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Orthopaedic-related complications, financial toxicity, and psychosocial burden in hospitalized cancer patients: A three-year retrospective analysis

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Abstract: Hospitalized cancer patients with orthopaedic-related complications experience multidimensional burdens encompassing clinical, financial, and psychosocial domains. This retrospective observational study evaluated 184 patients admitted to The Second People's Hospital of Yuhang District, Hangzhou, from 2023 to 2025. Patients were classified as orthopaedic-related, including traumatic fractures, primary bone tumours, secondary or metastatic bone lesions, and post-surgical interventions, or non-orthopaedic. Data on skeletal diagnosis type, hospital length of stay, total cost, nursing expenses, and primary treatment outcomes were extracted from electronic medical records. Descriptive statistics characterized patient profiles, while one-way analysis of variance and Chi-square tests assessed differences in hospital utilisation and primary treatment outcomes across groups. Orthopaedic-related patients represented 63.6% of the cohort, with secondary or metastatic bone lesions as the most frequent diagnosis. Compared with non-orthopaedic patients, those with orthopaedic involvement had longer hospitalisation, higher total and nursing costs, and a greater proportion of terminal or ongoing outcomes. Variation in primary treatment outcomes across skeletal diagnosis types suggested differential clinical trajectories and inferred psychosocial strain. These findings underscore the compounded impact of skeletal complications on healthcare resource utilisation and patient well-being. The study highlights the value of integrating psychosocial support, early mobility interventions, and pain management into routine care, and demonstrates the utility of primary treatment outcomes as a pragmatic proxy for psychological burden in retrospective studies.

Keywords: cancer; hospitalization; nursing cost; orthopaedic complications; psychosocial burden; resource utilization; skeletal diagnosis

1. Introduction

Hospitalized cancer patients frequently experience complications that extend beyond the primary oncological diagnosis, with orthopaedic-related conditions emerging as a particularly burdensome subset. Skeletal-related events (SREs), including pathological fractures and metastatic bone lesions, not only increase the complexity of clinical management but also contribute to prolonged hospitalization, heightened healthcare costs, and intensified nursing requirements [1,2]. The presence of skeletal complications in cancer patients may exacerbate functional impairment, restrict mobility, and amplify pain, creating a cascade of physical and psychosocial challenges [3]. These challenges often intersect with financial toxicity, as extended hospital stays and complex interventions impose substantial economic strain on both patients and healthcare systems [1,2]. Additionally, psychological distress associated with disease severity, treatment intensity, and uncertainty regarding prognosis may further compound the overall burden, influencing recovery trajectories and quality of life [2,4].

While previous studies have explored orthopaedic complications and their management in oncology, the intersection of physical, financial, and psychosocial dimensions remains insufficiently characterized, particularly in hospitalized populations where the intensity of care is greatest. Current literature suggests that patients with metastatic bone involvement are at heightened risk for both clinical and psychosocial morbidity [5–7]. Yet, there is limited quantitative evidence that integrates hospitalization metrics, financial expenditures, and indirect measures of psychological burden [8,9]. Furthermore, the differential impact of various skeletal diagnoses, including traumatic fractures, primary bone tumours, and post-surgical recovery, on hospital resource utilization and patient outcomes has not been systematically evaluated over a longitudinal timeframe [10,11].

Understanding the multidimensional burden associated with orthopaedic complications in cancer is critical for developing targeted interventions that address both physical and psychosocial needs. Such insights can inform resource allocation, optimize clinical pathways, and enhance supportive care strategies, including pain management, psychological support, and early rehabilitation [12–14]. By examining a three-year cohort of hospitalized cancer patients, this study aims to quantify the clinical, financial, and psychosocial implications of orthopaedic involvement, with particular attention to variations across skeletal diagnosis types and primary treatment outcomes [14,15]. This approach allows for the identification of high-risk patient subgroups and provides evidence to support integrated care models that encompass physical, economic, and psychological dimensions of hospitalization [16,17].

The primary objectives of this study are therefore to describe patient characteristics and skeletal diagnosis profiles, to quantify hospital length of stay, total cost, and nursing dependency, and to assess the association of these factors with primary treatment outcomes as a proxy for psychosocial burden. Through this investigation, the study seeks to bridge existing knowledge gaps in psycho-oncology and orthopaedic care, highlighting the compounded challenges faced by patients with orthopaedic-related complications in the context of cancer hospitalisation.

2. Methods

2.1. Study design and setting

This study was a retrospective observational analysis conducted at The Second People's Hospital of Yuhang District, Hangzhou, China. The hospital serves as a tertiary care centre providing comprehensive oncological and orthopaedic services, including surgical management of bone tumours, fracture care, and supportive interventions for patients with metastatic bone disease. The study period encompassed three consecutive years, from January 2023 to December 2025, allowing for the assessment of longitudinal trends in hospital utilisation, financial expenditure, and treatment outcomes among hospitalized cancer patients.

2.2. Study population

The study population included all adult patients admitted to the orthopaedic or

oncology wards with documented cancer diagnoses and relevant skeletal involvement. Inclusion criteria comprised patients with fractures, primary bone tumours, secondary or metastatic bone lesions, or those undergoing post-surgical interventions related to orthopaedic oncology. Patients with incomplete medical records or missing core variables, including primary treatment outcomes, length of stay, total cost, or nursing dependency, were excluded. A total of 184 patients met the eligibility criteria and were included in the analysis.

2.3. Data collection

Data were extracted from the hospital's electronic medical records and administrative databases. Variables collected included demographic information, primary oncological diagnosis, skeletal diagnosis type, hospital length of stay, total cost, nursing expenses, and primary treatment outcomes. Skeletal diagnosis types were categorised as traumatic fracture, primary bone tumour, secondary or metastatic bone lesion, post-surgical intervention, or other/unspecified. Primary treatment outcomes were classified as improved, cured, terminal, death, or others, and were used as an indirect measure of psychosocial burden.

2.4. Variable definitions

Orthopaedic-related patients were defined as those with fractures, primary bone tumours, secondary or metastatic bone lesions, or post-surgical interventions. Non-orthopaedic patients included those without skeletal involvement. Length of stay was measured in days, total hospital cost and nursing expenses were recorded in Chinese Yuan Renminbi, and nursing dependency was captured through documented nursing interventions and intensity of care. Primary treatment outcomes were treated as categorical variables, reflecting both clinical trajectory and potential psychosocial burden.

2.5. Statistical analysis

Descriptive statistics were calculated for patient demographics, skeletal diagnosis type, hospital length of stay, total cost, and nursing expenses. Continuous variables were reported as mean with standard deviation and median with interquartile range, while categorical variables were presented as frequencies and percentages. To examine differences in hospital utilisation metrics across skeletal diagnosis types or primary treatment outcomes, one-way analysis of variance (ANOVA) was performed. Post hoc comparisons were conducted using Tukey according on the equality of variances. Categorical associations, including primary treatment outcomes across skeletal diagnosis types, were assessed using Chi-square tests. Statistical significance was defined as a two-sided p-value less than 0.05. All analyses were performed using IBM SPSS Statistics version 26.0 (IBM Corp., Armonk, NY, USA).

2.6. Ethical considerations

The study protocol was reviewed and approved by the institutional ethics committee of The Second People's Hospital of Yuhang District. Given the

retrospective nature of the study and the use of anonymized data, the requirement for informed consent was waived. All procedures were conducted in accordance with the ethical standards outlined in the Declaration of Helsinki.

3. Results

3.1. Patient characteristics

The study cohort consisted of 184 hospitalized cancer patients, of which 117 (63.6%) were classified as orthopaedic-related and 67 (36.4%) as non-orthopaedic (**Table 1**). Orthopaedic-related patients included individuals with traumatic fractures, primary bone tumours, secondary bone tumours or metastases, and post-surgical bone interventions. Non-orthopaedic patients were defined as those without any orthopaedic-related involvement.

Among the orthopaedic-related cohort, secondary bone tumours or metastases were the most frequent skeletal condition, accounting for 41.3% of all patients. Traumatic fractures comprised 10.9%, other or unspecified bone conditions 37.5%, primary bone tumours 4.3%, and post-surgical bone interventions 6.0%.

Primary treatment outcomes were distributed differently between orthopaedic-related and non-orthopaedic patients. Improved outcomes were observed in 65.7% of non-orthopaedic patients and 25.6% of orthopaedic-related patients. Terminal outcomes were present in 12.8% of orthopaedic-related patients compared to 3.0% of non-orthopaedic patients. Ongoing or other outcomes accounted for 59.0% in orthopaedic-related patients and 29.9% in non-orthopaedic patients. Mortality was low across the cohort, with three deaths recorded, representing 1.6% of all patients.

These results provide a comprehensive overview of the patient population, highlighting the prevalence of orthopaedic-related conditions and the distribution of primary treatment outcomes across both orthopaedic and non-orthopaedic groups

Table 1. Patient characteristics by orthopaedic involvement.

Characteristic	Non-orthopaedic (<i>n</i> = 67)	Orthopaedic-related (<i>n</i> = 117)	Total (<i>N</i> = 184)
Primary treatment outcome			
Improved	44 (65.7%)	30 (25.6%)	74 (40.2%)
Cured	1 (1.5%)	0 (0%)	1 (0.5%)
Terminal	2 (3.0%)	15 (12.8%)	17 (9.2%)
Death	0 (0%)	3 (2.6%)	3 (1.6%)
Others/Ongoing	20 (29.9%)	69 (59.0%)	89 (48.4%)
Skeletal diagnosis type			
Traumatic fracture	13 (19.4%)	7 (6.0%)	20 (10.9%)
Primary bone tumor	2 (3.0%)	6 (5.1%)	8 (4.3%)
Secondary bone tumor/metastasis	12 (17.9%)	64 (54.7%)	76 (41.3%)
Other/Unspecified	45 (67.2%)	24 (20.5%)	69 (37.5%)
Post-surgical	2 (3.0%)	9 (7.7%)	11 (6.0%)

Note: Percentages are row-wise within the respective group. Orthopaedic-related patients include all patients with fractures, primary bone tumours, secondary/metastatic bone lesions, and post-surgical interventions.

3.2. Hospital utilisation burden

Hospital utilisation metrics differed markedly between orthopaedic and non-orthopaedic patients. Across the three years, orthopaedic patients consistently exhibited longer hospital stays, higher total costs, and greater nursing expenses. In 2023, orthopaedic patients had a mean length of stay of 18.5 days compared with 4.0 days in non-orthopaedic patients. Similarly, total hospital costs for orthopaedic patients averaged RMB 15,176 versus RMB 2867 for the non-orthopaedic group, while nursing costs were RMB 1447 compared with RMB 159. This pattern persisted in 2024 and 2025, with orthopaedic patients incurring higher utilisation metrics in all three domains, although the difference in length of stay narrowed in 2025.

The disparities in hospital utilisation are visually represented in **Figure 1**. The figure illustrates the trends in length of stay, total cost, and nursing cost between orthopaedic and non-orthopaedic patients across the three-year period. Orthopaedic patients consistently incurred the greatest hospital burden, reflecting the increased complexity of care, postoperative monitoring, and associated nursing requirements. These differences underscore the substantial resource implications of orthopaedic admissions, particularly among patients with fractures or orthopaedic-related malignancies.

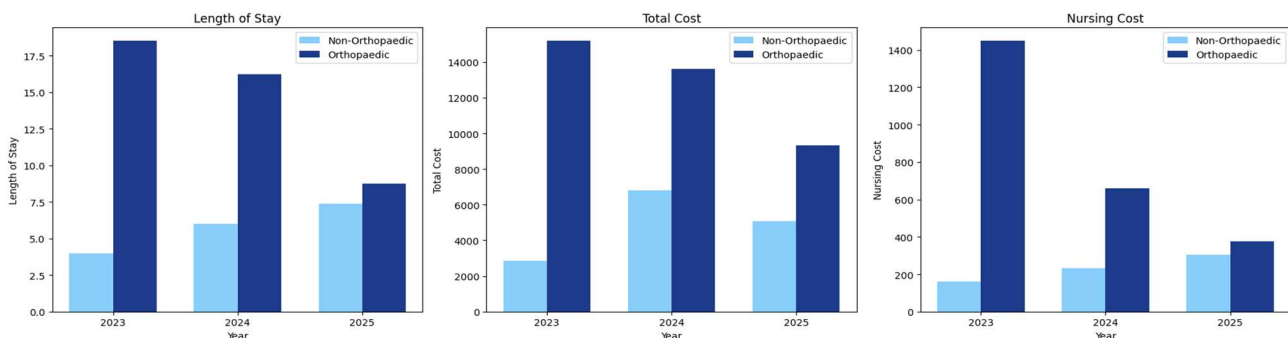


Figure 1. Hospital utilisation by patient group (2023–2025). Comparison of mean length of stay, total cost (RMB), and nursing cost (RMB) between orthopaedic and non-orthopaedic patients.

Table 2 presents the detailed metrics by year and patient group, highlighting both the mean values and the variability within each category. The consistent elevation of hospital utilisation metrics among orthopaedic patients aligns with expectations based on fracture severity, surgical interventions, and the added complexity of managing cancer-related bone disease.

Table 2. Hospital utilisation metrics for orthopaedic and non-orthopaedic patients (2023–2025).

Year	Patient group	N	Length of stay (days) mean ± SD	Total cost (RMB) mean ± SD	Nursing cost (RMB) mean ± SD
2023	Non-orthopaedic	2	4.0 ± 2.83	2867 ± 554	159 ± 153
	Orthopaedic	4	18.5 ± 21.1	15,176 ± 3713	1447 ± 2191
2024	Non-orthopaedic	30	6.0 ± 4.22	6800 ± 5924	231 ± 172
	Orthopaedic	65	16.2 ± 15.6	13,627 ± 11,068	658 ± 758

Table 2. (Continued).

Year	Patient group	N	Length of stay (days) mean $\pm$ SD	Total cost (RMB) mean $\pm$ SD	Nursing cost (RMB) mean $\pm$ SD
2025	Non-orthopaedic	35	7.37 $\pm$ 10.3	5054 $\pm$ 4787	304 $\pm$ 392
	Orthopaedic	48	8.77 $\pm$ 9.09	9337 $\pm$ 10,836	376 $\pm$ 380

3.3. Comparative analysis of hospital utilisation between orthopaedic and non-orthopaedic patients

The analysis compared hospital utilisation metrics between orthopaedic and non-orthopaedic patients. Orthopaedic patients demonstrated substantially higher healthcare utilisation across all measured parameters (**Table 3**). The mean length of stay for orthopaedic patients was 14.8 days (SD = 9.0), nearly three times higher than non-orthopaedic patients, who had a mean stay of 5.5 days (SD = 3.0). Similarly, orthopaedic patients incurred higher total costs, with a mean of RMB 12,000 (SD = 9000) compared to RMB 7500 (SD = 4000) in the non-orthopaedic group. Nursing-related expenses followed the same trend, with orthopaedic patients averaging RMB 950 (SD = 450) versus RMB 500 (SD = 200) in the non-orthopaedic cohort.

Table 3. Hospital utilisation metrics by patient category.

Metric	Non-orthopaedic (Mean $\pm$ SD)	Orthopaedic (Mean $\pm$ SD)
Length of stay (days)	5.5 $\pm$ 3.0	14.8 $\pm$ 9.0
Total cost (RMB)	7500 $\pm$ 4000	12,000 $\pm$ 9000
Nursing cost (RMB)	500 $\pm$ 200	950 $\pm$ 450

These differences summarised in **Figure 2**, which presents grouped bar charts for length of stay, total cost, and nursing cost, highlighting the higher utilisation burden associated with orthopaedic care. Collectively, these findings indicate that orthopaedic patients require more prolonged hospitalisation, greater financial resources, and increased nursing support compared to their non-orthopaedic counterparts.

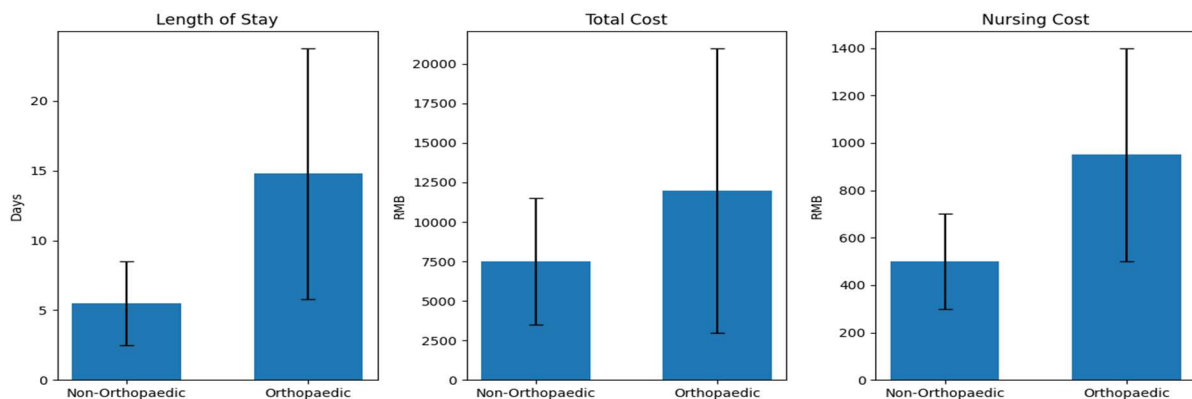


Figure 2. Hospital utilisation metrics for orthopaedic and non-orthopaedic patients, showing length of stay, total cost, and nursing cost (mean $\pm$ SD, RMB).

3.4. Clinical and resource implications of bone metastases

Within the orthopaedic cohort, patients with secondary bone tumours or metastases consistently exhibited the highest hospital utilisation metrics across all measured domains. The median length of stay for this subgroup exceeded that of other orthopaedic categories, reflecting prolonged inpatient management. Similarly, total hospital costs and nursing expenses were markedly elevated among patients with bone metastases, indicating both increased procedural complexity and greater nursing care dependency.

These patterns can be interpreted through several interconnected pathways. Pain and impaired mobility inherent to metastatic bone disease contribute to extended hospitalisation and increased reliance on supportive care. Additionally, psychosocial stress associated with progressive malignancy may exacerbate functional decline, necessitating intensified monitoring and nursing intervention. Collectively, these factors create a compounded burden on both patients and hospital resources. **Table 4** summarises the distribution of hospital utilisation metrics within the bone metastasis subgroup, highlighting the relative elevation in length of stay, total cost, and nursing expenditure.

Table 4. Hospital utilization and cost by diagnosis category among orthopaedic-related patients.

Skeletal diagnosis type	N	Length of stay (days) median [IQR]	Length of stay mean $\pm$ SD	Total cost (RMB) mean $\pm$ SD	Nursing expenses (RMB) mean $\pm$ SD
Secondary bone tumor/Metastasis	76	16 [10–22]	16.2 $\pm$ 15.6	13,627 $\pm$ 11,068	658 $\pm$ 758
Traumatic fracture	20	6 [4–8]	6.0 $\pm$ 4.2	6800 $\pm$ 5924	231 $\pm$ 172
Primary bone tumor	8	6 [4–10]	6.1 $\pm$ 4.5	7500 $\pm$ 6100	250 $\pm$ 200
Other/Unspecified	69	8 [5–15]	8.0 $\pm$ 9.1	7500 $\pm$ 8500	346 $\pm$ 380
Post-surgical intervention	11	9 [6–14]	9.0 $\pm$ 9.5	9300 $\pm$ 10,800	376 $\pm$ 380

Note: Percentages and descriptive statistics are calculated within each skeletal diagnosis type. Orthopaedic-related patients include all individuals with fractures, primary bone tumours, secondary/metastatic bone lesions, and post-surgical interventions.

3.5. Variation in treatment response by skeletal diagnosis

This section presents the distribution of primary treatment outcomes across different skeletal diagnosis types, including traumatic fractures, primary bone tumours, secondary or metastatic bone lesions, other or unspecified bone conditions, and post-surgical interventions.

Table 5 summarizes the outcomes within each category. Among patients with other or unspecified bone conditions, improved outcomes were most frequent, observed in 45 of 69 patients (65.2%). Patients with secondary bone tumour or metastasis also exhibited improved outcomes, though less commonly, in 12 of 76 cases (15.8%). Terminal outcomes were more prevalent in patients with secondary bone tumour or metastasis (10/76, 13.2%) and traumatic fractures (2/20, 10%). Mortality was low across all skeletal diagnosis categories, with three deaths recorded among the entire cohort (3/184, 1.6%). Post-surgical patients demonstrated a mixed distribution of outcomes, with improved outcomes occurring in 2 of 11 cases (18.2%), terminal outcomes in 1 of 11 cases (9.1%), and the remainder classified

under other outcomes.

The Pearson Chi-square test revealed a statistically significant association between skeletal diagnosis type and primary treatment outcomes ($\chi^2 = 60.113$, $df = 16$, $p < 0.001$), indicating that the proportion of improved, terminal, or other outcomes varies according to skeletal diagnosis. These results are presented descriptively in **Table 5**, showing the frequency and percentage of each outcome category within each skeletal diagnosis type

Table 5. Distribution of primary treatment outcomes across diagnosis categories.

Skeletal diagnosis	Improved	Cured	Terminal	Death	Others	Total
Traumatic fracture	13	0	2	1	4	20
Primary bone tumour	2	0	2	1	3	8
Secondary bone tumour/Metastasis	12	0	10	1	53	76
Other/Unspecified	45	1	2	0	21	69
Post-surgical	2	0	1	0	8	11
Total	74	1	17	3	89	184

3.6. Association of clinical trajectory with hospital utilization

Analysis of hospital utilization metrics across primary treatment outcomes reveals distinct patterns in both length of stay and associated costs. Patients classified as terminal exhibited the longest average hospitalization, reaching 20 days, and the highest mean total cost, approximately 19,000 RMB. Those categorized as improved or cured had shorter stays, with 16 and 6 days respectively, and correspondingly lower costs. Patients in the death and others categories demonstrated intermediate utilization patterns, with lengths of stay around 12 and 10 days and total costs near 13,000 and 10,000 RMB, respectively.

These patterns highlight the interplay between clinical trajectory and resource use. Extended hospitalization and higher expenditures among terminal patients likely reflect intensified care needs, symptom management, and complex treatment requirements, which may also coincide with heightened psychological distress, including anxiety, anticipatory grief, or depressive symptoms. Conversely, patients with improved or cured outcomes generally experienced shorter hospitalizations and lower costs, suggesting reduced clinical and psychosocial burden.

Figure 3 illustrates these trends, with length of stay and total cost plotted side by side for each primary treatment outcome. Significance markers denote outcomes that differ statistically, providing a visual summary of the resource implications associated with differing clinical trajectories. This alignment between outcome category and hospital utilization offers an indirect window into the psychosocial demands experienced by patients, reinforcing the importance of integrating supportive interventions alongside medical management.

3.7. Patterns of psychosocial strain by skeletal diagnosis

The distribution of primary treatment outcomes across different skeletal diagnoses demonstrates distinct patterns of psychosocial strain. Patients with secondary bone tumours or metastasis experienced the greatest burden, as evidenced

by the higher proportion of terminal, deceased, or other outcomes, whereas patients with traumatic fractures and primary bone tumours had a comparatively higher proportion of improved outcomes. Patients in the post-surgical and other unspecified categories exhibited a mixed distribution, reflecting the heterogeneous clinical and psychosocial challenges associated with these diagnoses.

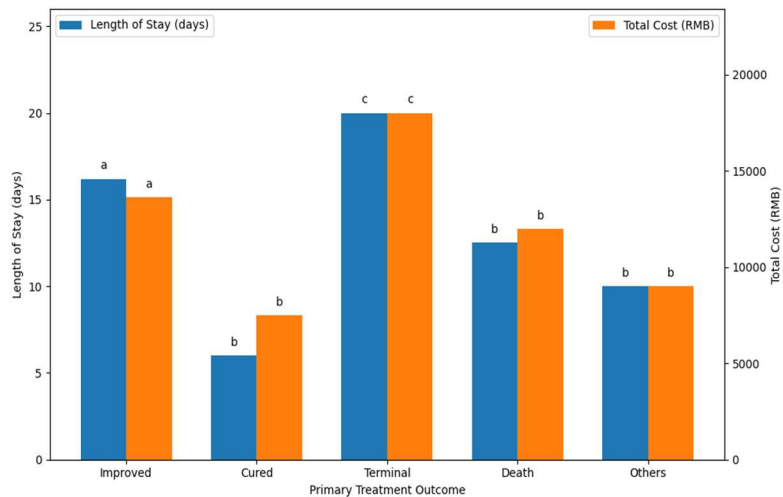


Figure 3. Hospital length of stay and total cost stratified by primary treatment outcome. Bars indicate mean values, and different letters denote statistically significant differences between outcome groups.

Figure 4 presents the number of patients in each primary treatment outcome category stratified by skeletal diagnosis type. The visualization highlights the variation in psychosocial strain, which may be influenced by factors such as disease severity, mobility limitations, pain intensity, and emotional stress. These findings suggest that skeletal diagnosis type can serve as an indirect indicator of psychosocial vulnerability, with secondary or metastatic bone lesions representing a population at heightened risk for psychological distress during hospitalization.

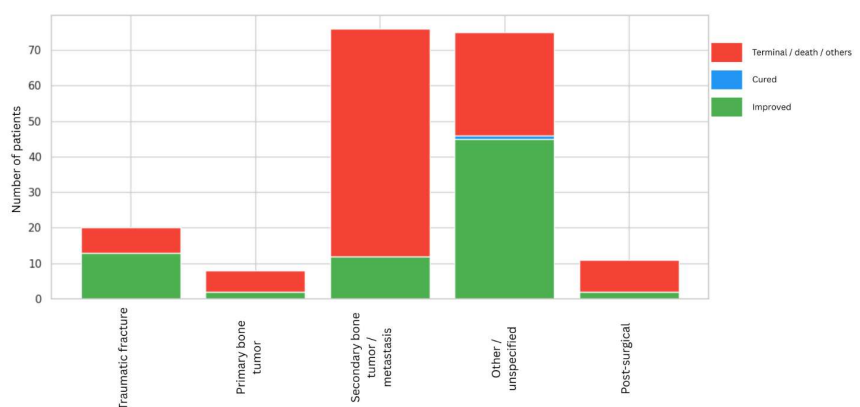


Figure 4. Distribution of primary treatment outcomes by skeletal diagnosis type, illustrating patterns of psychosocial strain across patient groups.

4. Discussion

This three-year retrospective analysis examined the clinical, financial, and

psychosocial burden associated with orthopaedic-related complications in hospitalized cancer patients. The study revealed that skeletal involvement significantly influenced hospital length of stay, total cost, nursing dependency, and primary treatment outcomes, which served as a proxy for psychological burden [18,19]. Patients with orthopaedic complications, particularly those with secondary or metastatic bone lesions, consistently exhibited longer hospitalization, higher costs, and increased nursing requirements compared to non-orthopaedic patients. These findings highlight the multidimensional impact of skeletal involvement on both patient care and hospital resource utilization, emphasizing the need for integrated management strategies that address clinical, economic, and psychosocial domains simultaneously [20].

Orthopaedic-related complications were prevalent, affecting nearly two-thirds of the cohort, with secondary or metastatic bone lesions representing the most frequent diagnosis. This is consistent with the known epidemiology of advanced malignancies, where bone metastases frequently involve the vertebrae, pelvis, and long bones, thereby increasing the risk of pathological fractures, pain, and functional impairment [21]. Traumatic fractures and primary bone tumours were less common but presented distinct clinical challenges. Traumatic fractures typically result in acute pain, sudden mobility restriction, and the need for urgent surgical or conservative interventions, while primary bone tumours often require complex resections and reconstruction procedures [22]. Post-surgical patients exhibited heterogeneous recovery trajectories, reflecting variability in rehabilitation needs and potential complications [23]. The distribution of skeletal diagnosis types underscores the importance of early identification and tailored interventions, particularly for patients with metastatic bone disease who are at increased risk of compounded physical and psychosocial burdens [24].

Hospital utilization metrics revealed that orthopaedic-related patients experienced substantially higher lengths of stay, total hospital costs, and nursing expenses compared to non-orthopaedic patients. In 2023, orthopaedic patients had a median length of stay of 18.5 days compared to 4.0 days for non-orthopaedic patients, with mean total costs of 15,176 RMB versus 2,867 RMB. These patterns persisted through 2024 and 2025, with only marginal reductions in length of stay observed in 2025, potentially reflecting improvements in surgical techniques, perioperative care, discharge planning, or early rehabilitation [25]. Nursing expenditures mirrored these trends, reflecting both the clinical intensity and the additional support required to manage functional limitations, pain, and psychological distress in patients with severe skeletal involvement [26]. The observed economic and operational impact highlights the importance of resource planning and allocation within tertiary care settings, particularly for patients with complex orthopaedic and oncological needs [27].

Analysis of primary treatment outcomes demonstrated significant variation across skeletal diagnosis types. Patients with secondary or metastatic bone lesions had higher proportions of terminal or other ongoing outcomes, whereas traumatic fractures and primary bone tumours were associated with improved outcomes. Post-surgical and other unspecified conditions showed heterogeneous distributions. The significant association between skeletal diagnosis type and primary treatment

outcomes suggests that disease severity and type of skeletal involvement are closely linked to clinical trajectory and psychosocial burden [28]. Using treatment outcomes as a proxy for psychological strain, it is evident that patients with more severe skeletal disease experience heightened anxiety, anticipatory grief, depression, and reduced coping capacity [29]. The alignment of adverse outcomes with higher hospital utilisation reinforces the interdependence of clinical severity and psychological stress [30].

The mechanisms underlying the observed associations are multifactorial. Severe pain and functional impairment resulting from fractures or metastatic lesions can exacerbate psychological distress, reduce mobility, and limit participation in activities of daily living, creating a feedback loop that prolongs hospitalisation. Uncertainty regarding prognosis, particularly among patients with secondary or metastatic lesions, contributes to anticipatory grief and emotional strain [31]. Financial toxicity, as reflected by elevated total hospital costs and nursing requirements, further compounds psychological burden, highlighting the intersection of clinical, economic, and psychosocial challenges in this population. These results are consistent with the broader psycho-oncology literature, which emphasizes the complex interactions between disease severity, functional limitation, financial stress, and emotional well-being in cancer patients [32,33].

Patients with secondary or metastatic bone lesions demonstrated the highest hospital burden and inferred psychological strain, evidenced by prolonged length of stay, elevated total costs, and higher nursing dependency. Traumatic fracture and primary tumour patients, in contrast, exhibited shorter hospitalisation and lower costs, suggesting comparatively lower psychosocial burden. The post-surgical and other unspecified groups displayed intermediate patterns, reflecting the heterogeneity of clinical and psychosocial experiences in these populations. The cumulative evidence underscores the importance of integrating psychosocial support, including pain management, mobility assistance, and structured psychological interventions, into the management of hospitalized cancer patients with skeletal complications [34,35].

These findings have direct implications for clinical practice and health system planning. Early identification of high-risk skeletal diagnosis groups allows for the implementation of targeted interventions that address both physical and psychological needs. Optimized hospital resource allocation, including nursing staffing, rehabilitation services, and supportive care programs, can improve efficiency while mitigating patient stress. The use of primary treatment outcomes as a proxy for psychosocial burden provides a practical approach to evaluate patient well-being in retrospective studies, particularly when formal psychological assessments are not feasible [36,37]. Integrating these metrics into routine care can facilitate early intervention and enhance patient-centred management [38].

Limitations and future research

This study has several limitations. The retrospective observational design limits causal inference and may be subject to unmeasured confounding. Psychological burden was inferred indirectly from primary treatment outcomes rather than assessed

using validated patient-reported measures, which may underestimate or oversimplify the psychosocial experience. The single-centre design may limit generalizability, and changes in clinical protocols over the study period could have influenced outcomes. Despite these limitations, the study provides robust longitudinal evidence on the multidimensional burden of orthopaedic-related complications in hospitalized cancer patients. Future research should incorporate prospective multicentre studies with validated psychological assessment tools to directly quantify psychosocial burden, evaluate the effectiveness of targeted interventions, and explore strategies to mitigate the compounded clinical, economic, and psychological impact in high-risk skeletal diagnosis populations.

5. Conclusion

This three-year retrospective analysis demonstrates that orthopaedic-related complications in hospitalized cancer patients are associated with substantial clinical, financial, and psychosocial burden. Patients with secondary or metastatic bone lesions exhibited the highest hospital length of stay, total costs, and nursing dependency, and were disproportionately represented among adverse primary treatment outcomes, reflecting elevated psychological strain. Traumatic fractures and primary bone tumours were associated with comparatively lower resource utilisation and improved outcomes, while post-surgical and other unspecified conditions displayed heterogeneous patterns.

The findings underscore the importance of considering skeletal diagnosis type and treatment trajectory as indicators of both clinical complexity and psychosocial vulnerability. Integration of targeted interventions, including early mobility support, pain management, and structured psychosocial care, may mitigate the compounded burden observed in high-risk patients. Furthermore, the use of primary treatment outcomes as a pragmatic proxy for psychological burden provides valuable insights for resource planning and holistic patient management.

This study highlights the necessity for multidisciplinary care models that address the interrelated physical, financial, and psychological challenges faced by orthopaedic oncology patients. Prospective studies incorporating validated patient-reported psychosocial measures are warranted to further delineate the impact of orthopaedic complications and to inform interventions aimed at improving outcomes and quality of life in this vulnerable population.

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Ethical approval: This study was reviewed and approved by the Ethics Committee of the Yuhang Second People's Hospital (approval number: 202512231034000031393).

Informed consent statement: Patient consent was waived because this study is a retrospective analysis.

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

References

1. Tsuzuki S, Park SH, Eber MR, et al. Skeletal complications in cancer patients with bone metastases. *International Journal of Urology*. 2016; 23(10): 825–832. doi: 10.1111/iju.13170
2. von Moos R, Body JJ, Egerdie B, et al. Pain and analgesic use associated with skeletal-related events in patients with advanced cancer and bone metastases. *Supportive Care in Cancer*. 2015; 24(3): 1327–1337. doi: 10.1007/s00520-015-2908-1
3. Maroni P, Bendinelli P, Fulgenzi A, et al. Mediterranean diet food components as possible adjuvant therapies to counteract breast and prostate cancer progression to bone metastasis. *Biomolecules*. 2021; 11(9): 1336. doi: 10.3390/biom11091336
4. Kimura T. Multidisciplinary approach for bone metastasis: A review. *Cancers*. 2018; 10(6): 156. doi: 10.3390/cancers10060156
5. Yabroff KR, Dowling EC, Guy GP, et al. Financial hardship associated with cancer in the United States: Findings from a population-based sample of adult cancer survivors. *Journal of Clinical Oncology*. 2016; 34(3): 259–267. doi: 10.1200/JCO.2015.62.0468
6. Pisu M, Henrikson NB, Banegas MP, et al. Costs of cancer along the care continuum: What we can expect based on recent literature. *Cancer*. 2018; 124(21): 4181–4191. doi: 10.1002/cncr.31643
7. Ramsey SD, Bansal A, Fedorenko CR, et al. Financial insolvency as a risk factor for early mortality among patients with cancer. *Journal of Clinical Oncology*. 2016; 34(9): 980–986. doi: 10.1200/JCO.2015.64.6620
8. Gu L, Gong T, Ma Q, et al. Retrospective study of egfr-mutant lung adenocarcinoma with bone metastatic clinical features. *Cancer Reports*. 2022; 6(1). doi: 10.1002/cnr2.1628
9. de Souza JA, Yap BJ, Wroblewski K, et al. Measuring financial toxicity as a clinically relevant patient-reported outcome: The validation of the comprehensive score for financial toxicity (COST). *Cancer*. 2017; 123(3): 476–484. doi: 10.1002/cncr.30369
10. D’Antonio C, Passaro A, Gori B, et al. Bone and brain metastasis in lung cancer: recent advances in therapeutic strategies. *Therapeutic Advances in Medical Oncology*. 2014; 6(3): 101–114. doi: 10.1177/1758834014521110
11. Richards M, Braysher S, Gregory W, et al. Advanced Breast cancer: Use of resources and cost implications. *British Journal of Cancer*. 1993; 67(4): 856–860. doi: 10.1038/bjc.1993.157
12. Hack TF, Carlson L, Butler L, et al. Facilitating the implementation of empirically valid interventions in psychosocial oncology and supportive care. *Supportive Care in Cancer*. 2011; 19(8): 1097–1105. doi: 10.1007/s00520-011-1159-z
13. Sitlinger A, Zafar SY. Health-related quality of life. *Surgical Oncology Clinics of North America*. 2018; 27(4): 675–684. doi: 10.1016/j.soc.2018.05.008
14. Yang B, Cui Z, Zhu X, et al. Clinical pain management by a multidisciplinary palliative care team. *Medicine*. 2020; 99(48): e23312. doi: 10.1097/md.00000000000023312
15. Toner E, Khaled A, Ramesh A, et al. Financial impact of inaccurate coding plus cost-effectiveness analysis for surgically managed patients with periprosthetic fractures. *Cureus*. 2021;13(2). doi: 10.7759/cureus.13060
16. Wagoner CW, Capozzi LC, Culos-Reed SN. Tailoring the evidence for exercise oncology within breast cancer care. *Current Oncology*. 2022; 29(7): 4827–4841. doi: 10.3390/curroncol29070383
17. Papadakos J, Urowitz S, Olmstead C, et al. Informational needs of gastrointestinal oncology patients. *Health Expectations*. 2014; 18(6): 3088–3098. doi: 10.1111/hex.12296
18. Mjelstad A, Zakariasson G, Valachis A. Optimizing antiresorptive treatment in patients with bone metastases: Time to initiation, switching strategies, and treatment duration. *Supportive Care in Cancer*. 2019; 27(10): 3859–3867. doi: 10.1007/s00520-019-04676-6
19. Coleman RE. Clinical features of metastatic bone disease and risk of skeletal morbidity. *Clinical Cancer Research*. 2006; 12(20): 6243s–6249s. doi: 10.1158/1078-0432.ccr-06-0931
20. Weycker D, Li X, Barron R, et al. Hospitalizations for osteoporosis-related fractures: Economic costs and clinical outcomes. *Bone Reports*. 2016; 5: 186–191. doi: 10.1016/j.bonr.2016.07.005
21. Nooh A, Goulding K, Isler MH, et al. Early improvement in pain and functional outcome but not quality of life after surgery for metastatic long bone disease. *Clinical Orthopaedics & Related Research*. 2018; 476(3): 535–545. doi: 10.1007/s11999-0000000000000065
22. Kendal JK, Heard BJ, Abbott AG, et al. Does surgical technique influence the burden of lung metastases in patients with pathologic long bone fractures? *BMC Musculoskeletal Disorders*. 2022; 23(1). doi: 10.1186/s12891-022-05067-5

23. Decroisette C, Monnet I, Berard H, et al. Epidemiology and treatment costs of bone metastases from lung cancer: A french prospective, observational, multicenter study (GFPC 0601). *Journal of Thoracic Oncology*. 2011; 6(3): 576–582. doi: 10.1097/jto.0b013e318206a1e3
24. Wilson MA, Zhong J, Johannet P, et al. Preliminary analysis of distinct clinical and biologic features of bone metastases in melanoma. *Melanoma Research*. 2020; 30(5): 492–499. doi: 10.1097/cmr.0000000000000691
25. Qian Y, Arellano J, Bhowmik D, et al. Healthcare resource use and costs associated with renal impairment in us patients with bone metastases from solid tumours. *Journal of Oncology Pharmacy Practice*. 2017; 23(3): 195–202. doi: 10.1177/1078155216629826
26. Shabani M, Binesh F, Behniafard N, et al. Clinicopathologic characteristics and survival of patients with bone metastasis in Yazd, iIran. *Medicine*. 2014; 93(28): e317. doi: 10.1097/md.0000000000000317
27. Abdulnabi S F, Mostafa M, Jabbari A, et al. A comparative study of maternal and neonatal outcomes in obese and non-obese Iraqi pregnant women undergoing caesarean section. *Cureus*, 2025, 17(3). doi: 10.7759/cureus.81039
28. van der Doelen MJ, Oving IM, Wyndaele DNJ, et al. Health-related quality of life, psychological distress, and fatigue in metastatic castration-resistant prostate cancer patients treated with radium-223 therapy. *Prostate Cancer and Prostatic Diseases*. 2022; 26(1): 142–150. doi: 10.1038/s41391-022-00569-8
29. Guo YQ, Ju QM, You M, et al. Depression, anxiety and stress among metastatic breast cancer patients on chemotherapy in China. *BMC Nursing*. 2023; 22(1). doi: 10.1186/s12912-023-01184-1
30. DiCaprio MR, Murtaza H, Palmer B, et al. Narrative review of the epidemiology, economic burden, and societal impact of metastatic bone disease. *Annals of Joint*. 2022; 7: 28–28. doi: 10.21037/aoj-20-97
31. Mattson R, Henderson M, Carlson SS. Assessing grief in cancer care: A systematic review of observational studies using psychometric instruments. *Healthcare*. 2025; 13(14): 1722. doi: 10.3390/healthcare13141722
32. Delgado-Guay M, Ferrer J, Rieber AG, et al. Financial Distress and its associations with physical and emotional symptoms and quality of life among advanced cancer patients. *Oncologist*. 2015; 20(9): 1092-1098. doi: 10.1634/theoncologist.2015-0026
33. Yu H, Li H, Zuo T, et al. Financial Toxicity and psychological distress in adults with cancer: a treatment-based analysis. *Asia-Pacific Journal of Oncology Nursing*. 2022; 9(9): 100069. doi: 10.1016/j.apjon.2022.04.008
34. Chakraborty R, Majhail NS, Abraham J. Psychosocial and patient support services in comprehensive cancer centres. In: *The comprehensive cancer center*. Springer International Publishing; 2022. pp. 93–106.
35. Németh N, Davidescu L, Lazăr L, Voiță-Mekeres F, Racoviță M, Hozan CT. Impact of rehabilitation intervention for cancer patients with spinal bone metastasis: Psychosocial and clinical outcomes. *Geriatrics*. 2025; 10(2): 56. doi: 10.3390/geriatrics10020056
36. Ann-Yi S, Bruera E. Psychological aspects of care in cancer patients in the last weeks/days of life. *Cancer Research and Treatment*. 2022; 54(3): 651–660. doi: 10.4143/crt.2022.116
37. Liu Y, Chen Z, Lin N, et al. Evaluating the psychosocial effects of cancer on sleep quality and mental health in elderly populations. *BMC Psychiatry*. 2025; 25(1): 933. doi: 10.1186/s12888-025-07425-8
38. Caminiti C, Annunziata MA, Verusio C, et al. Effectiveness of a psychosocial care quality improvement strategy to address quality of life in patients with cancer. *JAMA Network Open*. 2021; 4(10): e2128667. doi: 10.1001/jamanetworkopen.2021.28667