

REVIEW

Interventions to Reduce Financial Toxicity of Childhood, Adolescent, and Young Adult Cancer Survivors: A Scoping Review

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ABSTRACT

Financial toxicity (FT) worsens health outcomes and quality of life for childhood, adolescent, and young adult (CAYA) cancer survivors. This scoping review examines interventions designed to alleviate FT among CAYA cancer survivors and identifies the levels of influence within the multilevel framework that these interventions target (i.e., patient, family/caregiver, provider, organization, policy, and society levels). Additionally, this review analyzes how current interventions align with National Comprehensive Cancer Network (NCCN) *Recommendations for Supportive Care Services/Interventions for Socioeconomic Issues*. We included English-language studies mentioning cost or adjacent terms that analyzed the effectiveness/efficacy of interventions designed to address FT in CAYA populations. Thirteen studies met the inclusion criteria. Most ($n = 11$, 84.6%) studies were conducted in the United States and addressed multiple levels of influence, primarily targeting the individual ($n = 13$, 100%), organizational ($n = 7$, 53.8%), and provider ($n = 7$, 53.8%) levels. Regarding NCCN recommendations, interventions most frequently addressed the integration of financial assistance into survivorship care plans ($n = 8$, 61.5%) and the establishment of financial support programs ($n = 7$, 53.8%). Extant literature focuses primarily on the individual level, financial assistance, and support programs. Future research should elucidate complex parameters defining multilevel interventions and prioritize gaps in current interventions according to NCCN guidelines.

1 | Introduction

Patients with cancer experience higher out-of-pocket expenses, greater financial debt, and an increased risk of employment loss compared with individuals without cancer [1]. These financial

burdens stem from the substantial direct costs associated with cancer care, including diagnostic services, imaging, hospital and clinic fees, and medications, as well as indirect costs such as transportation, meals, childcare, and lost wages due to time away from work [2]. The costs experienced by patients with cancer

Abbreviations: ACA, Affordable Care Act; CAYA, childhood, adolescent, and young adult; FINassist, Financial and Insurance Navigation Assistance; FMLA, Family and Medical Leave Act; FT, financial toxicity; NCCN, National Comprehensive Cancer Network; PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

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vary globally, as direct costs are generally lower in countries with publicly funded healthcare systems. However, studies have found no significant differences in indirect costs, such as travel expenses and lost income, between countries with publicly and privately funded healthcare systems [3]. Cancer-related financial strain has been associated with adverse health behaviors, like delaying care or forgoing prescribed medications due to cost [4].

Financial toxicity (FT) encompasses the financial hardships and broader challenges a patient encounters due to the cost of their cancer care [5]. In addition to direct and indirect medical expenses, FT encompasses psychological distress and maladaptive coping behaviors [2]. Prior research has demonstrated that patients with cancer experience some degree of FT regardless of a country's healthcare model [3]. However, FT disproportionately affects people from low- and middle-income countries and individuals with low socioeconomic status, lack of insurance, younger age at diagnosis, and people of color [6–8].

FT can worsen health outcomes and have lasting negative impacts on quality of life, specifically for childhood, adolescent, and young adult (CAYA) cancer survivors [9, 10]. Consistent with the National Cancer Institute's definition, this review considered individuals to be cancer survivors from the time of diagnosis through the remainder of their lives [11]. CAYA cancer survivors were defined as individuals diagnosed with cancer at 39 years of age or younger. FT in this population has been associated with delayed care, treatment interruption or abandonment, and spillover effects that influence family members' ability to adhere to care [12, 13]. CAYA survivors are more susceptible to unique exposures that heighten their risk of FT when compared to adults. Because they are diagnosed earlier in life, CAYA survivors may experience decades of direct and indirect costs related to cancer and its treatment [14, 15]. Their medical expenditures can remain elevated for many years after diagnosis because of the ongoing care required to manage late effects of treatment. Adolescents and young adults, specifically, are more likely to be uninsured or underinsured, which may result in higher out-of-pocket expenses [16]. Furthermore, disruptions to key developmental milestones, including entry into higher education and/or the workforce and transitioning to greater independence, can hinder career advancement and reduce long-term earning potential [9, 14]. Additionally, this population may also have lower financial literacy, greater difficulty navigating and selecting health insurance plans, and increased reliance on urgent care settings that may incur higher out-of-pocket costs [9, 17–19]. Given that FT is a major source of psychological and financial distress for CAYA survivors, evaluating the current state of interventions aimed at addressing FT in this population is needed.

FT is produced by multiple forces at the individual, family/acquaintance, provider, organizational, policy, and societal levels of influence [15] (Table S1). FT does not solely result from an individual's health condition or out-of-pocket spending but rather is shaped by a range of contextual factors. These multi-level factors include the patients' awareness of the financial burden, availability of social support, cost discussions facilitated by providers and healthcare organizations, insurance options constrained by policy environments, and broader societal healthcare structures that make decisions largely driven by

profit rather than access to care [15]. Accordingly, interventions can be designed to target and be delivered at different levels of influence. At the individual level, interventions may improve health insurance literacy or provide direct financial assistance. At the family and acquaintance level, interventions may support families by offering treatment options that reduce caregiver travel, such as home-based administration. Provider-level interventions may equip clinicians with the knowledge and communication skills needed to discuss treatment-related costs with patients. At the organizational level, healthcare systems may establish financial assistance programs, discounted services, or patient-navigation resources. Policy-level interventions may expand insurance eligibility. Finally, society-level interventions may promote universal access to care. To advance research in this field, there is a need to systematically evaluate how existing FT interventions for CAYAs operate across these levels of influence and whether gaps remain in addressing determinants of FT.

Given the unique financial challenges faced by CAYAs, the National Comprehensive Cancer Network (NCCN) has developed *12 Recommendations for Supportive Care Services/Interventions for Socioeconomic Issues* (Table S2) aimed at addressing FT in this population [20]. Despite the availability of these recommendations, no studies to date have evaluated the extent to which existing interventions align with these guidelines.

For these reasons, a scoping review was conducted to evaluate the current state of interventions aimed at addressing FT in CAYAs, determine whether existing interventions target single or multiple levels of influence, and identify how these existing interventions comply with NCCN guidelines to guide the development of more comprehensive, equitable, sustainable, and effective FT interventions in this population.

The following research questions were formulated: What interventions currently exist to address FT among CAYAs with cancer? At which levels of influence do these interventions operate, and how do they align with NCCN guidelines?

2 | Materials and Methods

2.1 | Search Strategy

In partnership with a medical librarian, we searched online databases for peer-reviewed studies that described interventions aimed at addressing FT in CAYA cancer survivors. The librarian created search strategies using a combination of keywords and controlled vocabulary in Embase, Ovid Medline, Scopus, Cochrane Central Register of Controlled Trials (CENTRAL), the Cochrane Database of Systematic Reviews, APA PsycInfo, and Clinicaltrials.gov. Our team completed all search strategies on June 19, 2025, with no added limits, and returned a total of 4130 results. During the review process, nine records were added via citation searching. We uploaded all articles into Covidence, a screening and data extraction software for conducting reviews; 1406 duplicate records were deleted, resulting in a total of 2733, including nine articles added via citation search (Figure 1). Fully reproducible search strategies for each database can be found in the appendix (Data S1).

2.2 | Study Selection

2.2.1 | Title and Abstract Screening

Prior to beginning the screening process, we established a comprehensive protocol that defined the initial eligibility criteria. For preliminary screening, three reviewers (R.B., H.R., R.N.) rated document titles and abstracts as to whether they met our eligibility criteria: (i) written in English; (ii) mentioned cost or adjacent terms; (iii) mentioned CAYAs; (iv) mentioned cancer terms or adjacent terms (e.g., “acute lymphoblastic leukemia,” “retinoblastoma,” “chemotherapy,” “cancer radiotherapy,” “malignant neoplasm”); and (v) described an intervention aimed at addressing FT in CAYAs, along with its efficacy/effectiveness. We defined CAYA survivors as individuals aged 39 years or younger at the time of diagnosis.

Each article was independently assessed by two of the reviewers mentioned above. An article advanced to full-text screening only when both reviewers voted to include it. When the reviewers disagreed, the article was discussed by the review team. For discrepancies not resolved through discussion, a separate reviewer (A.J.H.) resolved remaining disagreements. To minimize the risk of excluding potentially relevant studies, any article without an abstract was also automatically moved forward to full-text review.

2.2.2 | Full-Text Screening

For our full-text screening, three reviewers (R.B., A.A., R.N.) reviewed the full text of each document, ensuring it fulfilled the same requirements outlined in the title and abstract screening. We also excluded conference abstracts, study protocols, narrative reviews, editorials, and clinicaltrials.gov registrations that lacked a peer-reviewed publication of results. Each article was independently assessed by two of the reviewers mentioned above. An article advanced to the data extraction phase only when both reviewers voted to include it. When the reviewers disagreed, the article was discussed by the review team. During these review meetings, the team also refined eligibility criteria to ensure consistency when unanticipated questions or areas of ambiguity arose. For example, the team established a distinction between interventions targeting FT directly in CAYAs versus those focused solely on their parents, electing to exclude the latter. For discrepancies not resolved through discussion, a separate reviewer (A.J.H.) resolved remaining disagreements.

2.2.3 | Data Extraction

We developed the data extraction sheet iteratively to ensure relevant and consistent information capture, revising as we progressed through the process. Three reviewers (R.B., A.A., R.N.) completed data extraction for included articles. Each included article was independently reviewed by two of the reviewers listed above, who separately extracted the relevant information. We extracted the following information from each study: title, lead author, publication year, country in which the study was

conducted, aims, study design, recruitment setting, population description, the cancer types included in the sample, inclusion/exclusion criteria, method of participant recruitment, total number of participants, baseline characteristic of the sample, outcomes measured, the NCCN guidelines addressed by the intervention, the levels of influence targeted by the intervention according to the model designed by Ruiz et al. (2023), and results. Consensus for extraction was determined by a separate reviewer (A.J.H.).

We grouped studies mainly by the levels of influence targeted by the intervention and the NCCN guidelines they complied with. We also grouped the studies by intervention type (e.g., grants, insurance navigation education, policy).

Application of the multilevel model required an iterative process to operationalize the criteria for classifying a specific level of influence as an intervention target. We defined a level of influence as a target if it met at least one of three criteria: (i) the level required specific training to deliver the intervention, such as financial navigators at the provider level receiving instruction on leading information sessions; (ii) the level was instrumental in the implementation of the study, such as pharmaceutical companies at the organizational level providing medications at free or reduced costs; or (iii) the level was a direct recipient of the intervention, such as a patient at the individual level receiving a grant aimed at reducing FT.

3 | Results

The initial database search yielded 2724 unique records, and nine unique studies were added via citation search. Following the title and abstract screening, 164 articles met the criteria for full-text eligibility assessment. After a detailed review, we selected 13 studies for data extraction. The primary reasons for exclusion at the full-text stage included ineligible study design ($n = 94$), irrelevant outcomes ($n = 34$), and non-English language ($n = 12$), as detailed in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram (Figure 1).

Table 1 includes general characteristics of the studies included in this review. While most studies included were from the United States of America ($n = 11/13$), there was one study each from France and India. The study types consisted of four cross-sectional studies, four cohort studies, three randomized controlled studies, one case control, and one acceptability study. The studies varied in including exclusively children (<18 years), children and young adults (12–39 years old), or caregivers of childhood cancer survivors.

This review contained various intervention types. The most common type was a multifactorial intervention ($n = 5$). These interventions combined multiple resources into a comprehensive tool to help CAYA cancer survivors mitigate FT. For example, Edward et al. (2024) developed FINassist (Financial and Insurance Navigation Assistance), which combined interdisciplinary financial and legal navigation aimed to reduce FT. These multifactorial interventions consisted of multiple tools intertwined into one to help address the broad impact of FT. However, specific policy-level interventions ($n = 2$), provision of care

TABLE 1 | Study characteristics.

Study	Country	Aim of study	Study design	Population description	Cancer type	Total number of participants
Bougas et al., 2025	France	To evaluate the effects of the “Right to be Forgotten” (RTBF) on the reduction of survivors experiencing difficulties in obtaining loan-related insurance after cancer in France	Serial cross-sectional	Young cancer survivors	Childhood cancer (solid tumor or lymphoma) and breast cancer	552 after matching
Close et al., 1995	United States	To compare prospectively chemotherapy in the hospital to chemotherapy at home with respect to billed medical charges, out-of-pocket expenses, and quality of life	Case-Control	Childhood cancer patients receiving repetitive chemotherapy regimens that are suitable for administration at home	Varied: osteosarcoma = 1 non-Hodgkin lymphoma = 1 Ewings = 1 rhabdomyosarcoma = 6 primitive neuroectodermal tumor = 3 rhabdoid brain tumor = 2	15
Edward et al., 2024	United States	To assess the feasibility and impact of a novel, interdisciplinary financial and legal navigation intervention (FINassist) on financial toxicity and health-related quality of life (QOL) of pediatric and AYA oncology patients and caregivers	Nonrandomized feasibility and acceptability study	Adult (aged 18 years and older) patients and caregivers of patients younger than 18 years of age with any pediatric, adolescent, or young adult cancer	5 patients had cancer alone 17 patients had blood-related disease alone 40 patients had both cancer and blood-related disease	15 adult patients and 46 caregivers
Fiala, 2021	United States	Compare health insurance coverage and the affordability of healthcare among adult childhood cancer survivors (CCS) before and after the implementation of the Affordable Care Act (ACA)	Serial cross-sectional	All CCS who reported receiving a cancer diagnosis before the age of 21 were identified. CCS were matched 1:3 to non-cancer controls based on age, sex, race, and ethnicity	N/A	CCS pre-ACA 2011–2013 (<i>n</i> = 309); CCS post-ACA 2015–2017 (<i>n</i> = 324) Matched 3:1 with non-cancer controls

(Continues)

TABLE 1 | (Continued)

Study	Country	Aim of study	Study design	Population description	Cancer type	Total number of participants
Jatia et al., 2019	India	To see the effect of a holistic support group (comprising physicians, other members of the hospital team, along with key regional nongovernment organizations) coupled with prospective tracking (Time-Responsive Electronic Abandonment Tracking System) on treatment abandonment in children with cancer in a limited-resource environment	Cohort	Pediatric patients (15 years and younger) from low-resourced settings	Pediatric cancers	11,011
Kirchhoff et al., 2024	United States	Adolescents and young adults (AYAs; age 18–39 years) with cancer report needing support with health insurance. We conducted a pilot randomized controlled trial to assess the feasibility and acceptability of a virtual health insurance navigation intervention (HIAYA CHAT) to improve health insurance literacy (HIL), awareness of Affordable Care Act (ACA) protections, financial toxicity, and stress	Randomized controlled trial	Eligible participants were aged 18–39 years and within their first year of cancer diagnosis	NA	86
Omese et al., 2019	United States	The aims of the current study were to quantify the utilization of the Sharing Hope/LIVESTRONG Fertility program, an assistance program for FP to cancer patients, by describing the demographic characteristics, geographic distribution, and the cost savings of the program on patient applicants from 2004 to 2011	Cohort	Cancer patients 15–39 years old	All. Men: The two most common diagnoses were testicular cancer (34%) and Hodgkin lymphoma (HL, 18%) Women: The most common diagnoses included breast cancer (48%), HL (13%), and genitourinary cancers (13%)	2451
Park et al., 2024	United States	This pilot randomized controlled trial sought to investigate the feasibility, acceptability, and preliminary efficacy of the health insurance navigation tools (HINT) intervention designed to aid childhood cancer survivors navigate their health insurance	Randomized controlled trial	Childhood cancer survivors	Leukemia, CNS malignancies, Hodgkin lymphoma, non-Hodgkin lymphoma, Wilms tumor, neuroblastoma, soft tissue sarcoma, or bone cancer	82

(Continues)

TABLE 1 | (Continued)

Study	Country	Aim of study	Study design	Population description	Cancer type	Total number of participants
Ragavan et al., 2023	United States	This study sought to (i) evaluate the predictors of patient-reported financial distress, and (ii) assess the impact of financial support services from the nonprofit organization Family Reach on patient-reported financial distress. Family Reach provides comprehensive financial support services to patients with cancer and their families. These services include free financial education, resource navigation, financial coaching, and financial assistance for nonmedical expenses	Cross-sectional study	Patients are eligible for Family Reach services if they (i) have a cancer diagnosis; (ii) are undergoing active treatment or have completed treatment within 1 year; (iii) receive treatment at a hospital within the United States, including territories; and (iv) are represented by a healthcare professional	Leukemia, breast, lymphoma, CNS, sarcoma, neuroblastoma, others/not specified	330
Strayer et al., 1980	United States	Compare the costs incurred in obtaining care from specialists (specialist-management) to costs incurred from obtaining shared-management care provided by specialists and primary physicians combined	Cohort	Families with kids with cancer	N/A	16
Thom et al., 2023	United States	Analyze the impact of charitable/philanthropic grants to cancer patients and survivors	Cohort	Young adult cancer survivors	Breast, lymphoma, leukemia, gynecological, brain, thyroid, colorectal, and others	300
Waters et al., 2023	United States	Describe the sources of informal financial support used by adolescent and young adult (AYA) cancer survivors and how financial toxicity and demographic factors were associated with different types and magnitudes of informal financial support	Pilot randomized controlled trial (mixed methods with qualitative interviews)	AYA cancer survivors	Not included	24 patients from the qualitative interview (QI) sample and 86 patients from the RCT sample
Wu et al., 2023	United States	Evaluate the associations between patient-provider cost discussions with patient-reported out-of-pocket (OOP) spending and long-term financial toxicity (FT) among adolescent and young adult (AYA; 15–39 years old) cancer survivors	Cross-sectional	Adolescent and young adult cancer survivors	Breast, lymphoma, colorectal, leukemia, brain, gynecologic, sarcoma, thyroid, other/prefer not to respond	247

Abbreviations: ACA, Affordable Care Act; AYA, adolescent and young adult; CCS, childhood cancer survivors; CNS, central nervous system; FP, fertility preservation; HIL, health insurance literacy; N/A, not applicable; OOP, out-of-pocket; QOL, quality of life; RCT, randomized controlled trial; RTBF, Right to be Forgotten; YA, young adult.

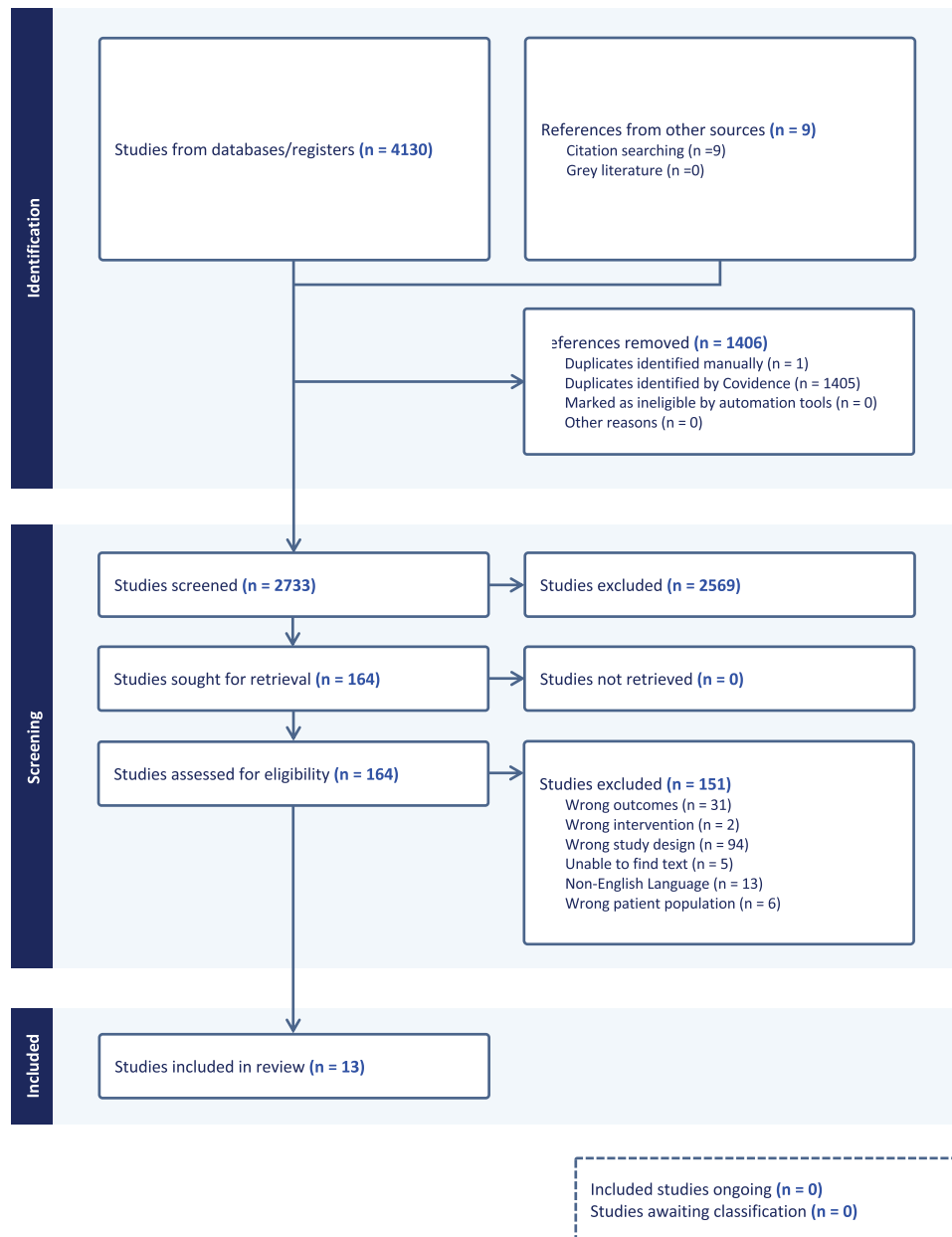


FIGURE 1 | PRISMA diagram of articles screened and included in this review.

interventions ($n = 2$), grant/crowdfunding interventions ($n = 3$), and specific fertility preservation intervention ($n = 1$) were also included.

All interventions included in our review targeted multiple levels of influence (Table S3). All studies targeted patients as recipients of the intervention. A significant portion of these studies also targeted the organizational ($n = 7$), provider ($n = 7$), and family and acquaintance ($n = 6$) levels. In instances where the organizational level was identified as a target, these entities typically functioned as instrumental avenues for implementation. Interventions targeted providers by either requiring specific training or utilizing them as the primary agents to deliver the intervention. While families and acquaintances were mainly targeted as recipients of support, one intervention specifically required the training and active involvement of family members to implement the care.

Conversely, interventions rarely addressed the societal ($n = 2$) or policy ($n = 2$) levels.

The studies included in this review all had FT-focused outcome measures (Table S3). These outcomes varied from out-of-pocket spending, loss of wages, comprehensive FT scores, difficulty acquiring or maintaining treatment, and health insurance literacy. Edward et al. (2024) showed a statistically significant decrease in total FT score among caregivers of childhood cancer survivors after receiving the FINassist intervention. Jatia et al. (2019) showed that a holistic support group decreases refusal to initiate treatment and treatment abandonment. Kirchhoff et al. (2024) and Park et al. (2024) found that their multisession insurance navigation interventions were associated with a significant increase in health insurance literacy. Close et al. (1995) and Strayer et al. (1980) saw significant financial savings

associated with their respective changes in provision of care. Bougas et al. (2025) and Fiala et al. (2021) showed that policy changes made statistically significant improvements in loan and health insurance acquisition. Omesi et al. (2019) provided significant discounts for oocyte, embryo, and sperm cryopreservation, lessening the FT of fertility preservation. Ragavan et al. (2023), Thom et al. (2023), and Waters et al. (2023) analyzed the provision of grants/crowdfunding to CAYA cancer survivors.

In addition, this review quantified how existing interventions address the NCCN *Recommendations for Supportive Care Services/Interventions for Socioeconomic Issues* in CAYA cancer survivors (Table 2). Financial assistance into survivorship care plans ($n = 8$) and financial support programs ($n = 7$) were most commonly addressed. Education on benefits was the next most common ($n = 5$). Mental health, transportation, and fertility-based services were relatively underrepresented ($n = 2$), while providing school support and education services and referring patients to career counseling or education support were the least represented ($n = 1$).

4 | Discussion

FT specifically experienced by CAYA cancer survivors can worsen health outcomes and have lasting negative impacts on quality of life [12, 13]. Consequently, identifying and evaluating interventions aimed at addressing FT in this population are critical. This scoping review found that these interventions utilized diverse strategies to mitigate FT among CAYA survivors, ranging from direct financial assistance, such as grants and crowdfunding [21–23], to indirect support like home-based chemotherapy to reduce travel [24]. Other effective intervention types included national policy changes like the “Right to be Forgotten” law [25] and the Affordable Care Act (ACA) [26], specialized training on health insurance and medically related legal navigation [27, 28], clinical management shifts such as shared-management care [29], provider-led cost discussions [30], and resource assistance for fertility preservation [31]. These interventions mitigated FT by reducing patient out-of-pocket costs and billed medical charges. Additionally, participants showed increased health insurance literacy, terminology knowledge, and confidence in navigating coverage. On a systemic level, interventions were associated with decreased difficulties in acquiring loans and health insurance [25, 26]. Some interventions even improved direct clinical outcomes, such as significant reductions in treatment abandonment [32]. Collectively, these interventions benefit CAYAs because they address challenges that are particularly relevant to this population, including reliance on family resources, financial burden placed on caregivers, transitions to independent insurance coverage, disruptions to education and entry into the workforce, and the costs associated with fertility preservation and future family formation [9, 14, 16, 33, 34].

It is important to note that the effectiveness and relevance of FT interventions in patients may vary across the broad age and developmental range represented by CAYAs. In the United States, for example, younger patients may receive some financial protection through parental insurance and family support, whereas young adults aged 26–39 may face additional barriers after losing eligibility for dependent insurance coverage [35]. Consequently,

health insurance literacy and navigation interventions, such as HIAYA CHAT [28] and HINT [36], may be particularly beneficial for older adolescents and young adults who are selecting or managing insurance independently. Conversely, interventions that rely heavily on parental or caregiver involvement, such as the home-based chemotherapy program described by Close et al. (1995), may be more feasible and relevant for younger patients who live with family members. Cancer may also affect educational attainment differently across developmental stages. Survivors diagnosed during pre-adolescence, for example, have demonstrated lower rates of high school completion [37]. Therefore, interventions such as the program described by Jatia et al. (2019), which provides school support and educational services, may be particularly beneficial for younger patients.

Based on how we operationalized our multilevel categorizations, all interventions included in our study met the multilevel criteria. The individual level was targeted through the direct provision of services and resources to patients [21, 22, 25, 26, 28, 31, 36]. Providers were targeted through required specialized training [24, 27, 28, 32, 36] or by serving as essential agents in intervention implementation [29, 30]. Families and acquaintances were primarily targeted as recipients of support; however, Close et al. (1995) also required family members to receive training and actively participate in the delivery of home-based chemotherapy. Organizations were targeted primarily through their role in providing essential resources and services [21, 22, 27, 28, 31, 32, 36].

Interestingly, the policy interventions analyzed by Bougas et al. (2024) and Fiala et al. (2021) demonstrate the multidirectional nature of the multilevel model. By utilizing policies such as the ACA and the “Right to be Forgotten” law to guide intervention goals, these models require a broader societal-level behavioral retraining to mitigate healthcare and loan-related discrimination and, ultimately, support CAYA cancer survivors. These interventions echo the assertion by Ruiz et al. (2023) that the various tiers of FT influence each other through significant “upstream” and “downstream” effects. Furthermore, more interventions targeting the society and policy levels are needed, as the overarching legal and social environment dictates the constraints and possibilities for all other levels of financial toxicity [15]. For example, policies that protect and expand the Family and Medical Leave Act (FMLA) in the United States can better support the family and acquaintance level by securing employment while caregivers assist survivors. Similar policy protections are also needed for patients in low-to-middle-income countries where concern about the financial impact of employment loss and the inability to return to work is greater compared to patients from high-income countries and where parents also experience employment disruption or job loss while caring for a child with cancer [33, 38]. Labor and workforce policies in these regions that guarantee job protection during illness could therefore benefit the patient level, specifically adolescents and young adults diagnosed with cancer while employed, as well as the family and acquaintance level who serve as caregivers. Furthermore, state or federal mandates requiring the inclusion of fertility preservation in standard insurance benefits would shift the burden from the organizational and individual levels, ensuring that access to essential reproductive care does not depend on philanthropic discounts or the total depletion of personal savings.

TABLE 2 | NCCN intervention attributes.

Study	Education on benefits	Drug assistance programs	Fertility-based services	Mental health	Legal resources	Transportation	Recommend financial support programs	Financial assistance into survivorship care plans	Assess health insurance status and provide information on potential sources of coverage	Provide school support and education services	Refer patients for career counseling and/or education support	Consider the need for long-term follow-up care
Bougas 2025 ^a												
Close 1995 ^b												
Edward 2024	X	X			X		X	X	X			
Fiala 2021 ^a												
Jatia 2019				X			X	X		X		X
Kirchhoff 2024	X				X		X	X	X			
Omesi 2019		X					X	X				
Park 2024	X				X		X	X	X			
Ragavan 2023	X					X	X	X	X		X	
Strayer 1980 ^b												
Thom 2023	X					X		X				
Waters 2023							X					
Wu 2023								X				X
Totals	5	3	1	2	3	2	7	8	4	1	1	2

Abbreviation: NCCN, National Comprehensive Cancer Network.

^a $n = 2/13$ policy changes outside of NCCN guidelines.

^b $n = 2/13$ included changes in treatment modality.

Analysis of NCCN recommendations reveals a concentration on direct financial assistance within survivorship care plans and the recommendation of financial support programs. While these efforts provide essential immediate relief, our findings show a need to expand support into areas like fertility services, school assistance, and career counseling, which were rarely mentioned. For many CAYA survivors, fertility is a major factor in their long-term quality of life, yet the path to preserving it or building a family later is notoriously expensive and filled with hidden costs [39, 40]. Consequently, interventions that outline these expenses and help lower them significantly improve the well-being of these patients [41, 42]. Similarly, because cancer often disrupts pivotal developmental years, educational and vocational support is necessary for survivors to regain “lost ground” and remain competitive in a demanding job market [43].

This review builds on previous work by focusing specifically on the CAYA population. Although prior reviews included some pediatric and young adult populations [44, 45], their findings were largely combined with those of older adults. As a result, intervention benefits, needs, and gaps specific to CAYA survivors may have been diluted or overlooked. Our review also maps interventions across multiple levels of influence, recognizing that policy-level measures, such as the ACA and “Right to be Forgotten” law, can function as interventions that reduce FT among CAYA survivors, an area that has received limited attention in previous reviews. In addition, this review extends the literature by including international interventions, including those implemented in low- and middle-income countries, where the burden and drivers of FT differ from those in high-income settings [6–8]. Finally, we evaluated the alignment of identified interventions with the NCCN recommendations developed to address socioeconomic challenges in this vulnerable population. Mapping existing interventions to these recommendations identifies areas of alignment and remaining gaps, thereby helping guide the development of more comprehensive interventions for CAYA survivors.

While this review provides a comprehensive overview of current interventions, several limitations must be considered. First, the decision to exclude grey literature, primarily due to a lack of reported efficacy or effectiveness data and analyses, means we may have missed innovative, community-based programs or non-profit pilot projects that have not yet undergone peer review to disseminate the results. Additionally, studies specifically designed to reduce FT among caregivers without directly assessing outcomes among CAYA survivors were excluded. This criterion may have resulted in missing interventions that indirectly reduce FT in CAYAs. Because the financial well-being of pediatric patients is closely intertwined with that of their caregivers and families, interventions that alleviate caregiver or household financial burden may also provide meaningful benefits to CAYA patients.

Additionally, restricting inclusion to English-language articles may have excluded relevant interventions reported in other languages. This limitation is especially important because FT is experienced differently across higher and lower income countries depending on healthcare costs, insurance coverage, employment protections, availability of social services, and the extent to which patients and families must pay for care out of pocket [38]. As a

result, interventions developed in non-English-speaking settings may address financial burdens or use delivery strategies that were not represented in this review. Similarly, the predominance of studies conducted in the United States limits the international generalizability of our findings, as many of the identified interventions were designed within a healthcare system that relies heavily on private insurance, employer-sponsored coverage, and patient cost sharing. These interventions may not be directly transferable to countries with publicly funded healthcare systems, different legal protections, fewer supportive resources, or greater barriers to accessing cancer care.

The majority of included studies also lacked sociodemographic diversity, primarily including participants who identified as White, well-educated, and English-speaking. This raises important equity and generalizability concerns, because interventions developed and evaluated within these relatively advantaged populations may not adequately address the needs, barriers, and lived experiences of individuals at greatest risk of FT [6–8]. Differences in healthcare access, financial literacy, employment protections, language accessibility, and healthcare financing may affect whether an intervention is feasible, acceptable, or effective across populations. Future research should intentionally recruit diverse and historically underrepresented participants, and incorporate culturally and linguistically appropriate intervention strategies. Greater representation is necessary to ensure that interventions designed to mitigate FT do not unintentionally widen existing disparities, and are equitable, accessible, and effective for the populations most likely to experience financial hardship.

Additionally, due to the lack of consensus on how to categorize interventions as multilevel, we operationalized a multilevel definition informed by multiple approaches in an effort to combine the strengths of these conceptualizations when applying it to a CAYA context. The standard multilevel model may also fail to fully capture the unique dyadic relationship between CAYA cancer survivors and their families regarding FT. Because these groups are so deeply intertwined in the CAYA population, interventions aimed at the family and acquaintance level ultimately improve FT at the patient level as well. This suggests that “family” and “patient” may not always function as distinct, independent levels of influence in this context. Further research is needed to parse out this interdependent relationship and determine how it can be more accurately represented within the multilevel framework.

Furthermore, the NCCN Recommendations Intervention for Socioeconomic issues are currently quite broad, requiring a degree of subjective interpretation when mapping intervention components to specific guidelines. For instance, parsing out whether interventions merely provided financial assistance or also provided information about financial support programs was difficult due to limited intervention descriptions and guidance within the NCCN document. Future iterations of the NCCN guidelines would benefit from more granular definitions to ensure they can be consistently applied and measured in research settings.

This scoping review synthesized 13 studies to evaluate the current landscape of interventions aimed at mitigating FT for CAYA cancer survivors. This scoping review also aimed to determine

whether existing interventions target single or multiple levels of influence and identify how these existing interventions comply with NCCN guidelines. The findings demonstrate that all analyzed interventions addressed multiple levels of influence. Future research should focus on elucidating the specific parameters that define multilevel interventions within the context of FT. Regarding alignment with NCCN guidelines, critical gaps persist in fertility-based services, career counseling, and educational support. Future research should prioritize the development of interventions that address these systemic gaps to more holistically mitigate FT in the CAYA population.

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Ethics Statement

Because this study is a scoping review and does not involve the collection of primary data from human participants, ethical approval from an ethics committee was not required.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section.

Supporting File: pbc70643-sup-0001-SuppMat.pdf.