

Financial Toxicity Intervention Improves Outcomes in Patients With Hematologic Malignancy

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QUESTION ASKED: Does screening for and intervening on financial toxicity (FT) in a busy clinical environment improve outcomes in patients with hematologic malignancies?

SUMMARY ANSWER: In this pilot study that included 107 patients with hematologic malignancies seen in a leukemia clinic, screening and comprehensive intervention was associated with increased mental and physical quality of life when compared with preintervention baseline. In patients with high-risk diseases (as determined by disease specific scoring systems), patients experiencing FT receiving the intervention were 56% less likely to die than patients treated at our institution with similar disease risk and financial difficulties.

WHAT WE DID: All patients who presented to the Levine Cancer Institute's Leukemia Clinic from May 2019 to March 2020 were screened for inclusion by assessment of their answers to a standardized previsit quality-of-life survey including two questions designed to assess FT. Patients screening positive were enrolled in the comprehensive intervention, which used nurse navigators, clinical pharmacists, and community pro bono financial planners. Patients were then followed for a year's duration and the results tracked. Primary outcomes were defined as improvement in mental and physical quality of life in all patients from their baseline values and improvement in overall survival in the high-risk disease group.

WHAT WE FOUND: Routine FT screening using a two-question form was able to be integrated into a busy leukemia clinic as standard of care with 683 patients screened in 10 months. Two hundred forty-three (35.6%) of these patients screened positive for FT and were scheduled for intervention. Patients experiencing FT had increased rates of noncompliance

including 17% of patients (n = 18) missing prescription medications and 16% (n = 17) missing over-the-counter medications because they could not afford them. Comprehensive intervention on these patients resulted in statistically significantly higher quality of life compared with preintervention baseline when measured by using Patient-Reported Outcomes Measurement Information System physical (12.5 ± 2.2 v 13.7 ± 1.8) and mental health scores (11.4 ± 2.2 v 12.4 ± 2.2 ; all $P < .001$). In patients with high-risk disease (as determined by using disease-specific scoring systems), risk of death in those receiving the intervention was 0.44 times the risk of death in those without the intervention after adjusting for race, and treatment with stem-cell transplant, oral chemotherapy, or immunotherapy (95% CI, 0.21 to 0.94; $P = .034$).

BIAS, CONFOUNDING FACTORS: This was a single-center, observational study without a planned control arm. As such, we cannot be certain of a causal relationship between the intervention and outcomes. This study was also performed before the COVID-19 pandemic and was stopped early because of the impact of the pandemic. However, the economic issues associated with COVID-19 make these interventions even more important.

REAL-LIFE IMPLICATIONS: Our results indicate that patients with hematologic malignancies represent a uniquely vulnerable population, sensitive to financial concerns that can lead to worsened outcomes. This study also demonstrates implementation of screening and intervention in a busy clinical environment is both feasible and effective. Validation of these methods and of the improvements in quality of life and mortality in larger cohorts with rigorously conducted research including randomized trials is warranted.

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ASSOCIATED CONTENT

Appendix

Data Supplement

Author affiliations and disclosures are available with the complete article at ascopubs.org/journal/op.

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PURPOSE Patients with hematologic malignancies are extremely vulnerable to financial toxicity (FT) because of the high costs of treatment and health care utilization. This pilot study identified patients at high risk because of FT and attempted to improve clinical outcomes with comprehensive intervention.

METHODS All patients who presented to the Levine Cancer Institute's Leukemia Clinic between May 26, 2019, and March 10, 2020, were screened for inclusion by standardized two question previsit survey. Patients screening positive were enrolled in the comprehensive intervention that used nurse navigators, clinical pharmacists, and community pro bono financial planners. Primary outcomes were defined as improvement in mental and physical quality of life in all patients and improvement in overall survival in the high-risk disease group.

RESULTS One hundred seven patients completed comprehensive intervention. Patients experiencing FT had increased rates of noncompliance including to prescription (16.8%) and over-the-counter medications (15.9%). The intervention resulted in statistically significantly higher quality of life when measured by using Patient-Reported Outcomes Measurement Information System physical (12.5 ± 2.2 v 13.7 ± 1.8) and mental health scores (11.4 ± 2.2 v 12.4 ± 2.2 ; all $P < .001$). In patients with high-risk disease (as determined by using disease-specific scoring systems), risk of death in those receiving the intervention was 0.44 times the risk of death in those without the intervention after adjusting for race, and treatment with stem-cell transplant, oral chemotherapy, or immunotherapy (95% CI, 0.21 to 0.94; $P = .034$).

CONCLUSION Screening and intervention on FT for patients with hematologic malignancies is associated with increased quality of life and survival.

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INTRODUCTION

The financial burden associated with oncologic care is increasingly recognized as a major determinant of outcomes in all tumor types.¹⁻⁵ The term financial toxicity (FT) was coined to emphasize these financial issues, analogous to the physical toxicities associated with these treatments.⁶⁻¹³ Previous research in the field has demonstrated an association between FT and noncompliance with treatment.¹⁴⁻¹⁸ This noncompliance extends to all aspects of the treatment and leads to worsened outcomes.¹⁹⁻²² Although the majority of work done to date has consisted of describing the issue, there is a growing consensus on the importance of moving from a descriptive to an interventional paradigm.²³⁻²⁸ In particular, there is a need for screening tools and interventions that can be used in busy and diverse clinical environments.²⁹⁻³²

Patients with hematologic malignancies such as leukemias are extremely vulnerable to FT with rates of distress higher than other malignancies because of high costs of treatment and health care utilization.³³⁻³⁸ In a longitudinal study commissioned by the Leukemia and Lymphoma Society of 2,332 patients with blood cancer with an initial diagnosis in 2014, patients had a cumulative average allowed spending (defined as costs paid by payers and patients combined, not including expenses not covered by insurance) ranging from \$200,000 US dollars (USD) for chronic leukemias to more than \$800,000 USD for acute leukemias in the first 36 months of treatment. By comparison, the average cumulative cost in the 36 months from diagnosis for lung cancer was \$250,000 USD and for colorectal cancer slightly < \$150,000 USD.³⁹ However, the majority of the research in FT thus far has been in solid

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tumors.^{12-14,40-43} Therefore, in this pilot study, we used a quick screening method to identify patients being treated in a leukemia clinic who were at high risk because of their therapy. We then investigated the impact of FT on their subsequent health services and identified areas of FT that could be targeted for intervention. Finally, we used systematic multidisciplinary intervention (using physicians, nurses, pharmacists, social workers, and pro bono financial counselors) in vulnerable patients to determine whether this multidisciplinary approach could improve quality of life and/or survival.

METHODS

Recruitment Methods

All patients who presented to the Levine Cancer Institute's Leukemia Clinic from May 2019 to March 2020 were screened for inclusion by assessment of their answers to a standardized previsit quality-of-life survey. The survey was administered on an iPad and was available in English and Spanish. Patients received assistance from the nursing staff if there were questions regarding technological issues with the survey (operating the iPad, opening e-mail, etc) or specific questions about meaning/intent of the items asked in the survey. The survey consisted of a combination of the Patient-Reported Outcomes Measurement Information System (PROMIS) Global-10 measure and two selected questions from the Comprehensive Score for financial Toxicity (COST) measure.⁴⁴⁻⁴⁶ In the selected questions, patients were asked to agree (or disagree) on a five-point scale with the statements "I know that I have enough money in savings, retirement, or assets to cover the costs of my treatment" and "I am satisfied with my current financial situation." The specific questions used were chosen on the basis of patient perceived importance and internal validity reported in the validation study of the COST questionnaire.⁴⁴ Patients who scored a total of five or lower were classified as exhibiting FT and targeted for intervention. Patients were then screened by the study staff for the remaining eligibility criteria: age \geq 18 years and diagnosis of hematologic malignancy \geq 3 months (as patients on average do not receive their first bill for treatment until 3 months post initiation). We attempted to initiate the intervention process within 72 hours of patient identification but scheduling of each aspect of the intervention was dependent on clinical circumstances and availability of intervention infrastructure.

Intervention Details

For the subjects receiving the intervention, the first step was evaluation by our nurse navigator team. Demographic data including education level, work history, income, marital status, and family size were obtained directly from the patient. The subjects also answered standardized questionnaires about delays in care, reasons for the delay, and missed medical interventions because of cost (Data

Supplement, online only). Finally, the patient completed the full COST measure.

Our pharmacist-based intervention was primarily focused on patient medications and potential cost savings/compliance. All medications and copays were assessed by a clinical pharmacist, and cost-saving strategies such as manufacturer's assistance and internal/external grant funding were investigated. This was done in association with a dedicated pharmacy technician who worked with manufacturers to obtain medications at reduced or no cost. Pharmacists also discussed with the prescribing physician other more cost-effective strategies for treatment if unable to decrease medication costs to a manageable level. Drug costs for reporting were calculated from average wholesale price obtained from Lexicomp. Patient-specific dosing was used when calculating the cost, which was then subtracted from the patient's copay (if applicable) and reported as annual savings.

Our social work-based intervention was focused on the direct and indirect costs of cancer care. Patients were evaluated for internal and external grant funding for copay assistance, transportation, and household expenses. If eligible, the social worker facilitated application and coordination with the funder. Insurance status was also assessed with assistance in obtaining the appropriate insurance coverage when needed.

Finally, the financial counselor intervention consisted of meeting with pro bono financial counselors one-on-one with the person in need. The financial counselors were all volunteer Certified Financial Planners who worked in the local community and volunteered their time for the project. Volunteers were recruited by e-mails from the Foundation for Financial Planning and from the local Financial Planning Association of Charlotte. All financial counselors were required to complete both a training course in volunteer pro bono financial planning and a specific course in financial planning for cancer that was facilitated through Foundation for Financial Planning. The intervention was flexibly designed and personalized to individual circumstances. Patients met with the counselor for a minimum of three visits; however, this was designed as a longitudinal relationship, and patients could continue to meet with their counselors as long as needed for financial guidance.

Baseline and Follow-Up Measures

Data were abstracted from the medical record for each patient including significant demographic data (age, sex, race, language, insurance type, and distance from the hospital). Disease-specific data including disease type, disease-related risk assessment, time since diagnosis, disease status/assessment, chemotherapy, history of bone marrow transplant, and outcomes data including relapse, hospitalizations, days in the intensive care unit, organ function (renal, pulmonary, and cardiac), and deaths were also recorded. The internal care teams (nurse navigator,

TABLE 1. Baseline Characteristics of Intervention Population

Characteristic	No. (%)
Sex	
Male	60 (56.10)
Race	
Caucasian	68 (63.60)
African American	30 (28.00)
Other	9 (8.40)
Age at survey, years	
Median (range)	58 (20-84)
Insurance	
Medicaid	18 (16.80)
Medicare	43 (40.20)
Private	39 (36.50)
Self-pay	4 (3.70)
VA	3 (2.80)
Employment	
Full-time	19 (17.80)
Part-time	10 (9.40)
Unemployed	78 (72.90)
Marital status	
Married	61 (57.00)
Divorced/single/widowed	43 (43.00)
Approximate household income per year, \$, USD	
0-20,000	35 (32.70)
20,000-40,000	31 (29.00)
40,000-60,000	19 (17.80)
60,000-80,000	10 (9.40)
80,000-100,000	4 (3.70)
100,000+	8 (7.50)
Received IV chemotherapy	59 (55.10)
Received oral chemotherapy	64 (59.80)
Received immunotherapy	35 (32.70)
Received HSCT	41 (38.30)
FT score	
Median (range)	4 (2-5)
COST score	
Median (range)	16 (0-44)
PROMIS physical, baseline	
Median (range)	13 (8-17)
PROMIS mental, baseline	
Median (range)	12 (5-17)
Disease	
AML	35 (32.71)
MF	12 (11.21)

(continued in next column)

TABLE 1. Baseline Characteristics of Intervention Population

(continued)

Characteristic	No. (%)
MDS	10 (9.35)
B-ALL	9 (8.41)
CML	9 (8.41)
AA	7 (6.54)
PV	7 (6.54)
Other	5 (3.74)
ET	3 (2.80)
T-ALL	3 (2.80)
CMML	2 (1.87)
LGL	2 (1.87)
MPN	2 (1.87)
APL	1 (0.93)

Abbreviations: AA, aplastic anemia; ALL, acute lymphoblastic leukemia (unspecified); AML, acute myeloid leukemia; APL, acute promyelocytic leukemia; B-ALL, B-cell acute lymphoblastic leukemia; CML, chronic myelogenous leukemia; CMML, chronic myelomonocytic leukemia; COST, Comprehensive Score for financial Toxicity; ET, essential thrombocythemia; FT, financial toxicity; HSCT, hematopoietic stem-cell transplant; IV, intravenous; LGL, large granular lymphocytic leukemia; MDS, myelodysplastic syndrome; MF, myelofibrosis; MPN, myeloproliferative neoplasm (unspecified); PROMIS, Patient-Reported Outcomes Measurement Information System; PV, polycythemia vera; T-ALL, T-cell acute lymphoblastic leukemia; USD, US dollars; VA, Veterans Affairs.

social work, and pharmacy) followed up with the patient at least every 2 months to assess efficacy. Each patient was also assessed every 3 months at a multidisciplinary meeting with representatives from each of the interventional teams. Follow-up for each patient was planned for 1 year.

All subjects who received the intervention were able to receive the entire intervention within 2 months, and there were no subjects who received partial intervention. However, some subjects were identified to exhibit severe FT but were unable to be seen for the intervention because of either gaps of trial staff coverage during their clinic visit or lack of time with clinical needs. These patients were subsequently scheduled for intervention at their next appointment, but the pilot was closed early because of the COVID-19 pandemic; so, they received standard care only. For a subset of these subjects identified to have severe FT and higher disease-specific risk, but who did not receive the intervention, baseline demographics and disease characteristics, as well as survival data, were abstracted.

This study protocol was approved by the Atrium Health Institutional Review Board under expedited review; informed consent was waived because of the minimal risk posed to patients and this process being used as the new standard of care.

TABLE 2. Delays, Noncompliance, and Coping Strategies Secondary to Cost of Cancer Care

Question	No. (%)
In the past 3 months, have you had delays in your cancer care because of the following?	
You did not have money for household expenses	13 (12.2)
You did not have health insurance	9 (8.4)
You or your family member could not afford to take time off from work	6 (5.6)
You did not have transportation	4 (3.7)
You could not afford gas or travel expenses	7 (6.5)
Other (mortgage payments)	1 (0.9)
In the past 3 months, have you needed any of the following but could not afford it?	
Prescription medications	18 (16.8)
Doctor's visits	7 (6.5)
X-ray or other testing	3 (2.8)
Over-the-counter medication	17 (15.9)
In the past 3 months, have you needed to do any of the following things because of your cancer treatment costs?	
Reduce spending on food and clothing	52 (48.6)
Cut back on leisure activities	60 (56.1)
Take less than the prescribed amount of a prescription	5 (4.7)
Partially fill a prescription	12 (11.2)
Use savings to help cover out-of-pocket expenses	55 (51.4)

Statistical Design

Categorical variables were summarized with frequencies and proportions, whereas continuous factors were summarized with descriptive statistics. Changes in outcomes (including PROMIS physical and mental scores) from before intervention to after intervention were compared using paired *t*-tests. Overall survival (OS) was measured from baseline survey date until date of death or else censored at date of last contact if subject is surviving at data cutoff. OS was evaluated using Kaplan-Meier methods and compared between intervention and nonintervention groups using a log-rank test. Cox proportional hazards models were used in model selection procedures for OS. Individual prognostics were identified with univariable models (sex, race, age, marital status, insurance, disease type, receiving intravenous chemotherapy, oral chemotherapy, immunotherapy, and stem-cell transplant); then, backward elimination and forward selection (entry/elimination criteria $P = .10$) were carried out to identify a final base model. This was used to estimate an adjusted hazard ratio (HR) for the intervention variable.

RESULTS

A total of 107 patients met criteria for FT and were placed in our interventional cohort (Appendix Fig A1, online only). Table 1 describes study demographics. There was a slight

male predominance, and race other than Caucasian was over-represented compared with the general population. The majority of our patients had Medicare or private insurance, but there were significant numbers with Medicaid, self-pay, and Veterans Affairs insurance. Approximately 80% ($n = 60$) of the patients earned incomes $< \$60,000$ USD a year. There was a range of hematologic diagnoses, but the majority were acute leukemias or myeloproliferative neoplasms. Fifty-five percent ($n = 59$) of patients had received or were receiving intravenous chemotherapy, 60% oral chemotherapy ($n = 64$), 33% immunotherapy ($n = 35$), and slightly more than one third ($n = 41$) had received hematopoietic stem-cell transplant before the time of intervention. All patients screening positive for financial distress completed the full COST measure. Concordance between the two questions used in this study and full survey was acceptable (Spearman's correlation coefficient = 0.449).

Patients experiencing FT had increased rates of non-compliance because of these financial issues (Table 2). Of note, approximately 17% of patients ($n = 18$) reported missing prescription medications because they could not afford them and 16% ($n = 17$) reported missing over-the-counter medications. Patients experiencing FT also reported a variety of coping strategies with nearly half ($n = 52$) reducing spending on food and clothing and another half ($n = 55$) using savings to cover out-of-pocket expenses. Eleven percent ($n = 5$) reported stretching their prescriptions by taking less than the prescribed amount because of the costs associated with their cancer therapy.

In terms of our intervention, our nurse navigators and social workers found grants for more than one third of the patients with a median value of \$850 USD (range: \$100 USD-\$17,850 USD). They also found other assistance such as gas cards, food pantry assistance, and transportation assistance at a median value of \$300 USD for patients (range: \$100 USD-\$300 USD). Our clinical pharmacists were able to obtain free or greatly cost-reduced medications for the qualified patients at a savings of \$197,158 USD (range: \$29,909 USD-\$639,801 USD). Finally, more than half (54.2%) of our patients expressed interest and were scheduled with a pro bono financial planner to receive one-on-one counseling.

In the subset of subjects with both baseline and post-intervention PROMIS Physical and Mental scores ($n = 49$), the intervention resulted in statistically significantly higher quality of life when measured by PROMIS physical (12.5 ± 2.2 v 13.7 ± 1.8) and mental health scores (11.4 ± 2.2 v 12.4 ± 2.2), compared with baseline scores (all $P < .001$; Fig 1).

Of 105 high-risk subjects identified at screening, 59 received the intervention, whereas 46 high-risk subjects received standard care only. There were no notable differences between the two groups with respect to sex, race, age, marital status, insurance type, FT screening score, therapy received, or disease type (Table 3). The OS

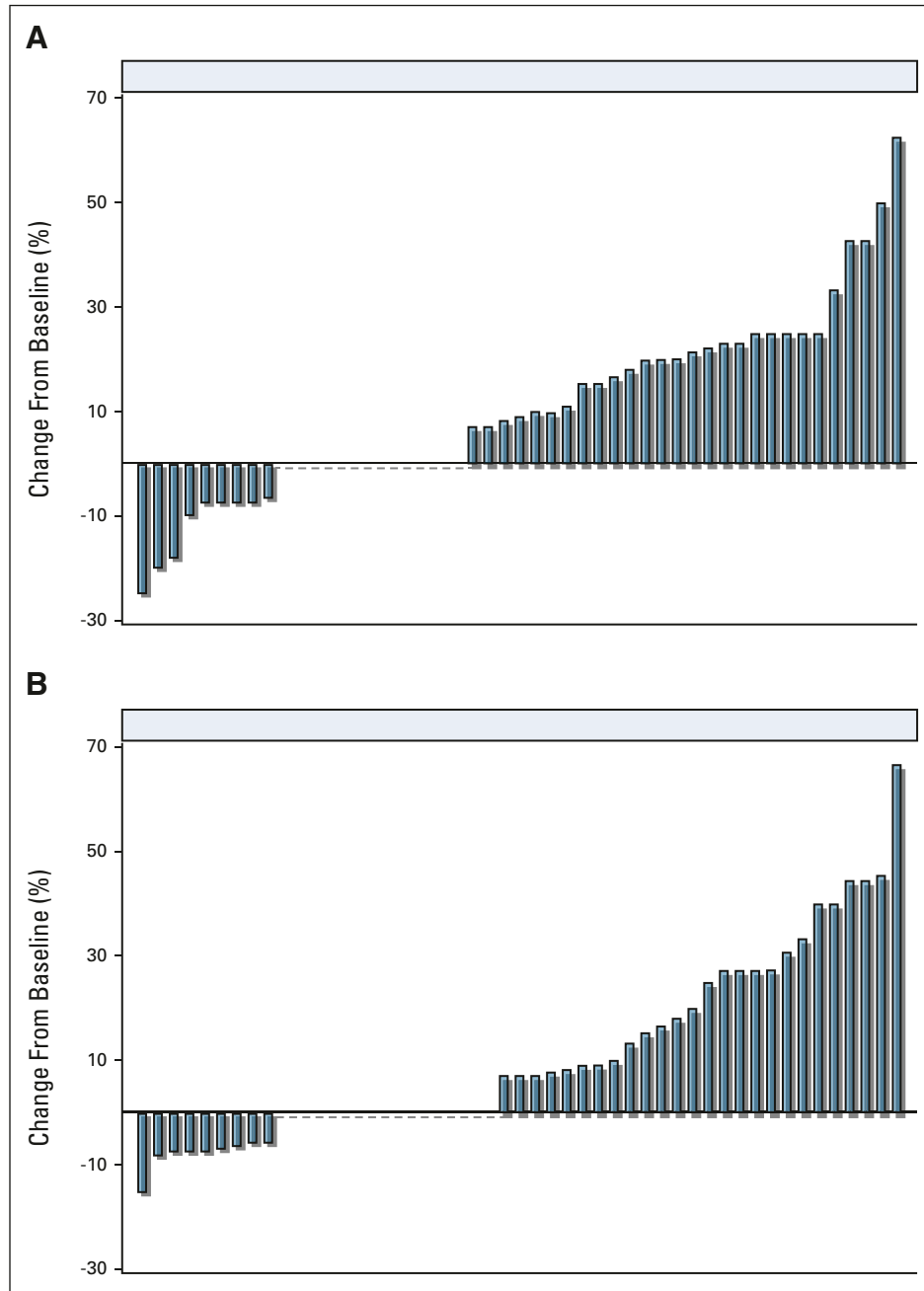


FIG 1. Change in PROMIS (A) mental and (B) physical scores following intervention (n = 49 subjects). PROMIS, Patient-Reported Outcomes Measurement Information System.

distributions were significantly different between the intervention and nonintervention groups, with a mortality rate during the study period of 27% for the patients who received the full FT intervention as opposed to 43% for the patients who received standard care (median follow-up of 11.4 months; range: 1.4-13.6 months; Fig 2). On the basis of the Kaplan-Meier curves, estimated OS at 6 months for the interventional cohort was 81.4% (95% CI, 68.9 to 89.2) versus 73.9% (95% CI, 58.7 to 84.3) for the nonintervention group; estimated OS rates at 12 months were 73.0% (59.0 to 82.9) and 46.4% (28.9 to 63.8),

respectively. On univariate analysis, intervention was significantly associated with survival (HR 0.44; 95% CI, 0.22 to 0.86; $P = .017$). On multivariate modeling, we found race, and treatment with stem cell transplant, oral chemotherapy, or immunotherapy to be significant. After adjusting for these variables, the adjusted HR was 0.44 (95% CI, 0.21 to 0.94; $P = .034$).

DISCUSSION

As the cancer care continues to improve, it has been increasingly apparent that there are stark disparities in

TABLE 3. Comparison of Interventional and Noninterventional Groups

Patient Characteristic	No Intervention (N = 46) No. (%)	Intervention (N = 59) No. (%)	P
Sex			
Female	18 (39.1)	21 (35.6)	.839
Male	28 (60.9)	38 (64.4)	
Race			
White	35 (76.1)	35 (59.3)	.058
African American	4 (8.7)	16 (27.1)	
Other	7 (15.2)	8 (13.6)	
Age at survey, years			
Median (range)	62 (28-90)	62 (20-84)	.824
Marital status			
Married	33 (71.0)	32 (54.2)	.513
Single	7 (15.2)	13 (22.0)	
Divorced/separated	4 (8.7)	9 (15.3)	
Widowed	2 (4.4)	5 (8.5)	
Insurance group			
Medicaid	7 (15.2)	11 (18.6)	.989
Medicare	20 (43.5)	24 (40.7)	
Private	16 (34.8)	20 (33.9)	
Self-Pay	2 (4.4)	2 (3.4)	
VA	1 (2.2)	2 (3.4)	
FT score			
2	8 (17.4)	19 (32.2)	.372
3	9 (19.6)	11 (18.6)	
4	16 (34.8)	16 (27.1)	
5	13 (28.3)	13 (22.0)	
Received IV chemotherapy	43 (93.5)	55 (93.2)	> .999
Received oral chemotherapy	32 (69.6)	32 (54.2)	.158
Received immunotherapy	7 (15.2)	10 (17.0)	> .999
Received allogeneic HSCT	31 (67.4)	36 (61.0)	.544
Disease			
ALL	6 (13.0)	14 (23.7)	.198
AML	26 (56.5)	37 (62.7)	
BP-CML	4 (8.7)	2 (3.4)	
MDS	7 (15.2)	6 (10.2)	
MPAL	3 (6.5)	0 (0.0)	

Abbreviations: ALL, acute lymphoblastic leukemia; AML, acute myeloid leukemia; BP-CML, blast phase chronic myelogenous leukemia; FT, financial toxicity; HSCT, hematopoietic stem-cell transplant; IV, intravenous; MDS, myelodysplastic syndrome; MPAL, mixed phenotypic acute leukemia; VA, Veterans Affairs.

delivery of this care. Large-scale studies, primarily in solid malignancies, have clearly shown an association between financial distress and worsened outcomes in oncology. This

study helps to define and characterize these issues in treatments of hematologic malignancies. More importantly, these data suggest that screening and intervention is feasible in this population and is associated with improvement in survival and quality of life.

Historically, a variety of approaches have been used to define and screen FT. We chose in this study to use two questions from the COST measure as a quicker and more easily implemented screening method in keeping with similar practices that have achieved wide adoption such as the Patient Health Questionnaire-2 and National Comprehensive Cancer Network Distress Thermometer.^{47,48} This approach also allows us to build upon the maturing literature and clinical experience using this validated tool. However, it should be noted that our questions, similar to the full COST measure, are focused on patient perception of financial need. Recently, Arastu et al⁴⁹ examined an alternative three-question screening method, which included investigation of change in behavior (missed medication). This is a very interesting approach as traditionally these questions have been asked at a later stage (including in current work), and may prove to be more relevant in the clinical setting. Both approaches would benefit from further validation in larger and more diverse cohorts. Regardless of the questions used, a shorter screening approach should be adopted to move from the research/theoretical stage to an interventional paradigm.

Our screening method revealed an extremely vulnerable population with clinically significant rates of noncompliance to all aspects of treatment because of financial concerns. Although consistent with previous work in the field, it is of particular concern in the hematologic malignancy population because of the unique challenges of the diseases. Hematologic malignancies are frequently extremely aggressive with a requirement for intensive treatment and long periods of profound myelosuppression. Medication and office visit adherence are key to reducing morbidity and mortality, and we demonstrated significant issues with both in patients experiencing financial difficulty. It is notable as well that these issues occurred at a tertiary cancer center that has well-established support programs in nurse navigation, clinical pharmacy, and financial counseling.⁵⁰ This further demonstrates the need for specific screening and intervention, since the impact may potentially be more profound in other clinical settings.

This intervention was designed to build on previously published work, which has demonstrated tremendous value in using financial navigation to routine cancer care.^{27,51,52} Similar to those studies, our navigator and pharmacy arms were able to secure grant funding, assistance programs, and other benefits that greatly diminished gaps in care. A novel addition in this work was the addition of pro bono community financial planners. Their expertise allowed identification of financial issues outside the typical

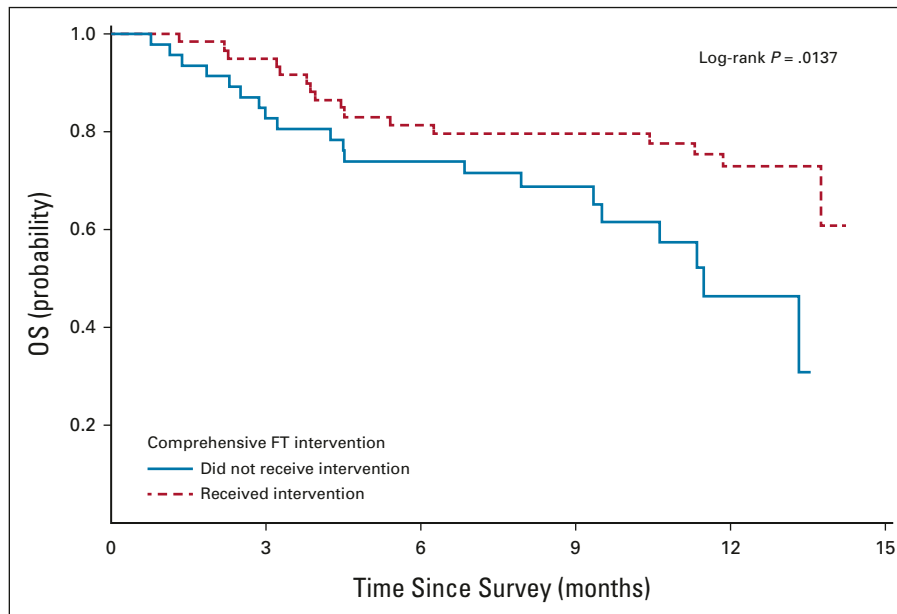


FIG 2. Overall survival. FT, financial toxicity; OS, overall survival.

medical domain that still were likely to affect care. Planners also were able to design individualized plans to fit patient's unique circumstances. Of note, the cost to the institution of our intervention was negligible, as we leveraged existing resources and used volunteer financial planners. However, the intervention resulted in significant financial improvement for the patients and the hospital system. This finding is in keeping with previous research in this area, which has demonstrated that employment of nurse navigators and financial navigators is a net positive financially for hospital systems.^{53,54}

Although this is not a randomized control trial and causation cannot be reliably ascertained, there appears to be an associated benefit in both quality of life and mortality with this multimodal approach. The quality-of-life improvement was seen in both the mental and physical domains of the PROMIS Global-10 measure, which may indicate both reduction in the stress that financial strain so often brings but also the improved care that comes with the ability to be compliant. The mortality data in the high-risk disease group were also interesting. This study had not originally planned to look at this comparison, but there were ultimately two very closely matched groups separated predominantly by presence or absence of the intervention. We theorize that this improvement in survival is secondary to increased compliance with treatment by the intervention population. This reinforces the need for aggressive surveillance and intervention on financial issues in the population.

There were several limitations to this study. This was a single-center, observational study without a planned control arm. As such, we cannot be certain of a causal relationship between the intervention and outcomes. We also recognize the data were obtained from patient-reported surveys that are subject to recall bias. There is also the question of the applicability of our findings from a single center. Nevertheless, as a tertiary safety-net medical center with a large geographic footprint, our patient populations did appear to be quite diverse from both a demographic and socioeconomic perspective. It should also be noted that three of the states where subjects in the study resided (North Carolina, South Carolina, and Tennessee) have chosen to not adopt the Medicaid expansion associated with the Affordable Care Act, and this may have influenced the results.^{55,56} Finally, this study was performed before the COVID-19 pandemic and was stopped slightly early because of the impact of the pandemic. However, the economic issues associated with COVID-19 make these interventions even more important.^{57,58}

Our results indicate that patients with hematologic malignancies represent a uniquely vulnerable population, sensitive to financial concerns that can lead to worsened outcomes. This study also demonstrates implementation of screening and intervention in a busy clinical environment is both feasible and effective. Validation of these methods and of the improvements in quality of life and mortality in larger cohorts (and across a spectrum of diseases) is warranted.

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PRIOR PRESENTATION

Presented as an abstract at an oral session at the 2020 American Society of Hematology annual meeting on Sunday, December 6, 2020 in Atlanta, GA.

AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST

Disclosures provided by the authors are available with this article at DOI <https://doi.org/10.1200/OP.22.00056>.

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AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST**Financial Toxicity Intervention Improves Outcomes in Patients With Hematologic Malignancy**

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APPENDIX

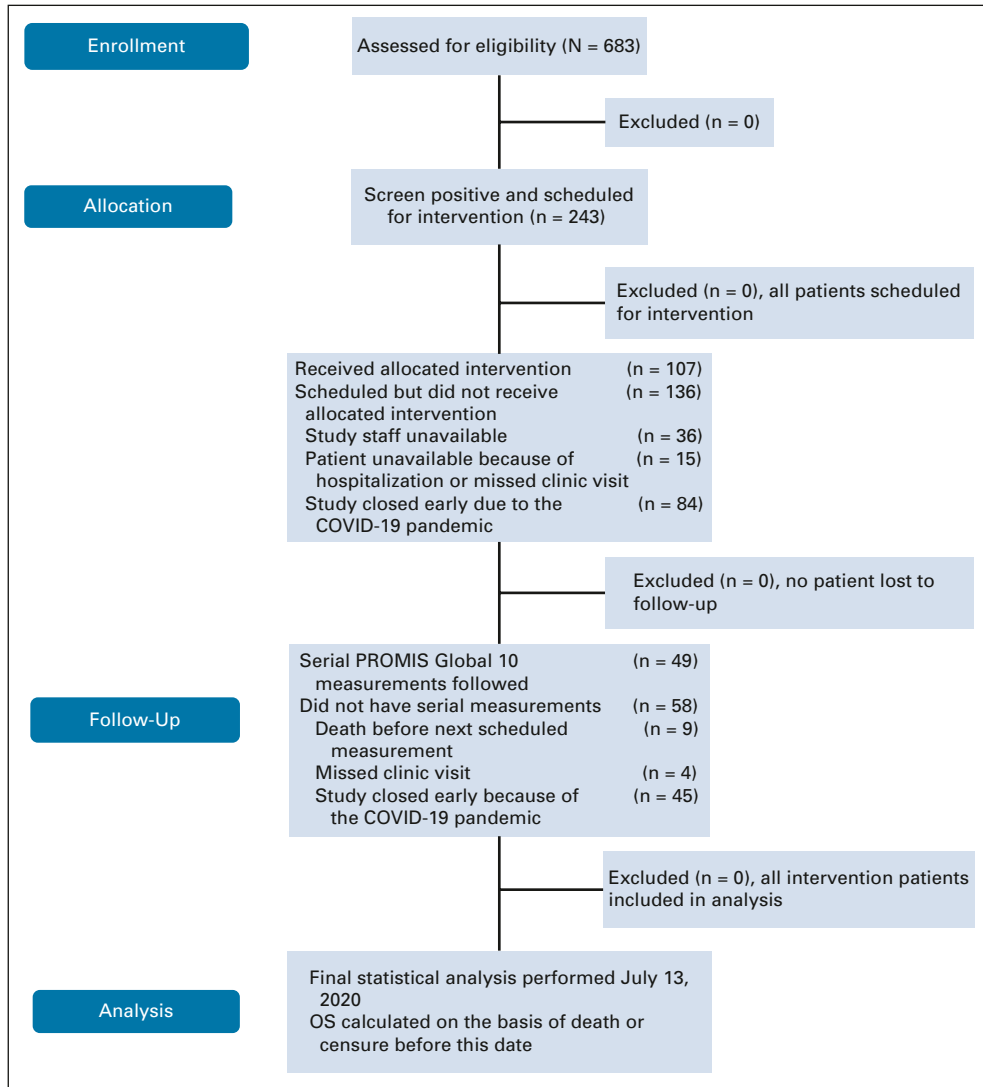


FIG A1. CONSORT diagram. OS, overall survival.