

Article

Financial toxicity in hematologic malignancies: from status and coping to humanistic care integration

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Abstract: Recently, financial toxicity (FT) has emerged as a critical term in the field of comprehensive health research. It refers to the objective economic burden and subjective financial pressure experienced by patients and their families due to disease-related expenses and treatment costs. For patients with malignant hematological diseases (e.g., leukemia, lymphoma, multiple myeloma), the prolonged treatment cycle and high medical costs often result in significant FT, manifesting as substantial financial strain and diminished quality of life. Existing studies indicate that FT is prevalent among patients with malignant hematological diseases and is closely associated with treatment plan selection, out-of-pocket expenses, income levels, and healthcare security policies. Such toxicity can lead to treatment interruptions, heightened psychological stress, and reduced survival rates. Notably, most existing investigations merely describe the epidemiological characteristics and correlational relationships of FT across pan-cancer populations, while few conduct targeted critical analysis on the inherent defects of current research designs, intervention limitations and unmet clinical demands specific to hematologic malignancies. Furthermore, research gaps regarding FT management for patients receiving hematopoietic stem cell transplantation, CAR-T cell therapy and long-term maintenance treatment remain largely underexplored. However, while current research primarily focuses on assessment tools, influencing factors, and correlations with health outcomes, targeted interventions remain insufficient. This article systematically reviews the current research status of FT in patients with malignant hematological diseases, critically analyzes the flaws of existing studies, highlights unique FT-related dilemmas in hematologic malignancies, explores unresolved scientific questions and prospective research directions, aiming to explore precise intervention models and coping strategies to address FT and provide a reference framework for developing systematic solutions.

Keywords: hematological malignancies; financial toxicity; medical expenses; coping strategy; healthcare security

1. Introduction

Malignant hematological diseases, also referred to as hematological malignancies (HM), encompass a group of highly heterogeneous and challenging malignant disorders such as leukemia, lymphoma, multiple myeloma, and myeloproliferative neoplasms [1,2]. In recent years, advancements in targeted therapy, immunotherapy, and hematopoietic stem cell transplantation have significantly improved survival outcomes for patients with these conditions. However, these medical advances are accompanied by substantial healthcare

expenditures, prolonged economic burdens, and adverse effects on health outcomes, collectively contributing to the phenomenon known as financial toxicity (FT). This has emerged as a critical challenge in the clinical management of HM [3,4]. Research indicates that FT not only compromises treatment adherence and quality of life but may also result in treatment discontinuation, psychological distress, and poorer prognoses [5–7].

In developed countries, extensive research has been conducted on FT, and it is increasingly being integrated into clinical practice guidelines. For example, the American Society of Clinical Oncology (ASCO) now includes FT assessment as part of comprehensive cancer care [8]. Globally, FT presents distinct manifestations across different national healthcare systems. In the United States, high out-of-pocket medical costs and imperfect insurance coverage make FT an extremely prominent clinical issue. By contrast, the United Kingdom, Canada, and Australia provide free access to in-hospital medications and core treatments via universal healthcare systems; their main FT challenges lie in long-distance medical travel, accommodation expenses during treatment, transportation fees, parking costs, and unaffordable out-of-hospital self-paid drugs. In low- and middle-income countries such as India, direct treatment and commuting costs often equal households' total monthly income for food and housing, leading to extremely high rates of treatment abandonment. This study is primarily based on the clinical reality of China, a middle-income country with a multi-level medical security system, and the research findings are applicable to clinicians, healthcare policymakers and social service practitioners in China and other countries with similar healthcare and economic contexts.

In contrast, developing countries face greater challenges due to uneven distribution of medical resources and an underdeveloped healthcare security system. Patients with HM in these regions often encounter severe financial strain caused by high costs of innovative therapies, travel expenses for medical consultations, income loss, and caregiving responsibilities. These factors frequently lead to situations where individuals fall into poverty due to illness or abandon treatment altogether due to financial hardship [9,10]. Notably, FT risks vary greatly across patient age groups and social statuses. In Canada and similar regions, treatment abandonment is rare among pediatric HM patients, yet young adults and working-age adult patients face severe financial pressure: most are in the career establishment stage with unstable income, and additional expenses for out-of-hospital drugs, transportation, fuel and daily living often force them to choose to suspend treatment. Moreover, young adults, patients with precarious housing, homeless or underhoused populations, and groups without stable medical follow-up services are more likely to be diagnosed at advanced disease stages due to delayed medical seeking, which further exacerbates FT and worsens long-term clinical prognosis. Moreover, while most existing studies focus on FT in patients with solid tumor, relatively limited attention has been given to this vulnerable population. Compared with solid tumors, HM features unique clinical traits including mandatory long-term maintenance treatment, high incidence of relapsed/refractory disease, frequent readmission for infection control, and widespread application of high-cost cellular therapies such as CAR-T and hematopoietic stem cell transplantation (HSCT). These clinical characteristics render the FT of HM patients far more persistent, complex and destructive, yet current literature rarely differentiates FT features between HM and solid tumors, leading to generalized research conclusions that lack pertinence for hematology clinical practice. Strategies

to address FT among patients with HM remain underdeveloped and require systematic investigation. Therefore, this paper aims to provide a comprehensive review of current research on FT in patients with HM, analyze influencing factors, evaluate limitations of existing interventions, and propose potential directions for future improvement. Drawing upon both domestic and international evidence, this study seeks to inform clinical practice, policy formulation, and further research, promoting standardized and personalized approaches to FT management. The ultimate goal is to enhance patient-centered care, improve clinical outcomes, and foster better physician-patient relationships.

2. Definition and conceptual framework of FT

2.1 Evolution and conceptual development of FT

The term “financial toxicity (FT)” was first introduced by Dr. Yousuf Zafar [11,12], describing the negative impact of excessive treatment costs on cancer patients who reduce medication doses, delay follow-up visits, or discontinue treatment altogether. Over time, the concept has evolved into a broader definition: FT refers to the multifaceted burden imposed by the financial costs associated with cancer treatment, which affects patients’ quality of life, treatment adherence, and survival outcomes. It represents a dual burden involving both economic and health-related dimensions [13,14]. While the issue of medical costs has traditionally been described as an “economic or financial burden,” the adoption of the term “toxicity” draws a parallel to therapeutic side effects such as those seen in chemotherapy, thereby emphasizing its direct impact on health [15]. Importantly, FT encompasses not only objective financial expenditures but also subjective experiences such as anxiety and depression related to financial stress, marking a conceptual shift from “economic or financial burden” to “toxicity”.

2.2 Specific characteristics of FT in patients with HM

Compared to patients with other types of cancer, individuals with HM experience distinct manifestations of FT. Firstly, treatment costs are notably high due to the use of advanced therapies such as gene-targeted inhibitors, CAR-T cell therapy, and hematopoietic stem cell transplantation, which could range from hundreds of thousands to millions of dollars. Secondly, the chronic nature of these diseases necessitates long-term treatment, including maintenance therapy, salvage regimens following relapse, and lifelong follow-up. Thirdly, indirect costs are considerable, as bone marrow suppression and immune compromise increase infection risks, leading to frequent hospitalizations and reliance on costly supportive treatments. Lastly, many patients are of working age; during treatment, they often experience functional impairments, disrupted social networks, and significant reductions in household income, further exacerbating their financial vulnerability. Consistent with the above discussion, young adult patients with unstable careers and precarious housing are the high-risk group for severe FT in HM populations; pediatric patients generally have lower FT-related treatment abandonment rates, while working-age adults and elderly patients also face differentiated financial pressures due to income differences.

Critically, relapsed/refractory HM further amplifies FT: patients have to switch to second- or third-line salvage regimens with higher prices and lower insurance reimbursement ratios, and repeated hospitalizations for severe infections after myelosuppression create a vicious cycle of rising medical expenses. Differing from

solid tumors that mostly adopt short-cycle radical treatment, the lifelong follow-up and long-term maintenance medication of HM mean FT will persist throughout the whole disease course, rather than being confined to the intensive treatment stage. Additionally, HSCT requires long-term post-transplant immune suppression treatment and complication management, bringing sustained economic pressure that is rarely discussed in pan-cancer FT studies.

2.3 Consequences and importance of assessing FT in patients with HM

As previously discussed, FT exerts profound negative effects on the quality of life, treatment compliance, and survival outcomes of patients with HM. The most immediate consequence is the direct financial burden, including high out-of-pocket expenses and insurance coverage gaps, which may force families to take on debt or liquidate assets [16]. Additionally, economic toxicity can lead to delayed or abandoned treatment due to cost concerns [17,18]. Furthermore, income loss and financial stress are strongly associated with mental health issues such as depression and anxiety. These pressures could strain family dynamics and lead to social isolation, worsening psychological distress, diminishing quality of life, and ultimately compromising prognosis [19,20]. Therefore, assessing FT holds significant practical value:

Firstly, timely and accurate evaluation of FT is essential for individualized medical decision-making. By understanding a patient's financial situation, clinicians could prioritize cost-effective treatment options covered by insurance, generic medications, or clinical trial participation, thereby preventing premature treatment discontinuation and predicting the risk of non-adherence.

Secondly, FT assessments contribute to enhanced patient well-being. Integrating financial evaluations into multidisciplinary care models - including psychological support and financial counseling - can mitigate the impact of illness-induced poverty.

Thirdly, FT assessment plays a crucial role in optimizing the allocation of medical resources, identifying high-risk patients, such as those without medical insurance or from low-income backgrounds, and facilitating targeted interventions. By leveraging support mechanisms such as hospital social work services or charitable initiatives - including drug assistance programs and transportation subsidies - healthcare systems could better address the financial challenges faced by vulnerable populations. Furthermore, such assessments can inform policy adjustments, particularly in expanding the coverage of medical insurance to include innovative therapies for HM, thereby enabling personalized support and intervention strategies. These assessments also provide empirical data to support revisions to medical insurance directories, charitable assistance programs, and broader policy formulation.

Fourthly, FT assessments generate valuable insights for clinical research and public health initiatives. Data on FT could underpin health economics analyses, providing evidence for cost-effectiveness evaluations used in drug pricing negotiations and insurance policy adjustments. They also raise societal awareness of the financial hardships faced by patients with HM, encouraging support from public institutions and nonprofit organizations.

Finally, timely and effective evaluation of FT could significantly enhance doctor-patient communication and foster mutual trust, ultimately improving the overall quality of the patient-provider relationship. In clinical settings, open discussions regarding treatment costs can strengthen trust, refine communication strategies, and

help prevent treatment interruptions or disputes arising from financial constraints, especially among patients with HM.

In conclusion, FT poses a major barrier to the long-term survival and well-being of patients with HM. Its assessment is not only crucial for individual treatment decisions but also reflects broader issues of healthcare equity and social responsibility. Through early identification and targeted intervention, it is possible to improve patient outcomes and maximize the combined benefits of medical, economic, and social support systems. Nevertheless, current assessment and intervention systems still fail to fully match the long-term and recurrent characteristics of HM-related FT. Most assessment models focus on cross-sectional evaluation in the acute treatment phase, lacking dynamic tracking tools for patients in maintenance treatment and post-transplant follow-up periods, which is a key bottleneck restricting the effective management of HM-related FT.

3. Assessment framework and tools for FT

FT refers to the financial burden and associated adverse consequences experienced by patients undergoing treatment for major illnesses such as malignant hematological diseases or cancers. These consequences may include psychological distress, diminished quality of life, and reduced treatment adherence. Therefore, a comprehensive assessment framework should integrate both objective economic indicators and subjective patient experiences. Based on the extent to which financial burden influences patient behavior, FT could be categorized into three levels: mild, moderate, and severe. Mild toxicity involves reductions in non-essential expenditures (e.g., entertainment, education) without compromising treatment. Moderate toxicity may involve the use of savings or borrowing to cover medical costs, potentially delaying follow-up visits. Severe toxicity occurs when patients forgo treatment, sell assets, or declare bankruptcy due to overwhelming financial strain. The following outlines the commonly used dimensions and tools in economic toxicity assessment systems:

3.1 Objective economic burden assessment

Objective economic burden assessment constitutes a fundamental component of FT research, focusing on quantifiable financial indicators such as medical expenses, income loss, and debt levels. Unlike subjective assessments, this approach relies on verifiable financial data, offering a more direct measure of economic impact [21]. For patients with HM, direct medical costs include hospitalization fees (e.g., diagnostic and treatment charges, ICU and transplant unit costs), medication expenses (e.g., chemotherapy, targeted therapy, immunotherapy), and diagnostic testing fees (e.g., genetic testing, imaging). Non-medical direct costs encompass transportation, accommodation, and nutritional supplements. In addition, the economic burden resulting from both direct and indirect medical costs should also be considered. This includes direct economic burdens such as medical expenses (including out-of-pocket payments, insurance coverage, and other forms of reimbursement), as well as non-medical expenditures like transportation, accommodation, and caregiving costs. Additionally, indirect burdens - such as income loss and reduced productivity due to illness (for both patients and caregivers) - must be included. Therefore, an objective assessment of economic burden serves as a foundational element in FT research, providing empirical evidence to support clinical decision-making, policy formulation, and patient-centered support initiatives.

3.2 Subjective economic pressure assessment

Subjective assessment of economic stress is another crucial dimension within FT research. It emphasizes the individual's perception of financial hardship and its psychological consequences. Unlike objective indicators such as actual medical costs or debt levels, subjective economic stress evaluation captures the broader impact of financial strain on quality of life, treatment adherence, and mental health through patients' personal experiences [22,23]. In comprehensive assessments of FT, subjective economic stress typically encompasses: (1) psychological distress involving anxiety, shame, and concerns about the future, as well as diminished quality of life due to reductions in essential living expenses; (2) modifications in treatment decisions prompted by financial constraints; and (3) family discord, social withdrawal, or strained interpersonal relationships caused by medical debt. However, the central value of subjective assessment lies in its ability to reveal individual variability - even when facing identical financial costs, patients may experience vastly different levels of stress due to variations in personal financial resources, access to social support, or personal values. In conclusion, subjective economic stress assessment offers a patient-centered perspective that complements the limitations of purely quantitative economic data and provides a critical foundation for interventions targeting economic toxicity. Further development of standardized tools and investigation into their relationship with clinical outcomes are warranted.

3.3 Common assessment tools for FT

As previously discussed, FT is typically evaluated through two primary dimensions: objective economic burden and subjective economic pressure. Widely used standardized tools include:

(1) Comprehensive Score for Financial Toxicity (COST) Scale [24]: Designed for cancer patients, this scale assesses both objective indicators (e.g., medical borrowing, savings depletion, income loss) and subjective experiences (e.g., financial stress, quality of life impact). It consists of 11 items and can be completed within five minutes, making it the most widely adopted tool in this domain.

(2) FACIT-COST Scale [25,26]: An extension of the COST scale, it incorporates items specific to chronic diseases and is suitable for patients with long-term conditions such as diabetes and cardiovascular disease.

(3) Medical Expenditure Panel Survey (MEPS) Scale [27,28]: This tool focuses on out-of-pocket expenses, denied insurance claims, and catastrophic health expenditures exceeding 10% of household income.

(4) World Health Organization Fairness of Financial Contributions (FFC Index) [29]: A globally applicable measure assessing the fairness of healthcare expenditures, with key indicators including the proportion of household income spent on healthcare and the incidence of medical poverty.

(5) Medical Debt Survey (MDS) [30,31]: This instrument evaluates indicators such as credit card debt, high-interest loans, and declines in credit scores.

(6) PRO-CTCAE Economic Toxicity Module developed by the U.S. National Cancer Institute (NCI) [32,33].

Among these, the COST and FACIT-COST scales offer comprehensive assessments integrating both objective and subjective dimensions, whereas the MEPS, FFC Index, and MDS focus on objective economic burdens.

Notably, emerging methods such as electronic health record (EHR) systems - capable of automatically identifying high-risk patients using ICD-10 code Z59.6

(Extreme Poverty) - and AI predictive models employing machine learning to analyze clinical data for FT risk prediction are increasingly contributing to clinical assessments [34,35].

Despite the wide application of the above scales in general oncology populations, their adaptability for HM patients remains questionable. First, conventional FT scales are developed based on the treatment characteristics of solid tumors, lacking targeted items for HSCT, CAR-T therapy, repeated infection-related hospitalization and long-term maintenance medication, which are core components of HM treatment. Second, although FACIT-COST is applicable to chronic diseases, it fails to reflect the dynamic changes of FT in HM patients during relapse, salvage treatment and post-transplant complication management. Third, for HM patients requiring lifelong regular follow-up and long-term medication, existing tools are mostly designed for one-time or short-term repeated assessment, and cannot realize long-term continuous dynamic monitoring of FT. In addition, the subjective perception of patients undergoing long-term hematological treatment may be affected by prolonged disease stress, leading to response bias when using general FT scales. At present, there is still a lack of special FT assessment scales verified for HM populations, which is a prominent shortcoming in current research.

In conclusion, **Table 1** provides a reference for selecting appropriate FT assessment tools in clinical settings. In practice, several key considerations should guide the implementation of such assessments: First, the reliability and validity of the selected tools must be verified within the local population to ensure cultural appropriateness. Second, FT may fluctuate across disease stages and treatment phases, necessitating repeated assessments over time. Finally, integrating both subjective and objective tools (e.g., COST + MEPS) is recommended to enhance the comprehensiveness and accuracy of FT evaluations. In all, the assessment and practice of FT in patients with hematological malignancies in this study are detailed in **Figure 1**.

Table 1. Selection of FT assessment tools for clinical patients (optimized version).

Research type or scenario	Recommended tool or scale	Applicable scope & notes
Clinical rapid screening	COST scale, PRO-CTCAE	Suitable for all countries; real-time screening of FT for in-hospital HM patients
Research on health policies	MEPS, WHO FFC Index	Adaptable for cross-national comparison, national medical security system evaluation
Assessment of low-income population	Medical debt survey, Asset depletion	Prioritized for low- and middle-income countries and underprivileged groups
Long-term chronic disease management	FACIT-COST	Suitable for patients with long-term medication, applicable to all healthcare systems
Big data analysis	EHR marking, AI model	Applied to large-sample cohort monitoring in various countries

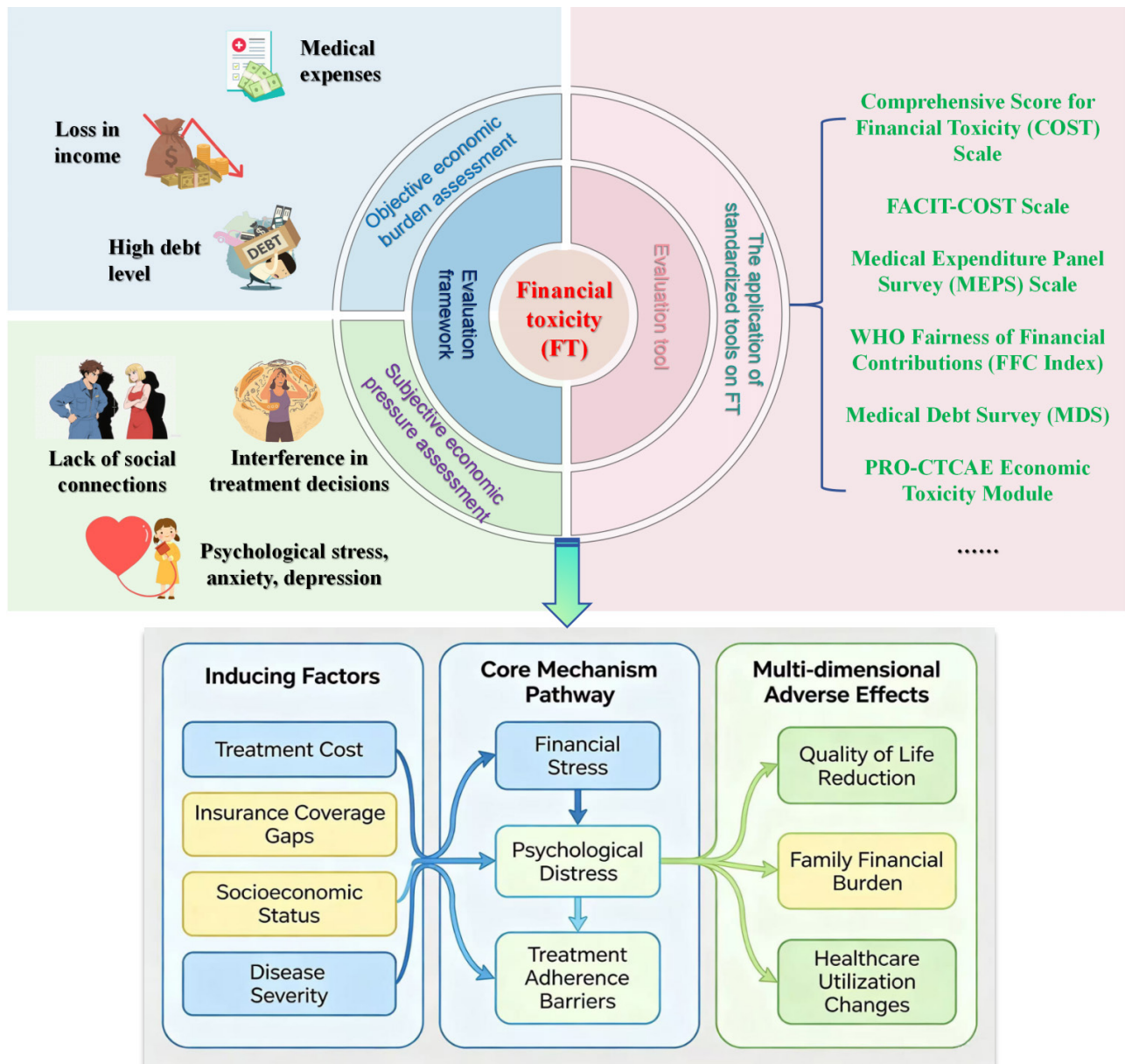


Figure 1. Technical roadmap for the evaluation and practice of FT in patients with HT.

4. Unique assessment challenges of FT in HM

It is widely acknowledged that the clinical diagnosis and treatment process for patients with malignant hematological diseases often entails a substantial economic burden. The evaluation of economic toxicity presents numerous distinctive challenges, primarily attributed to the following interrelated factors:

4.1 Complexity and high cost of treatment plans

(1) Long-term and dynamic nature of treatment. The management of malignant hematological diseases typically involves multiple phases, including induction chemotherapy, consolidation therapy, maintenance therapy, stem cell transplantation, and targeted or immunotherapy, spanning several months or even years [36]. The financial implications vary significantly across these stages, necessitating dynamic assessment of cumulative costs. However, conventional cross-sectional studies are inadequate in capturing the evolving nature of economic toxicity, thereby requiring longitudinal follow-up over extended periods.

(2) Emerging therapies and regional variability in insurance coverage. Advanced treatments such as CAR-T cell therapy, bispecific antibodies, and novel targeted agents may cost hundreds of thousands to millions of dollars per course, with limited insurance coverage or partial reimbursement [37,38]. Many high-cost therapies remain excluded from insurance schemes or offer minimal reimbursement. Additionally, due to the absence of historical data on the economic impact of innovative therapies and the volatility in their pricing, it is essential to incorporate analyses of drug accessibility and regional insurance policies into economic evaluations.

(3) Supportive care and associated costs. Patients with HM frequently require supportive interventions such as blood transfusions, anti-infective medications, and growth factor support, which further escalate overall expenditures. For example, the cost of managing granulocytopenia-related infections following chemotherapy can surpass that of the chemotherapy itself. This exacerbates financial strain on families, diminishes economic resilience, and negatively impacts patient quality of life, ultimately influencing survival outcomes [39].

4.2 Variability in healthcare systems

(1) Medical insurance policies and reimbursement constraints. The extent of coverage for treating malignant hematological diseases varies considerably across countries and regions. Therefore, FT assessments must be localized, integrating variables such as insurance reimbursement rates, out-of-pocket expenditure caps, and charitable assistance programs.

(2) Disparities in resource allocation and geographic accessibility. Specialized treatments like stem cell transplantation are concentrated in designated centers, compelling patients to incur additional travel and accommodation expenses when seeking care outside their home regions. Rural patients face disproportionately higher burdens. Furthermore, indirect costs associated with diagnosis and treatment are often overlooked, underscoring the need for a comprehensive cost-accounting framework.

4.3 Patient-specific characteristics

(1) Workforce disruption and income loss. Given the potential onset of malignant hematological diseases among working-age individuals, both patients and caregivers may experience prolonged work absences and significant income reductions. Pediatric cases similarly affect household financial stability. Consequently, assessing income loss requires consideration of socioeconomic variables such as occupation type and family financial resilience, complicating standardization efforts.

(2) Influence of psychological and social factors. Young adults with precarious housing and unstable careers are more likely to hide their financial difficulties due to social stigma, leading to underreporting of FT; while elderly patients may overestimate their economic pressure. Patients in different age groups and living conditions present obvious response bias in subjective assessment. Patients may underreport financial distress due to illness-related stigma or cognitive biases, while others may overestimate their capacity to manage costs. Subjective economic toxicity instruments (e.g., the COST scale) are susceptible to response bias and should be supplemented with objective indicators such as debt ratios and treatment discontinuation rates.

4.4 Limitations in evaluation tools and methodologies

(1) Lack of HM-specific assessment instruments. Existing economic toxicity scales, such as the COST and PRO-CTCAE, are predominantly designed for general

oncology populations and fail to address the unique needs of patients with HM, including frequent hospitalizations and long-term follow-up requirements. Hence, there is an urgent need to develop modular assessment tools tailored to this patient population, incorporating dimensions such as transplant-related costs and long-term complication management.

(2) Challenges in acquiring real-world data. As most malignant hematological diseases are rare, single-center studies often involve small sample sizes and highly individualized treatment regimens, hindering standardized cost analysis. Multi-center registries or insurance databases could provide valuable insights; however, they present challenges related to data privacy and integration.

In general, the current FT assessment system for HM is faced with multiple intertwined challenges: tool homogenization, difficulty in dynamic long-term monitoring, obstacles in real-world data collection, and regional differences in medical security policies. These problems have become major obstacles to in-depth research in this field. At present, there is no unified industry standard for FT assessment and risk stratification targeting HM globally, and the correlation between FT severity and long-term survival, relapse risk of HM patients has not been clearly verified in large-sample cohorts, which are all key unresolved questions worthy of further exploration.

5. Intervention strategies for addressing FT in patients with HM

5.1 Individual-level interventions

(1) Optimization of medical expenditures. Clinicians should prioritize treatment plans with demonstrated efficacy and favorable cost-benefit profiles. Opportunities to reduce treatment intensity and associated burdens should be explored. Integration of clinical trials and innovative therapies should be emphasized, encouraging eligible patients to participate in trials involving CAR-T or gene-targeted drugs to minimize out-of-pocket expenses. Unnecessary procedures, redundant diagnostic tests, and inappropriate use of supportive therapies should be avoided. For patients undergoing HSCT and long-term maintenance treatment, clinicians can formulate tiered medication schemes according to family economic status, to balance curative effect and economic burden.

(2) Patient education and psychosocial support. Throughout the diagnostic and therapeutic process, healthcare providers should enhance communication with patients, promote transparency regarding medical costs, and provide detailed explanations of expense structures prior to treatment. Offering multiple budget options can empower informed decision-making. Hematologists should implement financial literacy training, such as organizing “financial planning workshops” to guide rational allocation of medical resources. Concurrently, psychological support should be integrated to prevent treatment interruptions and adverse outcomes.

5.2 Policy-level interventions

(1) Enhancement of health insurance coverage. Regulatory authorities should consider gradually expanding national health insurance coverage to include newly developed high-cost drugs and advanced therapies. (2) Innovation in payment mechanisms. Alternative payment models - such as outcome-based reimbursement, installment payments, and risk-sharing agreements - should be promoted to maximize insurance benefits. Efforts should also focus on facilitating outpatient reimbursement for specialty drugs, major illness insurance claims, and cross-regional settlement

processes. Implementation of the “dual-channel” policy should be encouraged to improve access to high-cost targeted therapies. (3) Institutional reforms within healthcare facilities. Establishing dedicated patient financial assistance offices can facilitate resource coordination across departments. Collaborative initiatives among multiple institutions should advocate for the creation of specialized assistance funds for hematologic disorders and improvements in drug supply mechanisms for rare hematological diseases.

5.3 Societal support initiatives

(1) Targeted assistance funds and philanthropy. Hospitals and hematology centers should collaborate with foundations to provide medication subsidies or treatment grants, while assisting patients in applying for government aid, including temporary civil affairs department support. Encouraging enrollment in inclusive commercial insurance products can help offset high-cost self-pay items, thereby mitigating FT of the patients with HM. (2) Public welfare programs. Patient-led mutual aid groups should be supported to offer both economic and emotional assistance. When feasible, hospitals may establish compassionate care funds or provide subsidies for transportation, accommodation, and lost wages. Remote or online follow-up consultations should be promoted where clinically appropriate, reducing the frequency of hospital visits. (3) Occupational and social support services. Relevant governmental agencies should ensure legal protections for patients’ employment rights, including flexible work arrangements and accommodations during treatment. Social workers and non-governmental organizations can play a role in supporting disability assessments and early retirement applications due to illness.

In conclusion, addressing the economic toxicity experienced by patients with malignant hematological diseases necessitates multi-tiered interventions, with a focus on early identification, cost containment, resource coordination, and policy advocacy. It is worth pointing out that the current intervention measures are mostly passive remedies after the occurrence of FT, lacking proactive early screening and whole-course management models covering the entire treatment cycle of HM (induction, consolidation, transplantation, maintenance and relapse). In addition, there is a lack of evaluation systems to verify the actual effect of various intervention strategies on improving FT and long-term prognosis of HM patients. Future directions should emphasize value-based payment models to fundamentally alleviate the financial burden on patients.

6. Conclusion and outlook

Indeed, the diagnosis and treatment of HM often entail substantial and prolonged financial obligations. FT has emerged as a critical determinant affecting patients’ quality of life, treatment adherence, and clinical outcomes. It is increasingly recognized as a pivotal component in the holistic management of HM, demanding collaborative efforts from clinicians, policymakers, and society at large. A tripartite care model integrating “economics - clinical care - quality of life” should be actively pursued. Going forward, a patient-centered approach should be adopted, embedding FT considerations throughout the continuum of care to achieve balanced improvements in healthcare accessibility, treatment effectiveness, and patient well-being. This study takes China as the main research background, and the research conclusions and intervention strategies are applicable to China and other middle-income countries with similar medical security systems; meanwhile, the differentiated FT characteristics summarized in this paper can also provide references for

researchers and medical practitioners in high-income countries (the United States, the United Kingdom, Canada, Australia) and low-income countries (such as India) to carry out targeted FT management.

Combined with the above discussion, we summarize the core research gaps and future research directions in this field as follows: (1) Develop and psychometrically validate FT assessment scales specially adapted for HM, covering HSCT, cellular therapy, long-term maintenance treatment and repeated hospitalization scenarios; (2) Carry out large-sample longitudinal cohort studies to clarify the dynamic evolution rule of FT in the whole disease course of HM and its causal relationship with clinical outcomes; (3) Explore individualized, whole-cycle proactive intervention models for FT, and conduct controlled studies to verify the effectiveness of interventions; (4) Promote multi-party cooperation between clinical institutions, medical insurance departments and charitable organizations, and formulate industry guidelines and consensus on FT management for HM patients; (5) Carry out health economics research on high-cost hematological therapies, providing evidence for medical insurance policy adjustment and drug pricing. Solving these problems will help to fundamentally reduce the harm of FT and realize high-quality patient-centered care for hematologic malignancies.

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References

1. Liu Y, Tang H. CXCR Family and Hematologic Malignancies in the Bone Marrow Microenvironment. *Biomolecules*. 2025, 15(5):716. doi: 10.3390/biom15050716.
2. Yan Z, Liu Y, Zeng M, et al. Survey results analysis of death cognition and hospice attitude among healthcare providers in

- hematology department. *Journal of Leukemia & Lymphoma*, 2025, 34(3): 159-166. doi:10.3760/cma.j.cn115356-20240617-00092.
3. Li JL, Huang YP, Wu ZJ, et al. Study of current situations of economic toxicity and associated factors in hematological malignancies patients. *China Modern Doctor*, 2025, 63(11): 35-38. doi: 10.3969/j.issn.1673-9701.2025.11.009.
4. Yang H, Wu FM, Yin YX, et al. Research Progress on Financial Toxicity of Patients with Hematological Malignancies. *Medicine & Philosophy*, 2024, 45(5): 74-77. doi: 10.12014/j.issn.1002-0772.2024.05.15.
5. Chan RJ, Gordon L, Zafar SY, et al. Financial toxicity and symptom burden: what is the big deal? *Support Care Cancer*. 2018, 26(5): 1357-1359. doi: 10.1007/s00520-018-4092-6.
6. Zafar SY, Newcomer LN, McCarthy J, et al. How Should We Intervene on the Financial Toxicity of Cancer Care? One Shot, Four Perspectives. *Am Soc Clin Oncol Educ Book*. 2017,37:35-39. doi: 10.1200/EDBK_174893.
7. Zafar SY. Financial Toxicity of Cancer Care: It's Time to Intervene. *J Natl Cancer Inst*. 2015,108(5):djv370. doi: 10.1093/jnci/djv370.
8. Agarwal A, Livingstone A, Karikios DJ, et al. Physician-patient communication of costs and financial burden of cancer and its treatment: a systematic review of clinical guidelines. *BMC Cancer*. 2021,21(1):1036. doi: 10.1186/s12885-021-08697-5.
9. Blinder VS, Deal AM, Ginos B, et al. Financial Toxicity Monitoring in a Randomized Controlled Trial of Patient-Reported Outcomes During Cancer Treatment (Alliance AFT-39). *J Clin Oncol*. 2023,41(29):4652-4663. doi: 10.1200/JCO.22.02834.
10. Boulanger M, Mitchell C, Zhong J, et al. Financial toxicity in lung cancer. *Front Oncol*. 2022,12:1004102. doi: 10.3389/fonc.2022.1004102.
11. Zafar SY, Abernethy AP. Financial toxicity, Part I: a new name for a growing problem. *Oncology (Williston Park)*. 2013,27(2):80-1, 149. PMID: 23530397; PMCID: PMC4523887.
12. Zafar SY, Abernethy AP. Financial toxicity, Part II: how can we help with the burden of treatment-related costs? *Oncology (Williston Park)*. 2013,27(4):253-4, 256. PMID: 23781687.
13. Zafar SY, Peppercorn JM, Schrag D, et al. The financial toxicity of cancer treatment: a pilot study assessing out-of-pocket expenses and the insured cancer patient's experience. *Oncologist*. 2013,18(4):381-90. doi: 10.1634/theoncologist.2012-0279.
14. Peppercorn J, Gelin M, Masteralexis TE, et al. Screening for Financial Toxicity in Oncology Research and Practice: A Narrative Review. *JCO Oncol Pract*. 2025,21(1):5-11. doi: 10.1200/OP-24-00989.
15. Zafar SY, Peppercorn J. Reflections on the Financial Toxicity of Cancer: 10 Years Later. *Oncologist*. 2023,28(8):654-656. doi: 10.1093/oncolo/oyad179.
16. Shah K, Zafar SY, Chino F. Role of financial toxicity in perpetuating health disparities. *Trends Cancer*. 2022,8(4):266-268. doi: 10.1016/j.trecan.2021.12.007.
17. Chino F, Zafar SY. Financial Toxicity and Equitable Access to Clinical Trials. *Am Soc Clin Oncol Educ Book*. 2019,39:11-18. doi: 10.1200/EDBK_100019.
18. Tran G, Zafar SY. Financial toxicity and implications for cancer care in the era of molecular and immune therapies. *Ann Transl Med*. 2018,6(9):166. doi: 10.21037/atm.2018.03.28.
19. Knight TG, Hensel C, Blackley K, et al. The Financial Toxicity Tumor Board: 5-Year Update on Practice and a Guide to Implementation. *J Natl Compr Canc Netw*. 2025,23(5):164-168. doi: 10.6004/jnccn.2025.7010.
20. Zafar SY. Financial Toxicity of Cancer Care: It's Time to Intervene. *J Natl Cancer Inst*. 2015,108(5):djv370. doi: 10.1093/jnci/djv370.
21. Vöröš K, Skubic M, Bavdaž M, et al. Assessment of financial toxicity in patients with cancer in Slovenia. *Support Care Cancer*. 2025,33(6):515. doi: 10.1007/s00520-025-09591-7.
22. Richter L, Pauge S, Mehliis K, et al. Measuring financial distress in German cancer patients: development and validation of the Financial Distress of Cancer Assessment Tool (FIAT). *ESMO Open*. 2024, 9(12):103992. doi: 10.1016/j.esmoop.2024.103992.
23. Yao T, Liu L, Li X, et al. The experience of subjective financial distress on cancer patients in China: A qualitative study. *Support Care Cancer*. 2025,33(6):470. doi: 10.1007/s00520-025-09498-3.
24. Chen X, Bian H, Wu Z. Validation of the Chinese version of the financial toxicity scale in patients with wet age-related macular degeneration. *J Patient Rep Outcomes*. 2025,9(1):69. doi: 10.1186/s41687-025-00909-x.
25. Fradelos EC, Prapa PM, Tsaras K, et al. The Validation of the COMprehensive Score for Financial Toxicity (COST) Scale in Greek Language. *Adv Exp Med Biol*. 2023,1425:191-197. doi: 10.1007/978-3-031-31986-0_18.
26. Harris JP, Ku E, Harada G, et al. Severity of Financial Toxicity for Patients Receiving Palliative Radiation Therapy. *Am J*

- Hosp Palliat Care. 2024,41(6):592-600. doi: 10.1177/10499091231187999.
27. Hammarlund N, Jacobs M. Racial and ethnic disparities in financial toxicity among cancer survivors: implications for equity in survivorship care. *J Cancer Surviv*. 2025 Jun 5. doi: 10.1007/s11764-025-01817-1.
28. Clark NM, Hernandez AH, Knowlton LM, et al. Pre- and postinjury financial hardship among trauma survivors: A national survey study. *J Trauma Acute Care Surg*. 2025,98(5):720-728. doi: 10.1097/TA.0000000000004545.
29. Hassani A, Bakhat M, Boudhar A. The incidence of catastrophic and impoverishing health spending in Morocco: the value added of new methodologies : Evidence from the 2014 National Household Living Standards Survey. *Int J Health Econ Manag*. 2025,25(3):337-382. doi: 10.1007/s10754-025-09397-4.
30. Sengupta S, Datta BK, Coughlin SS. Medical debt is associated with higher sugar-sweetened beverage consumption among U.S. adults. *J Epidemiol Popul Health*. 2025,73(3):203123. doi: 10.1016/j.jep.2025.203123.
31. Thom B, Friedman DN, Aviki EM, et al. The long-term financial experiences of adolescent and young adult cancer survivors. *J Cancer Surviv*. 2023,17(6):1813-1823. doi: 10.1007/s11764-022-01280-2.
32. de Almeida DVP, Anderson JM, Danila DC, et al. Evaluating Immune-Related Adverse Events Using PRO-CTCAE in a Phase II Study of Ipilimumab for Hormone-Sensitive Prostate Cancer. *J Immunother Precis Oncol*. 2023,6(4):162-169. doi: 10.36401/JIPO-23-9.
33. Tschernia NP, Heiling H, Deal AM, et al. Patient-reported outcomes in CD30-directed CAR-T cells against relapsed/refractory CD30+ lymphomas. *J Immunother Cancer*. 2023,11(8):e006959. doi: 10.1136/jitc-2023-006959.
34. West S. Need versus cost: understanding EHR data migration options. *J Med Pract Manage*. 2013,29(3):181-183. PMID: 24765738.
35. Deboever N, Al-Tashi Q, Eisenberg M, et al. Machine Learning Prediction of Financial Toxicity in Patients with Resected Lung Cancer. *J Am Coll Surg*. 2025, 241(2): 107-116. doi: 10.1097/XCS.0000000000001373.
36. Alnaeem MM, Al Qadire M, Nashwan AJ. Unmet needs, burden, and quality of life among family caregivers of patients with advanced hematological malignancy. *Psychol Health Med*. 2025, 30(7):1573-1588. doi: 10.1080/13548506.2025.2482954.
37. Bröckelmann PJ, Scheffer Cliff ER, Iacoboni G, et al. Beyond maximum grade: tolerability of immunotherapies, cellular therapies, and targeted agents in haematological malignancies. *Lancet Haematol*. 2025,12(6):e470-e481. doi: 10.1016/S2352-3026(25)00051-1.
38. Wang Y, Luo B, Wang X, et al. Financial toxicity, coping strategies, and quality of life among Chinese patients with hematologic malignancies: a cross-sectional study. *Support Care Cancer*. 2024,32(7):475. doi: 10.1007/s00520-024-08693-y.
39. Knight TG, Aguiar M, Robinson M, et al. Financial Toxicity Intervention Improves Outcomes in Patients With Hematologic Malignancy. *JCO Oncol Pract*. 2022,18(9):e1494-e1504. doi: 10.1200/OP.22.00056.