Prospective Cohort Study Testing Interventions to Reduce Diagnosis Delay and Treatment Abandonment of Children With Burkitt Lymphoma in Kenya

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ABSTRACT

PURPOSE Low survival rates among children with Burkitt lymphoma (BL) in low- and middle-income countries (LMICs) are caused by multiple factors, including delays in diagnosis and treatment abandonment. These issues are often linked to the cost of diagnostic tests, treatment, and transportation. This study describes the implementation and effectiveness of a program targeting these issues among children with BL in Kenya.

METHODS Children with symptoms suggestive of BL between 2017 and 2018 were prospectively enrolled in an intervention program including (1) Diagnosis Delay Intervention by performing flow cytometry and covering its cost and (2) Treatment Abandonment Intervention by reimbursing transportation costs, compensating for some lost family income because of the child's hospital stay, and sending reminder phone calls. A medical record review was conducted to perform a historical comparison of diagnosis delay and treatment outcomes between two cohorts (2010-2016 *v* 2017-2018) to measure the effectiveness of the program.

RESULTS Forty-three patients who had a pathologically confirmed diagnosis of BL were enrolled in the intervention program. When comparing the historical cohort (2010-2016; N = 138) and the prospective cohort (2017-2018; N = 43), it was found that after implementing the program, the mean time to diagnosis decreased from 13.57 days to 10.58 days (P = .026). Treatment abandonment decreased from 27% to 5% (P < .001), and the event-free survival estimates also showed a significant improvement, increasing from 33% to 63% between the historical and prospective cohorts (P = .027).

CONCLUSION The combination of timely diagnosis and modest financial support for families to complete treatment significantly improved the survival rate of children with BL in our study. This program has the potential to be implemented for children with other cancers and in other LMIC settings.

ACCOMPANYING CONTENT

- Data Sharing Statement
- Protocol
- Reflexivity Statement

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INTRODUCTION

Burkitt lymphoma (BL) is an aggressive subtype of non-Hodgkin lymphoma (NHL). It has historically been the most commonly diagnosed childhood cancer in sub-Saharan Africa (SSA) and accounts for over 50% of all childhood NHL cases. It has a cell doubling time of 24 hours, making it the fastest-growing human tumor. BL occurs in SSA, where malaria is holoendemic and has an annual incidence of 40-50 per million children.[1-4]

In high-income countries, the cure rate of BL in pediatric patients is approximately 90% and treatment is stratified based on the stage of disease.[4] Treatment in low- and middle-income countries (LMICs) is modified to reduce unacceptable deaths related to treatment toxicity. Factors contributing to poor treatment outcomes include late diagnosis, the extent of comorbidities, limited tolerance of chemotherapy, and limited availability of supportive care facilities.[1] The reported 2-year survival rates of children with BL in SSA range from 25% to 62%.[5]

CONTEXT

Key Objective

Do simple interventions to support diagnostic testing and reduce treatment abandonment lead to improved survival in children with Burkitt lymphoma (BL) in Kenya?

Knowledge Generated

The cost of diagnostic tests and treatment can be high, placing a significant burden on families of children with cancer. Providing financial support for testing can reduce the time to diagnosis. The expenses for ongoing care and out-of-pocket costs for families of children with cancer are also major concerns. Cash payments and phone follow-up for families of children with BL decreased the rate of treatment abandonment, leading to better survival outcomes.

Relevance

Low-cost strategies can be developed to support children with cancer. Their sustainability can be ensured by modifying insurance coverage to include testing and involving charitable organizations to help with expenses.

Many patients with BL in LMICs abandon treatment because of costs related to diagnosis and treatment, travel expenses, and a lack of knowledge about the treatment needed to achieve cure.[1] A retrospective study conducted at Moi Teaching and Referral Hospital (MTRH), our large tertiary care referral hospital in Kenya, showed that children diagnosed with NHL between 2010 and 2012 had an event-free survival (EFS) rate of 29%. Abandonment of treatment was the most common cause of treatment failure at 35%. Many patients (44%) traveled more than 100 km to access care.[6] In another study at MTRH, a cohort of children diagnosed with NHL between 2013 and 2014 had a profound delay from the onset of symptoms to the time of cancer diagnosis (mean of 86.7 days), which resulted in delayed treatment.[7] Before 2016, no comprehensive national health insurance for cancer services existed.[8,9]

Financial interventions can help children with BL cover the costs of diagnostic testing and treatment and travel expenses.[10,11] Thus, we tested this hypothesis by implementing a program to reduce diagnosis delays and treatment abandonment among children with BL.

METHODS

Setting

Kenya is a lower-middle–income country in East Africa. The GDP per capita was $1,836 US dollars (USD) in 2018, with a median family income of <$3.00 USD a day.[12,13] At the time of the study, the total population was estimated at 47 million people, of which 39% (18 million) were children age 0-14 years.[14]

This prospective cohort study was conducted at MTRH in western Kenya and aimed to assess a financial subsidy program to shorten diagnostic delay and reduce treatment abandonment. The expected childhood cancer incidence is around 1,400 patients annually in this area.[14-16] The pediatric oncology unit with 35 beds was supervised by two pediatricians who manage approximately 250 new oncology patients every year. More than one patient frequently occupied beds. Government insurance covered the cost of hospital stay, chemotherapy, and supportive care.

The diagnosis of BL at MTRH is made through specimen collection by open or core needle biopsies. The staging of the disease was per St Jude staging.[17]

Patients at MTRH with BL received a 1-week prephase containing cyclophosphamide, vincristine, and prednisone, followed by eight cycles of combination chemotherapy every 3 weeks in the hospital. Combination chemotherapy included intravenous cyclophosphamide, vincristine, doxorubicin, methotrexate, cytarabine, oral prednisone, and intrathecal methotrexate, cytarabine, and hydrocortisone.

Study Design

This study describes the implementation of a minimal financial subsidy program to shorten diagnosis delay and reduce treatment abandonment among children with BL. The program contained two components: (1) Diagnosis Delay Intervention to shorten the time to diagnosis by improving available diagnostic testing in the hospital and paying for its cost and (2) Treatment Abandonment Intervention by reimbursing transportation costs, partially replacing lost family income because of the child's hospital stay, and making reminder phone calls when patients missed hospital appointments. A comparison of diagnosis delays and treatment outcomes between this cohort and our historical cohort at MTRH was conducted to measure the effectiveness of the program before and after its implementation.

Diagnosis Delay Intervention

Children who presented between January 2017 and December 2018 with symptoms and/or physical findings suggestive of possible BL were enrolled in the Diagnosis Delay Intervention of the study. Patients with a previous diagnosis of cancer were excluded.

The Diagnosis Delay Intervention aimed to shorten the time to diagnosis by (1) introducing the use of flow cytometry for the diagnosis of BL and covering its cost ($45 USD) and (2) covering the cost of core biopsy needles ($40 USD).

Patients were admitted to a general ward where tests and scans were ordered before a biopsy was scheduled and taken. Samples were obtained from patients through fine-needle aspiration (FNA), core needle biopsy, or surgical incisional/excisional biopsy. Study personnel expedited the procedure, handled specimens, and routed them to laboratories in a timely manner. Fresh tissue from all sources was processed and analyzed by flow cytometry, which was a new diagnostic test at MTRH. The test was performed by a senior laboratory technologist supported by a hematopathologist from the United States. Fluorescent antibodies to detect surface markers including CD10, CD19, CD20, Kappa, and Lambda were used to confirm BL diagnosis. Tissue was also processed for routine histopathology and immunohistochemical staining as part of the standard testing at MTRH. Fresh tissue was also processed for fluorescence in situ hybridization for a parallel pilot study to confirm the diagnosis of BL.[18]

Treatment Abandonment Intervention

Children with confirmed BL were consented to participate and enrolled in the Treatment Abandonment Interventions. The three abandonment interventions included (1) transportation reimbursement, covering costs to and from the hospital for the parent and child and (2) supplement for lost income. Partial replacement of lost income was given to parents. The caregiver received these support payments for the previous chemotherapy cycle on their return for each subsequent cycle to encourage them to complete treatment. The caregiver received 3,000 Kshs (approximately $23 USD) for the first chemotherapy cycle and 2,000 Kshs (approximately $15 USD) for each subsequent completed chemotherapy cycle. (3) Follow-up by phone: When a patient missed a scheduled hospital appointment, study personnel would call the caregivers and encourage them to bring their child back to continue treatment. At least one parent or guardian of each patient had access to a mobile phone.

Historical Comparison of Diagnosis Delays and Treatment Outcomes

For our historical comparison, a medical record review of patients diagnosed with NHL between January 2010 and December 2016 was conducted. Patients from the historical cohort whose files were missing were excluded from analysis.

Sociodemographic and clinical data were obtained from medical records. Sociodemographic characteristics included age at diagnosis, sex, patients' residence, and distance to the hospital (<100 km, >100 km). Clinical characteristics and laboratory data included standard diagnostic testing of histopathology, FNA cytology, and staging evaluation (physical examination, chest X-ray, abdominal ultrasound, full hemogram, lactate dehydrogenase, bone marrow aspirate, cerebral spinal fluid cytology). Data also included the date of diagnosis, duration of symptoms before hospital admission at MTRH (<1 month, 1-3 months, >3 months), date of start of treatment, treatment outcomes, and patient status as documented at the last follow-up visit.

Diagnosis delay was defined as the time from when the patient was admitted to MTRH until the cancer diagnosis was confirmed. The same definition for these time points was used for both the historical and prospective cohorts.

Treatment outcome event was defined as either the first treatment event that occurred (abandonment of treatment, death, progressive or relapsed disease), or if no treatment failure occurred, as EFS. Treatment abandonment was defined as failure to start or sustain treatment during four or more consecutive weeks and is the most severe form of nonadherence.[19]

We obtained informed consent from each participant's guardian. Our study was approved by the Institutional Research Ethics Committee of MTRH/MU (approval No.: 0001818).

Data Analysis

Data management and analysis were conducted using Excel, SPSS version 23, and R Studio version 4.2.2. Frequency distributions, medians, means, and standard deviations were calculated. The comparison between treatment outcomes was evaluated using the chi-squared test and Fisher's exact test. Only treatment outcomes during the first year after diagnosis were considered in this comparison to avoid bias caused by different follow-up times in the two periods. The probability of EFS was estimated using the Kaplan-Meier method; estimates were compared using the log-rank test. EFS was measured from the date of diagnosis to the first treatment event or the date of last follow-up. To compare the delays between the two periods, a two-tailed paired T test was used. A P value of <.05 is considered statistically significant. We also examined the cumulative incidence of treatment abandonment, disease progression/relapse, and death across the preintervention and intervention phases using competing risk methods. Gray's test was used to assess differences between groups.

RESULTS

Diagnosis Delay Intervention

A total of 91 patients with symptoms and/or physical findings suggestive of BL were enrolled in the study between January 2017 and December 2018.

Table 1 lists the sociodemographic and clinical characteristics of these children. Of the 91 patients, 60 (66%) were male, with a mean age of 7.9 years. Overall, 71 patients (78%) had symptoms for more than 1 month before presenting to MTRH, and 76 patients (84%) had to travel for more than 100 km to access care at MTRH. In total, 43 patients (47%) had a confirmed diagnosis of BL. The remaining 48 patients had other malignancies or benign conditions confirmed by flow cytometry and histopathology. The most common other diagnoses included Hodgkin lymphoma (n = 9, 10%), acute lymphoblastic leukemia (n = 4, 4%), and neuroblastoma (n = 4, 4%).

Table 2 lists the sociodemographic and clinical characteristics of the 43 patients with confirmed BL. New and standard diagnostic testing procedures are shown. Flow cytometry was performed for 38 patients. The time to receive a flow cytometry result was 1 day for the majority of patients. The five patients without flow cytometry testing were admitted to MTRH with pathology results or biopsy tissue blocks in hand.

The time points to measure diagnosis delay (date of admission in MTRH and date of confirmed cancer diagnosis) were recorded in 41 patients, and the mean and median diagnosis delays were 10.58 and 8 days, respectively, with a standard deviation of 9.96 days.

St Jude Staging[17] for the patients included stage I or II (n = 8, 19%), stage III (n = 28, 67%), and stage IV (n = 6, 14%). However, not all patients had complete staging evaluation.

Treatment Abandonment Intervention

Of the 43 patients with confirmed BL, one patient died before starting treatment and 42 were enrolled in part two of the study, the Treatment Abandonment Intervention. Overall, payments were provided for the following chemotherapy cycles: prephase (n = 41), course 1 (n = 38), course 2 (n = 36), course 3 (n = 34), course 4 (n = 34), course 5 (n = 33), course 6 (n = 28), course 7 (n = 24), and course 8 (n = 17).

Of 42 patients, two abandoned treatment. They missed scheduled hospital appointments and were followed up by phone call. One family decided to go for traditional alternative treatment, and the other patient from Uganda was unable to return to MTRH because of distance and lack of health insurance.

TABLE 1. Sociodemographic and Clinical Characteristics of 91 Patients With Physical Findings or Symptoms Suggestive of Burkitt Lymphoma (2017-2018)

Characteristic	Patients, No. (%)
Sex	
Male	60 (66)
Female	31 (34)
Age, years	
Mean ± SD (range)	7.86 ± 4.0 (0-15)
Median	8
Duration of symptoms before first hospital admission at MTRH	
<4 weeks	22 (24)
1-3 months	35 (38)
>3 months	36 (38)
Distance to MTRH	
<100 km	15 (16)
>100 km	76 (84)
Diagnoses	
Burkitt lymphoma	43 (47)
Hodgkin lymphoma	9 (10)
Unconfirmed	7 (8)
ALL	4 (4)
Neuroblastoma	4 (4)
Kaposi sarcoma	3 (3)
Rhabdomyosarcoma	3 (3)
Acute myeloid leukemia	3 (3)
NHL (not mature B)	3 (3)
Nasopharyngeal carcinoma	2 (2)
Osteosarcoma	1 (1)
Nephroblastoma	1 (1)
Chronic granulomatous lymphadenitis	1 (1)
Neuroendocrine tumor	1 (1)
Lipoma	1 (1)
Granuloma	1 (1)
No evidence of malignancy	1 (1)
Diagnostic testing	
Flow cytometry	38 (88)
FISH	42 (98)
H&E staining	40 (93)
FNA cytology	22 (51)
Immunohistochemistry	4 (9)
Staging evaluation	
Physical examination	36 (85)
Chest X-ray	30 (71)
Abdominal ultrasound	32 (76)
Full hemogram	42 (100)
LDH	41 (97)
Bone marrow aspirate	32 (76)
Cerebral spinal fluid	30 (71)

Abbreviations: FNA, fine-needle aspiration; FISH, fluorescence in situ hybridization; H&E, hematoxylin and eosin; LDH, lactate dehydrogenase; MTRH, Moi Teaching and Referral Hospital; NHL, non-Hodgkin lymphoma; SD, standard deviation.

TABLE 2. Comparison of Sociodemographic and Clinical Characteristics Between 138 Children With Non-Hodgkin's Lymphoma (2010-2016) and 43 Children With Confirmed Burkitt Lymphoma (2017-2018)

Characteristic	Historical Cohort (N = 138), No. (%)	Prospective Cohort (N = 43), No. (%)	*P* value Comparing the Two Periods
Sex			ns
Male	95 (69)	30 (71)	
Female	43 (31)	13 (30)	
Age, years			ns
Mean ± SD	7.4 ± 3.5	7.5 ± 3.5	
Median (range)	7 (1-16)	7 (2-15)	
Duration of symptoms before first hospital admission at MTRH	(n = 134)	(n = 41)	ns
<4 weeks	19 (14)	11 (27)	
1-3 months	71 (53)	18 (46)	
>3 months	44 (33)	11 (27)	
Distance to MTRH			.002
<100 km	41 (22)	3 (7)	
>100 km	96 (70)	40 (93)	
Clinical staging			ns
Stage I or II	22 (21)	8 (19)	
Stage III	64 (62)	28 (67)	
Stage IV	15 (15)	6 (14)	

Abbreviation: MTRH, Moi Teaching and Referral Hospital; ns, not significant; SD, standard deviation.

Among the 43 patients with confirmed BL, treatment outcomes at 1 year after starting therapy were death (n = 11, 23%), progressive disease or relapse (n = 3, 7%), followed by abandonment of treatment (n = 2, 5%), resulting in 27 children having a 1-year EFS (63%).

Historical Comparison of Diagnosis Delays and Treatment Outcomes

In our historical cohort of 153 patients diagnosed with NHL (but not specifically BL), 15 medical records were missing and excluded from analysis. Therefore, 138 patients in this cohort were compared with our prospective cohort of 43 patients diagnosed with BL. Table 2 shows that there were no significant differences in sex, age, duration of symptoms, and stage between the two cohorts. In the prospective cohort, more patients (93%) traveled for more than 100 km to reach MTRH compared with the historical cohort (70% $P = .002$).

Table 3 compares the diagnosis delays experienced by the historical (2010-2016) and prospective (2017-2018) cohorts. The historical cohort, consisting of 130 observations, showed a mean diagnosis delay of 13.57 days, with a standard deviation of 15.59. By contrast, the prospective cohort, with 41 observations, had a shorter mean delay of 10.58 days with a standard deviation of 9.95. The results indicated a significant difference in mean delays between the two groups ($P = .026$). Two patients of the 43 observations were removed from analysis. One patient died before starting therapy, and the second was lost to follow-up from the time of biopsy to return to start therapy.

Table 3 also compares the treatment outcomes at 1 year after diagnosis between the historical and prospective cohorts. The chemotherapy protocol and treatment intensity were identical for both cohorts, and there was no change in supportive care. Treatment abandonment decreased significantly after the Treatment Abandonment Intervention was introduced: 5% abandoned treatment, in contrast to 27% historically ($P < .001$). The yearly treatment abandonment rate from 2010 to 2016 remained steady at 38%, 41%, 25%, 9%, 33%, 18%, and 31%, respectively. Treatment abandonment thus shifted from being the most common treatment failure in the historical cohort to the least common reason for treatment failure in the prospective cohort. Figure 1 illustrates a significant improvement in EFS estimates between the historical and prospective cohorts ($P = .027$). Note that Table 3 shows actual percentages, whereas the Kaplan-Meier estimates in Figure 1 show time-dependent probability estimates. Statistically significant differences were observed in the cumulative incidence of abandonment between the preintervention and intervention phases ($\chi^2 = 8.49$, $P = .0036$). This finding suggests that the intervention was associated with a meaningful reduction in treatment abandonment. For disease progression/relapse, the difference approached but did not reach statistical significance ($\chi^2 = 3.56$, $P = .059$). No significant difference was observed in mortality between groups ($\chi^2 = 0.04$, $P = .84$). Of the 30 deaths in the historical cohort, 11 (37%)

TABLE 3. Comparison of Diagnosis Delays and Treatment Outcomes Between 138 Children With Non-Hodgkin's Lymphoma (2010-2016) and 43 Children With Confirmed Burkitt Lymphoma (2017-2018)

Characteristic	Historical Cohort (N = 138)	Prospective Cohort (N = 43)	*P* value Comparing the Two Periods
Diagnosis delay (days)			
Total No. of patients evaluable	130	41	
Mean (SD)	13.57 (15.6)	10.46 (9.86)	.022
Median (range)	10 (0-101)	8 (2-55)	
Treatment outcome at 1 year after diagnosis, No. (%)			
Abandonment	37 (27)	2 (5)	<.001
Death	30 (22)	11 (26)	ns
Progressive or relapsed disease	25 (18)	3 (7)	<.001
1-year EFS	46 (33)	27 (63)	<.001

Abbreviations: EFS, event-free survival; ns, not significant; SD, standard deviation.

were treatment-related. By contrast, of the 11 deaths in the prospective cohort, seven (64%) were treatment-related.

DISCUSSION

Before starting this study, the 1-year EFS rate for children with NHL at our hospital was 29%. This low survival rate was largely due to delayed diagnosis and treatment abandonment.[6] The EFS rate of this prospective cohort (63%) improved significantly compared with that of the historical cohort (33%). Treatment abandonment decreased significantly, with the historical cohort having an abandonment rate of 27% compared with 5% in the prospective cohort. These findings illustrate that delays in diagnosis and the financial costs of treatment are among the obstacles faced in ensuring good survival outcomes.[20-23] The literature suggests that a higher cure rate can be achieved for all children who are diagnosed with BL through precise diagnostics and treatment adherence.[11] This study showed that cost-effective interventions can be employed in Kenya to rapidly diagnose children with BL, reduce abandonment, and improve EFS. We successfully reduced the time to diagnosis

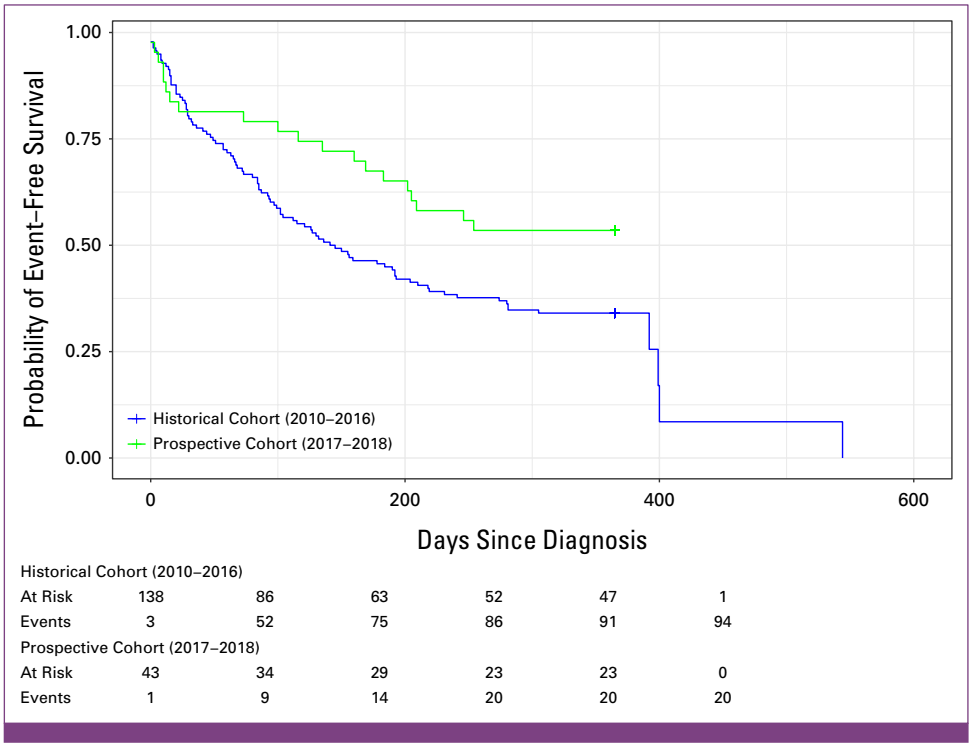

FIG 1. Kaplan-Meier estimates of EFS of 138 children with non-Hodgkin's lymphoma (2010-2016) and of 43 children with confirmed Burkitt Lymphoma (2017-2018): ($P = .027$). Events included abandonment of treatment, death, and progressive or relapsed disease. EFS, event-free survival.

through the introduction of flow cytometry, the provision of core biopsy needles, and paying for the test. In addition, we reduced treatment abandonment through financial support to the families and by making follow-up calls to families that missed appointments. These factors contributed to improved EFS at 1 year.

The time to diagnosis was effectively shortened compared with that of the historical cohort. For a tumor with a doubling time of <1 day, a 3-day reduction was both statistically and clinically significant. Before this study, we relied solely on histopathology to confirm the diagnosis of BL as we did not have good access to core biopsy needles. The process of preparing the histopathology slides and having them reported by the pathologists typically took more than a week in our facility because of the high volume of work and the limited number of pathologists. The introduction of flow cytometry significantly reduced the waiting time as results could be available within 24-48 hours after the samples were taken. Our study covered the cost of the flow cytometry, thus increasing access to the test. The intervention did not improve treatment-related early mortality. Future interventions to decrease mortality could include providing financial support for earlier referral to MTRH or shortening the time to obtaining tissue once admitted to hospital. An Egyptian study in patients with suspected lymphoma showed that flow cytometry had excellent sensitivity and specificity in diagnosing NHL and an 88% concordance with histopathology and immunohistochemistry.[24]

Our historical comparison of diagnosis delays and treatment outcomes reveals notable improvements after the implementation of simple and cost-effective interventions. A study performed in India showed that patients diagnosed between 2015 and 2019 had a median time of 78 days from symptoms to diagnosis, with poor survival associated with patients having delays of more than 30 days.[25] In Cameroon, patients diagnosed between 2004 and 2015 had a median delay of 31 days from the onset of symptoms to diagnosis. Prognosis can be improved, and a cure achieved through early diagnosis and initiation of therapy.[26]

In LMICs, where a majority of patients with BL reside, abandonment of treatment contributes to avoidable treatment failure and low survival chances.[27-31] As shown in our Treatment Abandonment Intervention, providing financial support for transportation and for each completed chemotherapy cycle of treatment significantly reduced abandonment. Families were provided support regardless of need and could use the funds for any purpose. Monetary and logistical barriers to health care include travel costs, diagnostic and treatment costs, and distance from the hospital, which can be solved by strategies such as providing subsidized transport and food and providing housing for families that live far. With the wide use of cell phones, patients who have missed hospital appointments can be tracked before they meet the abandonment criteria.[11] In El Salvador, a study aimed at improving adherence to childhood cancer treatment through the support of two nongovernmental organizations provided funds to support families in need with meals, family accommodation, transportation money, health care costs, and food baskets for families after discharge. These strategies led to a reduction of abandonment from 22% in 1999 to 3% in 2011 and 2012.[32] Our hospital provides nutritional support via nasogastric feeding tube when available, and parents are allowed to stay at bedside during the stay. An abandonment rate of 35% was reported in our hospital for patients with NHL diagnosed between 2010 and 2012.[6] To ensure a more contemporary cohort for comparison, we found that the average annual rate of abandonment was 27% in children with NHL from 2010 to 2016. After the introduction of our Diagnosis Delay and Treatment Abandonment Interventions, the abandonment rate dropped to 5% among patients with BL.

This study has several limitations that should be taken into consideration. It was conducted at a single hospital in Kenya, which limits how broadly the results can be applied. However, other studies in LMICs have also shown that strategies focused on prompt diagnosis and reducing treatment-related costs can improve treatment outcomes.[15-17] In addition, retrospective medical record studies often face challenges with incomplete or missing records, which can complicate interpretation. Because of the absence of controls or random assignment, we cannot conclude that our results were solely due to the implemented interventions. Over the past decade, there have been national campaigns in Kenya to increase cancer awareness, which could have contributed to treatment adherence and thus better outcomes. In addition, the diagnosis of patients in the historical cohort was not differentiated among the various subtypes of NHL, whereas in our prospective cohort, confirmation of BL was obtained following the initial flow cytometry result through subsequent histologic or genetic testing. This might have led to poorer outcomes in the historical cohort since patients might have been improperly treated using an incorrect protocol.[11]

In conclusion, this study demonstrates that combining rapid diagnosis with family support to complete therapy significantly reduced diagnosis delay, treatment abandonment, and improved EFS of children with BL. Sustaining such interventions requires effort from the government or philanthropic organizations to help in covering essential costs of cancer care, including income loss and out-of-pocket expenses.[11]

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AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST

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