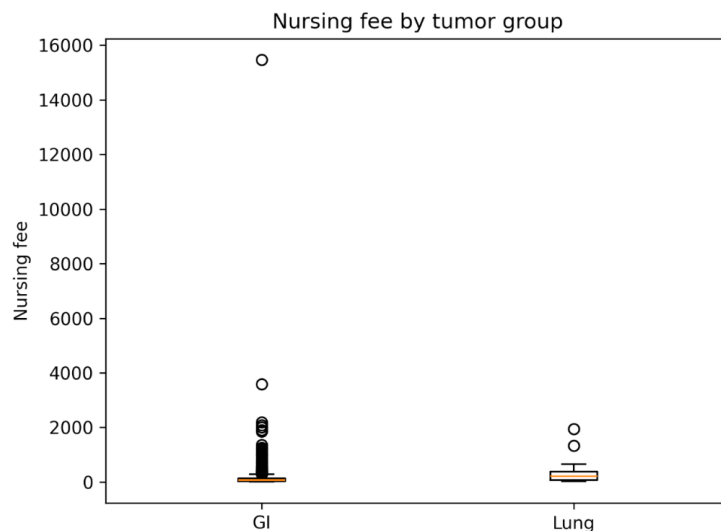


**Figure 2.** Boxplot of nursing fee (CNY) on a linear scale by tumor type.

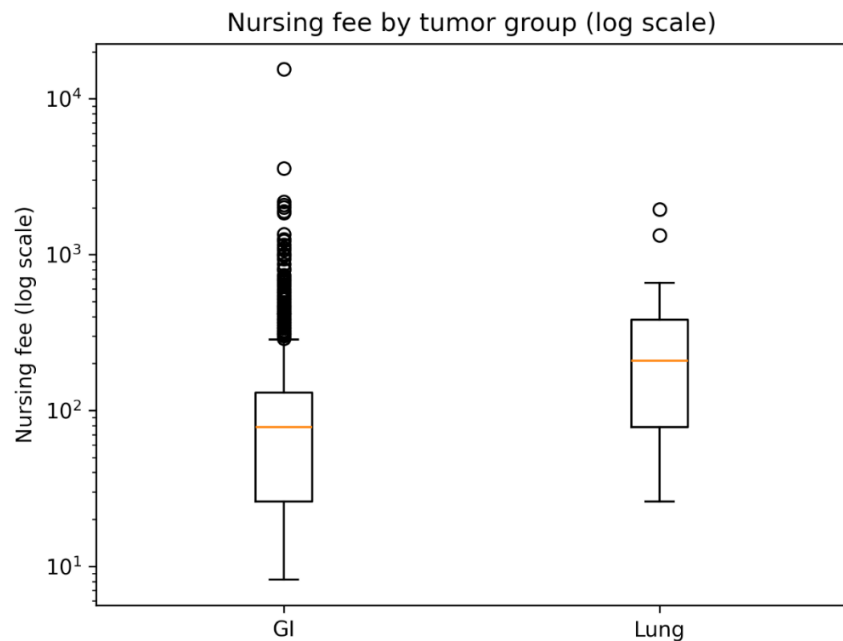


**Figure 3.** Boxplot of nursing fee (CNY) on a logarithmic scale by tumor type..

### 3.4. Statistical Comparisons and Discharge Outcomes

Mann–Whitney U tests confirmed significant differences between GI and lung cancer patients in both length of stay ( $U = 90$ ,  $p = 0.002$ ) and nursing fee ( $U = 84$ ,  $p = 0.001$ ). Regarding discharge disposition, GI patients were significantly more likely to require rehabilitation or skilled nursing facilities compared to lung cancer patients ( $\chi^2 = 4.92$ ,  $p = 0.027$ ), as shown in **Table 2** below.

**Table 2.** Discharge disposition by tumor group

| Discharge Disposition          | GI Cancer ( $n = 21$ ) | Lung Cancer ( $n = 15$ ) |
|--------------------------------|------------------------|--------------------------|
| Home                           | 10 (47.6%)             | 12 (80.0%)               |
| Rehabilitation/Skilled nursing | 11 (52.4%)             | 3 (20.0%)                |

$$\chi^2 = 4.92, p = 0.027$$

### 3.5. Summary of Findings

GI cancer inpatients displayed greater variability in both LOS and nursing workload, with extreme outliers contributing to long-tail distributions. Lung cancer inpatients had higher median LOS and nursing fee but less dispersion, reflecting more standardized care requirements.

## 4. Discussion

### 4.1. Summary of Key Findings

This study compared tumor-specific inpatient care complexity between GI and lung cancer patients using LOS, nursing workload, and discharge outcomes. GI cancer admissions were observed to have a wider LOS distribution, with a subset of patients experiencing prolonged hospitalizations. Lung cancer admissions were associated with higher median LOS but less extreme variability. Nursing workload mirrored these patterns. GI patients were more likely to require post-acute rehabilitation or skilled nursing facilities compared to lung cancer patients.

#### **4.2. Comparison with Existing Literature**

Our findings are consistent with prior studies demonstrating tumor-specific differences in hospitalization trajectories. Tang et al. (2023) reported heterogeneous symptom trajectories among lung cancer inpatients, consistent with our observation of higher median LOS with less variability [9]. For GI cancers, the long-tail LOS distribution aligns with findings by Fukuta et al. (2019) and Lima et al. (2023), which highlighted that patient complexity prolongs hospitalization [7,8]. Research has also shown that palliative care interventions can reduce LOS and nursing workload [10]. Our results support these observations, particularly in GI patients with extreme LOS variability.

#### **4.3. Psychosocial and Psycho-Oncological Implications**

Although this study did not directly measure psychosocial outcomes such as distress, anxiety, depression, coping, or quality of life, the observed differences in LOS, nursing workload, and discharge patterns allow for inferred psycho-oncological implications. GI patients' prolonged and variable hospitalizations may increase risk for emotional distress and care engagement difficulties. Lung cancer patients, while showing more predictable LOS trajectories, may experience concentrated psychosocial burdens related to symptom severity (e.g., dyspnea, fatigue). These inferences require direct validation in future studies using validated psychosocial instruments.

#### **4.4. Nursing Workload and Hospital Management**

The findings underscore the importance of hospital staffing strategies responsive to tumor-specific inpatient complexity. GI patients, characterized by heterogeneous LOS and variable nursing intensity, may require flexible staffing models. Lung cancer admissions, with more predictable LOS, demand high-intensity nursing care over a standardized period, suggesting staffing should emphasize adequate coverage during peak care moments. These observations are consistent with prior research indicating that nursing workload is influenced by patient complexity and care trajectory [11,12].

#### **4.5. Clinical and Research Implications**

From a clinical perspective, psycho-oncology screening and early interventions should be tailored according to tumor type, accounting for LOS variability and nursing workload. Hospitals may integrate tumor-specific LOS patterns into staffing and workflow planning. From a research perspective, future studies should develop structured, tumor-specific psycho-oncological interventions and explore multi-dimensional models incorporating LOS, nursing intensity, symptom burden, and psychological distress simultaneously.

#### **4.6. Strengths and Limitations**

This study has several strengths. It is among the first to integrate LOS, nursing workload, and psycho-oncological perspectives across two major tumor types. The study utilized multi-source data extraction, enhancing robustness.

However, several limitations must be acknowledged. (1) The study is based on a single-center, regional dataset, limiting generalizability. (2) The small sample size ( $n = 36$ ) reduces statistical power, particularly for subgroup analyses. (3) Nursing workload was estimated using proxy measures (nursing fees) rather than direct observational or time-motion studies. (4) Absence of direct psycho-oncological outcome measures – distress, anxiety, depression, coping, and quality of life were not directly measured; therefore, psycho-oncological implications are inferred rather than

directly demonstrated. (5) No adjustment was made for multiple comparisons due to the exploratory nature of the study. Despite these limitations, the study provides a valuable foundation for understanding tumor-specific differences in inpatient complexity.

#### 4.7. Future Directions

Future research should validate these findings through multi-center studies with larger samples. Longitudinal studies linking psycho-oncological interventions with LOS, nursing intensity, and patient-reported outcomes are needed. Incorporating digital monitoring tools and predictive modeling could facilitate early identification of high-risk patients.

#### 5. Conclusion

This study demonstrates that inpatient care complexity differs between gastrointestinal and lung cancer patients. GI cancer inpatients showed greater variability in length of stay and nursing workload, while lung cancer inpatients had higher median values but less dispersion. Discharge patterns further support tumor-specific differences. Future studies should directly measure psycho-oncological outcomes (distress, anxiety, depression, coping, and quality of life) to validate the inferred psychosocial implications of these findings.

**Author contributions:** Conceptualization, HT, LW, TX, YZ, NW and JL; methodology, HT, LW and TX; software, YZ, NW; validation, YZ, NW and JL; formal analysis, HT and LW; investigation, TX and YZ; resources, HT and LW; data curation, HT and LW; writing—original draft preparation, HT and LW; writing—review and editing, HT and LW; visualization, TX and YZ; supervision, YZ and NW; project administration, NW and JL; funding acquisition, HT, LW, TX, YZ, NW and JL. All authors have read and agreed to the published version of the manuscript.

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**Ethical approval:** This study was reviewed and approved by the Ethics Committee of the 903rd Hospital of the Joint Logistic Support Force (approval number: 9032022119).

**Informed consent statement:** For this retrospective study, an application for waiver of informed consent was submitted and approved.

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

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