



Beyond Preventable Admissions: Rethinking Unplanned Hospitalization as a Patient-Centered Quality Indicator in Modern Oncology

Tamriko Bulia^{1,2}; Davit Barliani²; Nana Makaridze³; Gogita Katcharava²; Ketevan Sibashvili²; Guram Gadabadze²

¹School of Health Sciences; The University of Georgia; ²Tbilisi State Medical University The First University Clinic; ³N(N)LE New Vision University Hospital

ABSTRACT

Background: Unplanned hospitalization during systemic anticancer therapy is increasingly used to measure treatment safety, healthcare utilization, and oncology service quality. However, hospital admission is a heterogeneous clinical outcome that may reflect potentially preventable deterioration, unavoidable complications, or appropriate escalation of care. Treating these circumstances as equivalent may lead to misleading assessments of clinical performance and inappropriate quality-improvement priorities.

Objective: To critically examine the determinants, preventability, and interpretation of unplanned hospitalization among adults receiving systemic anticancer therapy and propose a patient-centered approach to its evaluation.

Evidence synthesis: This critical narrative review draws on observational studies, systematic reviews, randomized clinical trials, professional guidelines, and research on supportive care delivery. Available evidence identifies treatment toxicity, disease-related complications, functional vulnerability, comorbidity, symptom burden, and healthcare accessibility as interacting determinants of acute care use. Estimates vary considerably across populations and study designs. Electronic patient-reported outcome monitoring and geriatric assessment-guided interventions improve selected clinical outcomes, but reductions in hospitalization are not consistently demonstrated. Administrative definitions of preventability may also misclassify urgent or clinically necessary encounters. Alternative outpatient and home-based models offer opportunities to reduce conventional hospital utilization, although effectiveness depends on patient selection, service capacity, and implementation context.

Conclusions: Hospitalization frequency alone is an insufficient measure of cancer care quality. A more clinically meaningful approach should distinguish preventable deterioration from necessary admission and incorporate clinical severity, symptom trajectories, modifiable risk factors,

healthcare accessibility, and patient preferences. Future research should prioritize standardized outcome definitions, longitudinal risk assessment, and pragmatic evaluation of interventions that improve patient-centered outcomes without compromising timely acute care.

Keywords: unplanned hospitalization; systemic anticancer therapy; emergency department utilization; supportive oncology; preventability; patient-reported outcomes; risk stratification; quality of cancer care.

Introduction

Unplanned hospitalization is a consequential event in the trajectory of cancer care. For healthcare systems, it represents substantial resource utilization; for clinicians, it may signal treatment toxicity, disease progression, or unmet supportive needs; and for patients, it may disrupt anticancer treatment, diminish functional independence, and impose psychological, financial, and practical burdens. Although these perspectives are interconnected, they do not necessarily lead to the same interpretation of hospitalization as a quality outcome.

The complexity of this issue has increased alongside advances in systemic anticancer therapy. Cytotoxic chemotherapy, molecularly targeted treatments, immune checkpoint inhibitors, and combination regimens have expanded therapeutic possibilities but introduced diverse patterns of acute and cumulative toxicity. At the same time, patients receiving treatment increasingly include individuals with advanced disease, multiple comorbidities, functional impairment, and prolonged exposure to healthcare services.

A systematic review and meta-analysis by Prince et al. (2019) demonstrated substantial variation in hospitalization estimates across clinical populations and research designs. Such heterogeneity challenges the assumption that hospitalization rates can be compared meaningfully without accounting for differences in case mix, treatment exposure, follow-up, and healthcare organization.

Unplanned acute care has consequently become a target for service redesign. Handley et al. (2018) identified several potentially useful strategies, including improved identification of high-risk patients, enhanced access and coordination, standardized symptom management, urgent oncology services, and early palliative care. However, the effectiveness of these approaches depends partly on how the outcome of interest is defined.

An admission for severe neutropenic sepsis may reflect appropriate and timely clinical management. Conversely, hospitalization for dehydration following several days of inadequately addressed gastrointestinal toxicity may reveal an opportunity for earlier intervention. Both events contribute to conventional hospitalization statistics, yet their implications for quality improvement differ substantially.

This review argues that the central objective of supportive oncology should not be hospitalization avoidance itself, but the prevention of avoidable clinical deterioration while preserving access to

necessary acute care. It examines the evidence supporting this distinction and considers how hospitalization might be evaluated as a more clinically meaningful and patient-centered outcome.

The Measurement Problem: What Does Unplanned Hospitalization Represent?

A fundamental limitation of the existing literature is the inconsistent measurement of unscheduled healthcare utilization.

Studies variously examine emergency department attendance, direct inpatient admission, hospital readmission, all-cause hospitalization, treatment-related hospitalization, or composite acute care outcomes. These measures overlap but are not interchangeable.

An emergency department presentation may result in discharge following assessment, whereas a direct hospital admission may occur without emergency department attendance. Combining these events obscures differences in severity, diagnostic requirements, and opportunities for outpatient management.

Observation periods introduce additional uncertainty. A hospitalization occurring shortly after chemotherapy may be temporally associated with treatment, but the causal contribution of treatment may remain unclear. Conversely, delayed adverse events, cumulative toxicity, and progressive functional decline may occur outside commonly used observation windows.

Dufton et al. (2022) systematically examined methodological approaches to measuring unplanned emergency department presentations during systemic anticancer therapy and identified substantial heterogeneity in population selection, denominators, observation periods, and adjustment for confounding.

This variation limits comparisons between studies and complicates the interpretation of hospitalization as a performance indicator.

The distinction between presentation and admission is illustrated by Kim et al. (2026). In a secondary analysis involving 346 patients receiving chemotherapy, 115 patients (33%) experienced at least one unplanned hospital presentation during the first three treatment cycles. Importantly, more than half of the presentations did not result in inpatient admission.

These findings demonstrate that emergency evaluation and hospitalization represent different stages of acute care. A patient may require urgent investigation to exclude sepsis or other serious complications and subsequently be discharged safely. Such an encounter should not automatically be classified as unnecessary.

The measurement problem extends to causal attribution. Hospitalization during anticancer therapy may result from treatment toxicity, cancer progression, pre-existing disease, or several interacting conditions. Retrospective classification based on discharge diagnoses may fail to capture this complexity.

For future research, hospitalization outcomes should therefore be defined according to their timing, clinical cause, severity, relationship to treatment, and potential modifiability.

Distinguishing the occurrence of acute deterioration from the setting in which it is managed is particularly important.

Clinical Determinants of Unplanned Hospitalization

Treatment-related complications

Systemic anticancer therapy remains an important contributor to acute clinical deterioration.

Cytotoxic chemotherapy may cause febrile neutropenia, infection, severe nausea and vomiting, diarrhea, dehydration, electrolyte disturbances, renal dysfunction, and hematological complications. The probability and severity of these events depend on treatment intensity, baseline organ function, previous toxicity, comorbidity, and individual physiological reserve.

Kim et al. (2026) reported that a substantial proportion of unplanned presentations occurred during the first chemotherapy cycle, with fever and gastrointestinal symptoms among the leading reasons. These findings suggest that early treatment may represent a clinically important period for intensified patient education, symptom surveillance, and rapid supportive intervention.

However, treatment-related risk cannot be generalized across all anticancer agents.

Immune checkpoint inhibitors may cause inflammatory toxicities affecting the lungs, gastrointestinal tract, liver, endocrine organs, and other systems. Their onset may be delayed, and presenting symptoms may resemble infection or cancer progression.

Targeted therapies may produce cardiovascular, pulmonary, hepatic, dermatological, or metabolic complications requiring treatment-specific surveillance.

Fleshner et al. (2023), in a systematic review of emergency department use among oncology patients, identified pain and treatment-related toxicity as major reasons for acute presentations. The authors also highlighted limited evidence concerning newer anticancer treatments and inconsistent definitions of potentially preventable emergency visits.

These findings suggest that prevention requires more than general toxicity education. Surveillance and response pathways must reflect the mechanisms, timing, and severity of complications associated with specific treatment regimens.

Cancer-related deterioration

Not all hospitalizations occurring during systemic therapy are attributable to treatment.

Patients may require admission for malignant bowel obstruction, respiratory compromise, pleural effusion, bleeding, thromboembolism, neurological deterioration, metabolic disturbances, or uncontrolled pain.

The distinction between treatment toxicity and disease progression is particularly important because the underlying mechanisms may require fundamentally different interventions.

For example, dyspnea in a patient receiving immunotherapy may reflect immune-mediated pneumonitis, infection, pulmonary embolism, pleural disease, or tumor progression. Early clinical assessment is essential because inappropriate delay may worsen outcomes.

Disease stage provides important prognostic information but does not fully describe the patient's acute clinical risk. Patients with similar anatomical disease extent may differ substantially in symptom burden, functional reserve, treatment tolerance, and access to supportive services.

Changes in clinical trajectory—including escalating symptoms, repeated urgent consultations, nutritional deterioration, and declining performance status—may therefore be more informative than static disease characteristics alone.

Frailty and physiological vulnerability

Functional vulnerability influences both susceptibility to treatment complications and the capacity to recover from acute illness.

Chronological age and conventional performance status are insufficient to capture the full range of factors relevant to treatment tolerance.

Hurria et al. (2011) demonstrated that multidimensional geriatric assessment could identify older adults at increased risk of severe chemotherapy toxicity. Their findings supported the integration of functional, nutritional, cognitive, and comorbidity-related information into routine clinical evaluation.

Klepin et al. (2021) examined unplanned hospitalization among 750 older adults receiving chemotherapy and found that 193 patients (25.7%) experienced at least one unplanned admission. Their analysis highlighted the importance of vulnerabilities extending beyond tumor characteristics.

The ASCO guideline update by Dale et al. (2023) recommends geriatric assessment to identify functional limitations, cognitive impairment, comorbidity, polypharmacy, nutritional concerns, and inadequate social support among older adults receiving systemic treatment.

Importantly, the clinical value of geriatric assessment depends on whether identified vulnerabilities lead to appropriate interventions.

In a randomized trial, Li et al. (2021) demonstrated that geriatric assessment-driven interventions reduced severe chemotherapy-related toxic effects among older adults with cancer.

Nevertheless, reductions in severe toxicity should not automatically be interpreted as reductions in hospitalization. The relationship between these outcomes requires direct evaluation.

Frailty is also not confined to older patients. Cachexia, cumulative treatment toxicity, advanced disease, and prolonged inactivity may substantially reduce physiological reserve at any age.

A longitudinal approach is therefore needed to identify changes in vulnerability throughout treatment.

Social and healthcare-system factors

Hospitalization risk is influenced by circumstances beyond cancer biology and treatment toxicity. Patients who live alone, lack caregiver support, experience financial hardship, or face transportation barriers may be less able to access early assessment when symptoms worsen.

Healthcare organizations can modify the consequences of these vulnerabilities.

In settings with rapid-access oncology services, ambulatory hydration, urgent laboratory testing, and coordinated telephone triage, selected complications may be managed without conventional hospital admission.

Where such services are unavailable, hospitalization may represent the safest or only feasible treatment option.

This distinction is essential when comparing utilization across healthcare systems. Differences in hospitalization rates may reflect variations in service capacity rather than differences in the quality of clinical decision-making.

Preventability Is Not Synonymous With Avoidability

The concept of potentially preventable hospitalization is widely used in quality improvement, but it is often applied without sufficient consideration of clinical context.

Some admissions follow complications that might have been mitigated through earlier recognition or treatment. Others occur despite appropriate monitoring and timely intervention. A hospitalization for dehydration, for example, may reflect delayed management of progressive gastrointestinal toxicity. Alternatively, it may result from rapidly evolving illness that could not reasonably have been controlled outside the hospital.

The final diagnosis alone cannot establish which explanation is correct.

Alishahi Tabriz et al. (2025) evaluated the validity of a Centers for Medicare & Medicaid Services measure intended to identify potentially preventable emergency department visits among patients with cancer. The investigators found important discrepancies between administrative classifications and indicators of clinical urgency. Notably, some visits classified as potentially preventable involved high-acuity presentations or resulted in hospitalization.

These findings challenge the assumption that retrospective diagnostic coding can reliably identify unnecessary acute care.

A more clinically meaningful approach should distinguish three questions.

First, could the underlying deterioration have been prevented or reduced through earlier intervention?

Second, once deterioration occurred, could the patient have been managed safely without admission?

Third, was an appropriate alternative care pathway realistically available?

These questions address different dimensions of quality.

The first concerns prevention of illness progression. The second concerns the clinical necessity of inpatient treatment. The third concerns healthcare accessibility and organizational capacity. Conflating them may create misleading quality assessments and inappropriate incentives. Reducing hospitalization rates should not become a goal that discourages timely emergency evaluation or shifts excessive responsibility to patients and caregivers.

From Static Risk Prediction to Longitudinal Recognition of Deterioration

Traditional hospitalization risk models commonly rely on variables measured before treatment initiation, including age, tumor stage, comorbidity, laboratory results, and treatment regimen.

Although clinically relevant, these factors provide only a partial account of risk.

Hospitalization vulnerability changes throughout the treatment course. A patient with preserved baseline function may develop severe toxicity after the first cycle, while another patient with substantial comorbidity may remain stable through effective supportive management.

Baseline susceptibility and emerging deterioration should therefore be considered complementary dimensions of risk.

Gajra et al. (2023) evaluated a quality-improvement intervention incorporating predictive analytics and individualized nursing actions to reduce avoidable acute care utilization. The findings support the potential value of combining risk identification with targeted clinical responses, although the nonrandomized design limits causal conclusions.

Prediction alone does not prevent hospitalization.

A model may accurately identify patients at high risk without specifying which intervention could alter their clinical trajectory. Advanced disease, for example, may predict acute care use but is not always directly modifiable.

Conversely, delayed recognition of toxicity may represent an actionable problem even when its statistical contribution to overall prediction is relatively modest.

The clinical utility of a risk model therefore depends not only on discrimination and calibration but also on whether its predictions lead to safe, feasible, and effective interventions.

Patient-Reported Outcomes and Early Detection of Clinical Deterioration

One of the most promising strategies for identifying emerging complications involves structured symptom monitoring between scheduled oncology appointments.

Conventional follow-up relies on periodic clinical encounters, although symptoms may develop or worsen between visits.

Patient-reported outcome measures provide a method of collecting information directly from patients and may help clinicians recognize deterioration earlier.

In a randomized trial involving 766 patients receiving treatment for advanced solid tumors, Basch et al. (2016) demonstrated that electronic symptom monitoring improved health-related quality

of life and reduced emergency department attendance. Emergency visits occurred in 34% of the intervention group compared with 41% receiving usual care.

Hospitalization occurred in 45% and 49%, respectively, but the difference was not statistically significant.

A subsequent analysis reported improved overall survival in the intervention group (Basch et al., 2017).

Denis et al. (2017) also reported improved survival with web-mediated symptom follow-up among selected patients with lung cancer, suggesting that earlier recognition of clinical changes may influence subsequent management.

However, more recent evidence provides a more nuanced perspective.

The PRO-TCT cluster-randomized trial evaluated electronic patient-reported outcome monitoring in community oncology practices. Among 1,191 patients, the intervention significantly delayed the first emergency visit and improved selected measures of symptoms, physical function, and health-related quality of life. It did not improve overall survival (Basch et al., 2025).

These findings demonstrate that symptom monitoring can provide meaningful benefits without uniformly improving every clinical endpoint.

They also emphasize the importance of the response pathway.

Electronic questionnaires do not independently prevent deterioration. Their effectiveness depends on whether concerning symptoms trigger timely assessment, medication adjustment, diagnostic investigation, or escalation of care.

Implementation must additionally address digital literacy, language accessibility, cognitive impairment, and unequal access to technology.

The central intervention is therefore not symptom reporting alone, but the clinical system capable of responding to reported needs.

Alternative Models of Acute Oncology Care

The availability of alternative care settings influences whether acute deterioration results in conventional hospitalization.

Rapid-access oncology clinics, nurse-led triage, ambulatory supportive treatment, and coordinated follow-up may provide safe alternatives for appropriately selected patients.

Home-based oncology care represents another potential strategy.

Mooney et al. (2021) evaluated the Huntsman at Home program in a prospective, nonrandomized real-world comparison. The intervention was associated with reduced unplanned hospital utilization and healthcare costs among selected patients.

These findings are promising but should be interpreted in light of patient selection, study design, and service requirements.

Nipp et al. (2022) described clinical trial protocols for supportive oncology care delivered at home, emphasizing the need to test whether home-based interventions can improve outcomes and reduce the burden of conventional healthcare utilization.

The availability of such services may substantially influence hospitalization rates. A patient requiring intravenous hydration, symptom assessment, or medication adjustment may be managed outside the hospital in one healthcare system but require admission in another.

Consequently, utilization outcomes cannot be interpreted independently of service capacity.

Alternative care models should also be evaluated for safety, caregiver burden, feasibility, and equity. Home-based care is not necessarily appropriate for patients with severe instability, complex diagnostic needs, or inadequate support.

The goal should be clinically appropriate care in the least burdensome safe setting, rather than shifting treatment away from hospitals irrespective of patient circumstances.

Hospitalization and the Broader Burden of Cancer Care

Hospitalization affects patients beyond the immediate consequences of the acute clinical event.

Admissions may disrupt treatment schedules, reduce functional independence, increase caregiver responsibilities, and impose additional financial and emotional burdens.

The concept of time toxicity provides a useful framework for understanding these effects.

Gupta et al. (2022) argued that the time patients spend obtaining cancer treatment and interacting with healthcare services represents a meaningful burden that is often insufficiently captured in conventional evaluations of treatment value.

In a subsequent analysis of a randomized trial involving patients with advanced colorectal cancer, Gupta et al. (2023) demonstrated how healthcare contact time could be quantified alongside treatment outcomes.

More recent population-based research by Ording et al. (2025) examined time toxicity among patients receiving systemic treatment for metastatic lung cancer in routine clinical practice.

These studies reinforce the importance of evaluating how treatment and its complications affect patients' available time, not merely whether they survive or require admission.

Financial burden is another relevant dimension.

Zafar et al. (2013) documented the financial consequences of cancer treatment among insured patients, illustrating that healthcare-related costs may remain substantial even when formal insurance coverage is available.

A reduction in hospitalization that requires frequent outpatient attendance, substantial travel, or additional caregiver involvement may therefore provide less benefit than admission counts alone suggest.

Quality assessment should incorporate symptom burden, functional status, treatment continuity, time at home, financial consequences, and patient preferences.

The Contribution of Supportive and Palliative Care

Supportive and palliative care are integral to comprehensive oncology management.

Their role extends beyond end-of-life care to symptom control, communication, psychosocial support, caregiver needs, and complex decision-making.

Temel et al. (2010) demonstrated improvements in quality of life and other outcomes through early palliative care among patients with metastatic non-small-cell lung cancer.

Zimmermann et al. (2014) subsequently reported benefits of early specialist palliative care integration in a cluster-randomized trial involving patients with advanced cancer.

The updated ASCO guideline recommends early interdisciplinary palliative care involvement for patients with advanced malignancies, particularly when significant physical, psychological, or other unmet needs are present (Sanders et al., 2024).

Nevertheless, these findings should not be interpreted as evidence that palliative care universally prevents hospitalization.

Some admissions occur because of severe, potentially reversible complications and remain clinically appropriate despite comprehensive supportive management.

The relevant contribution of palliative care is to improve symptom assessment, communication, coordination, and alignment of treatment with patient goals.

Health-system capacity is particularly important in determining how such care can be delivered.

Bulia et al. (2026) evaluated Georgia's palliative care system using WHO indicators and European benchmarks, identifying structural issues relevant to service development and accessibility.

Although this study did not directly examine unplanned hospitalizations, it provides context for understanding why models developed in highly resourced settings may require adaptation before implementation elsewhere. Integrated supportive care should therefore be evaluated not only by its potential to reduce acute utilization but also by its ability to improve access, continuity, symptom control, and patient-centered outcomes.

Rethinking Hospitalization as a Quality Indicator

The evidence reviewed here suggests that hospitalization should be interpreted through several complementary dimensions rather than treated as a uniformly adverse event.

The first dimension is clinical necessity: whether the patient's condition required inpatient assessment or treatment.

The second is the preceding clinical trajectory: whether deterioration developed gradually and whether warning signs were recognizable before admission.

The third is modifiability: whether a feasible intervention could reasonably have altered the course of deterioration.

The fourth is healthcare accessibility: whether appropriate outpatient or home-based alternatives were available when needed.

The fifth is patient-centered appropriateness: whether admission and subsequent treatment were consistent with the patient's preferences, goals, and expected clinical benefit.

These dimensions are conceptually distinct.

A patient admitted promptly for severe sepsis may have received high-quality care despite contributing to an unfavorable hospitalization statistic. Conversely, a patient who remains outside the hospital because of access barriers may experience poor care despite contributing favorably to utilization measures.

The proposed approach should be regarded as a conceptual framework for future investigation rather than a validated risk score or quality instrument.

Its central contribution is to separate the occurrence of hospitalization from the quality of the clinical pathway leading to it.

Research Priorities

Several priorities emerge from the available evidence.

First, future studies should standardize definitions of emergency presentations, hospital admissions, readmissions, and potentially preventable deterioration.

Second, risk assessment should integrate baseline vulnerability with longitudinal changes in symptoms, function, nutrition, treatment tolerance, and supportive needs.

Third, prediction models should undergo external validation across tumor types, treatment regimens, and healthcare settings. Evaluate their clinical usefulness by assessing whether predictions lead to interventions that improve outcomes.

Fourth, pragmatic trials should compare different combinations of symptom monitoring, rapid-access services, geriatric interventions, and supportive care integration.

Fifth, evaluations should include potential unintended consequences. Strategies that reduce admission rates but increase delayed emergency treatment, caregiver burden, or inequitable access cannot be considered successful.

Finally, research should prioritize patient-meaningful outcomes, including symptom control, functional independence, treatment continuity, quality of life, and time spent in preferred environments.

These priorities matter especially in resource-constrained settings, where the availability of outpatient alternatives may substantially modify the effects of preventive interventions.

Conclusion

Unplanned hospitalization during systemic anticancer therapy is a heterogeneous outcome shaped by treatment toxicity, disease progression, physiological vulnerability, social circumstances, and healthcare organization.

Although some episodes of clinical deterioration may be preventable, others require timely inpatient management. Treating these events as equivalent risks undermining the validity of hospitalization-based quality assessment.

Evidence supports multidimensional risk evaluation, longitudinal symptom monitoring, and coordinated supportive interventions. However, improved symptom detection does not consistently translate into reduced hospitalization, and the effectiveness of preventive strategies depends on the clinical resources available to respond.

A patient-centered approach should distinguish avoidable deterioration from necessary admission and evaluate hospital utilization alongside safety, functional outcomes, treatment continuity, quality of life, and patient preferences.

The objective of modern supportive oncology should not be fewer hospitalizations irrespective of circumstance, but fewer avoidable harms and better care when hospitalization is necessary.

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