

A Demonstration of Peer Support for Ugandan Adults With Type 2 Diabetes

Linda C. Baumann · Nakwagala Frederick ·
Nankwanga Betty · Ejang Josphine · Nambuya Agatha

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Abstract

Background By 2030, 80 % of people with diabetes will be living in developing countries.

Purpose The purpose of this pre-post quasi-experimental study was to test the feasibility of a peer intervention to improve the following: (1) diabetes self-care behaviors, (2) glycemic control, (3) social support and emotional well-being, (4) linkages to health care providers, and (5) to assess the sustainability of the intervention 18 months later.

Method Participants were adults with type 2 diabetes who resided in rural Uganda. Participants ($n=46$) attended a 1-day diabetes education program and agreed to make weekly contacts over 4 months with each other by phone or in person to assist with daily management, provide social and emotional support, and encourage appropriate contact with health care providers.

Results Results indicated improvement in glycosylated hemoglobin (A1C), diastolic blood pressure, and eating behaviors.

Conclusions A short-term peer support program was a feasible intervention to improve diabetes care in rural Uganda. Participants were successfully recruited and retained, and they

experienced positive behavioral and physiologic outcomes. Elements of the intervention were sustained 18 months after the intervention.

Keywords Peer support · Type 2 diabetes · Diabetes self-care

Introduction

Type 2 diabetes comprises 80 % of diabetes worldwide and is a growing pandemic [1]. Diabetes has long been considered a disease of affluence due to the role of overweight, obesity, and lack of physical activity in its development. However, globalization has equalized risk factors so that by 2030, 80 % of people with diabetes will be living in developing countries. Although no epidemiologic studies on diabetes prevalence have been done in Uganda, the prevalence of diabetes in the African region is 3.8 % with prevalence estimates of 4.3 % by 2030, and impaired glucose tolerance is expected to rise from 8.5 to 9.6 % by 2030 [2].

There is a compelling need to explore the prevention and management of diabetes in developing world settings, especially since many of these settings have a severe shortage of health care workers [3]. Because lifestyle is the key to preventing the devastating complications of diabetes, and because lifestyle behaviors must be patient-driven, it is imperative that we examine sustainable strategies that will actively engage individuals in management of their disease. In this context, peer support is a promising approach toward achieving self-care goals [4].

Peer-based strategies for diabetes self-management, delivered by nonprofessionals who have diabetes or are familiar with its management, have received attention for their effectiveness in lowering glycosylated hemoglobin (A1C) and systolic and diastolic blood pressure [5] and for their cost-effectiveness [6]. Heisler and colleagues conducted a randomized trial with US veterans who had an A1C >7.5 % ($n=244$)

L. C. Baumann (✉)
School of Nursing, University of Wisconsin-Madison, Madison,
WI 53792-2455, USA
e-mail: ljbauman@wisc.edu

N. Frederick · E. Josphine · N. Agatha
Mulago National Hospital, Kampala, Uganda

N. Frederick
e-mail: nakwagala@yahoo.com

E. Josphine
e-mail: josephinejang@hotmail.com

N. Agatha
e-mail: agathanambuya@yahoo.com

N. Betty
Mityana District Hospital, Mityana, Uganda
e-mail: betty_nankwanga@yahoo.com

and assigned them to receive standard care or reciprocal peer support (RPS) [7]. Participants in the RPS group received brief training in peer communication and diabetes self-management, were assigned support partners, and were then encouraged to engage in weekly phone calls. RPS participants had a significant decrease, 0.58 %, in A1C compared to the standard care group after 6 months. Less and colleagues [8] created a lay diabetes facilitator (LDF) training program in Jamaica in which LDFs attended a 6-h training course about educating people with diabetes to improve self-management skills and glycemic control. After 6 months, the group who met with LDFs had a drop of 0.6 % in A1C compared to an increase of 0.6 % in the standard care group, $p < 0.05$.

Peer support has also been effective at mitigating the emotional aspects of diabetes. It is well documented that depression and diabetes are closely associated [9]. Among individuals with diabetes, depression is associated with poorer engagement in treatment, worse glycemic control, more complications of diabetes, and higher mortality rates [10]. A diabetes self-management program in the USA put trained peers in community settings to deliver a 6-week education program on self-management topics. Peer leaders received 4 days of training and then provided weekly classes to community members. At 6 and 12 months, participants showed significant improvements in health behaviors, depression, and self-efficacy [11].

Petite conducted a meta-analysis of 53 studies on peer support models for chronic disease self-management [5] and a review of technologies used to promote interaction around behavioral change. The author concluded that approaches to peer support were so diverse that their contribution to effective diabetes self-management is difficult to determine [12]. Peer training has also varied widely depending on the organization, the setting, and the goals of the intervention. Typical sites for peer support programs are physician-led clinics. To date, no nurse-led clinics for diabetes management have used a peer support strategy for chronic disease management [13]. However, nurse-led systems of integrated management of diabetes and hypertension in South Africa have been effective at decreasing fasting plasma glucose and systolic and diastolic blood pressure [14–18] and achieving higher levels of patient satisfaction than physician-led care [19].

Several reviewers have observed the need for more information regarding the training procedures used in peer interventions [20, 21] such as the initial and ongoing training needs of peer workers, intensity of training, training content, and the amount of oversight required by credentialed health care providers [22].

More evidence is also needed on the contexts and functions of peer support for chronic disease management in low- and middle-income countries [23]. Fisher et al. [24] describe four key functions of peer support: (1) assistance in applying disease management or prevention in daily life, (2) emotional and social support, (3) linkage to clinical care, and (4) ongoing

availability of support. These key functions provide a flexible template for tailoring and evaluating peer support programs across cultural settings and within diverse health care systems.

This study was conducted in rural Uganda to test the feasibility of a peer support intervention by a nurse-led interdisciplinary team. The intervention addressed outcomes of diabetes self-care behaviors, glycemic control, social support and emotional well-being, and linkages with health care providers. Further, interview and observational data were collected 18 months later to assess the sustainability of the intervention.

Methods

Setting

Patients over 18 years old with diabetes were recruited from the diabetes clinic in Mityana, a rural community in Uganda located 45 miles northwest of the capital city of Kampala. Champions had to read and speak English and receive additional training in communication skills to provide peer partners emotional support and assistance with daily management. Partners had no language criterion and agreed to participate in weekly contacts. The clinic staff recruited patients both at the clinic and by radio, to serve as either a champion or partner if they expressed interest in participating and were able to attend the scheduled training meetings. The goal was to recruit 30 champions and 30 partners.

Intervention

The intervention was designed to address key functions of peer support: (1) assistance in applying disease management or prevention in daily life, (2) emotional and social support, (3) linkage to clinical care, and (4) ongoing support [23]. Ugandan physicians and nurses, who are specialists in diabetes care, delivered the diabetes training sessions in English for champions and in both English and Luganda for the partners.

This single-group pre-post study examined a 4-month peer support intervention in which participants were trained in diabetes self-care, some serving as peer champions and others as peer partners. Participants were asked to complete a written contact log after each contact with a peer; a prepaid telephone network was activated among all participants, and call logs were recorded electronically. Measures of diabetes self-care and physiologic outcomes were obtained at a final group meeting 4 months later (T2).

At a 1-day meeting (T1), held separately 2 weeks apart for champions and partners, all participants completed premeasures and received 5 hours of education on diabetes self-care. Additionally, the champions received 1 hour of review and role play in using supportive communication skills, such as

active listening and providing assistance with daily management. At the conclusion of the partner meeting, the champions and partners were matched in pairs or triads by age and gender and agreed to make telephone or personal contact weekly throughout the trial period. All participants were provided with mobile phones linked to a prepaid network so that calls could be made at no cost.

The curriculum addressed areas of diabetes self-care that included healthy eating, being active, taking medications, monitoring blood sugar, problem solving, reducing risks, and problem solving. All participants were given a packet of materials that contained the following: a consent form, the Diabetes Self-Care Questionnaire, Screening Data Form, Take Care of Your Feet poster, Peer Champion Contact Logbook, Peer Champion Training Booklet, and “The ABC’s of Diabetes” brochure [25]. Materials were written at the fifth grade reading level and printed in a large font.

Measures

The Diabetes Self-Care Questionnaire This 49-item questionnaire was modified from the Diabetes Self-Management Assessment and Reporting Tool (D-SMART) [26, 27] developed to measure diabetes self-care: demographic items ($n=8$), missing medication ($n=3$), healthy eating ($n=5$), physical activity ($n=1$), problem solving about blood glucose ($n=4$), self-monitoring blood glucose ($n=2$), risk factors ($n=3$), perceptions of social support ($n=2$), emotional well-being ($n=6$), barriers to self-care ($n=14$), and confidence in self-care abilities ($n=1$). The instrument has been used in a population of Ugandan adults with type 2 diabetes [28]. Nine additional items in the post-questionnaire asked participants to rate their experience, both problems and benefits, of peer support.

Physiologic Measures To measure height, participants stood with their back against a wall to which a measuring tape was attached, without shoes. Weight without shoes was obtained using a portable scale and recorded in kilograms. Body mass index (BMI) was estimated using a chart from Boston Medical Center (<http://www.bmc.org/Images/BMI-Chart.jpg>) based on the formula of (weight (kg)/[height (m)²]). A blood pressure reading was obtained in a sitting position with the right arm at the heart level using an aneroid blood pressure cuff and stethoscope.

Hemoglobin A1C Blood specimens for A1C testing were obtained by a laboratory technician. Venipuncture was performed using standard precautions. Blood samples were transported in a cold container by a hospital vehicle the same day to the Mulago Hospital Clinical Laboratory for analysis using a Roche COBAS Integra 400/700/800 analyzer. Results were interpreted using Diabetes Control and Complications

Trial (DCCT) protocol values of 4.8 to –5.9 % as the desirable range of A1C. The clinical goal for A1C level is 7 % or less.

Participant Logbooks All participants were given a paper logbook in which they were to record each peer contact. The champion logbook included four items: date of contact, topic discussed, result of the discussion, and plan for next contact. The partner logbook included the following: date of contact, goal for the week, change(s) made, and moods and feelings.

Phone Records A prepaid monthly closed network user group was purchased for mobile phones to allow participants to call any of the participants, the Mityana Diabetes Clinic nurse and study partners from Mulago Hospital. Phone activity was electronically tracked over the intervention period and included the origination number, recipient number, date, time, and duration of the call.

Narrative Notes The study nurse recorded every contact between study participants and research staff, including the date, participant identification number, and a brief description of the nature of the call or visit and advice given. Narrative summaries were taken by the study nurse of the educational meetings held at the diabetes clinic at 2 and 3 months during the intervention.

Data Analysis Statistical software package SPSS v17 was used for analyses. Descriptive statistics were used to summarize the findings, and *t* tests were used to compare premeasures and postmeasures by champion or partner status using a Bonferroni correction for multiple comparisons. Qualitative data from the participant logbooks and narrative notes of the clinic nurse and comments from participants at the final meeting were entered into an electronic database and content analyzed for themes. Then, individual responses were categorized into these themes by two researchers, and results were compared for agreement. Individual responses provided orally in the final evaluation session were recorded and summarized as narrative. Finally, effect size (ES) was calculated to demonstrate the strength of the relationship between pre- and post-outcome measures using a standardized measure of effect (Cohen’s *d*) calculated on mean differences over a pooled measure of standard deviation [29].

Procedure

The study protocol was reviewed and approved by human subject committees at the University of Wisconsin-Madison in the USA and Mulago Hospital, Kampala, Uganda. Written informed consent was obtained from all participants. At the 1-day training session, champions completed the measures described above and then received the training. Two weeks later, a similar meeting was held for partners. At the conclusion of

the partner training session, champions were invited to meet their partner or partners, matched by age and gender. All participants were provided with a mobile phone that was part of a prepaid network for use during the study. Champions exchanged phone numbers with their assigned partners and agreed to make at least weekly contacts through telephone or in person. Both champions and partners attended a 4-month postintervention meeting. The meeting included the collection of postmeasures and an open discussion with participants and researchers to share their experiences, successes, difficulties, and suggestions. At the end of the study, mobile phones were collected, and transportation funds were distributed. Participants were encouraged to continue to support each other with their diabetes care through personal or telephone contacts and to attend the diabetes clinic for disease management and further education.

Results

Participant Characteristics

Nineteen champions and 27 partners were recruited, and postmeasures were obtained for 16 champions and 25 peers, representing an 84 and 93 % retention rate, respectively. Three champions and two partners did not complete the study because of death, failing health, and absences due to employment. (see Fig. 1)

Demographic characteristics of participants who completed the intervention are displayed in Table 1. The significant difference in education level of champions and partners reflects the English language inclusion criterion used for champions.

Baseline Comparisons

When comparing pre- and post-outcome measures between champions and partners, we found no differences. Therefore, the results have been aggregated for all participants. Pre- and post-differences in diabetes self-care measures appear in Table 2. Of the health behaviors measured, only healthy eating significantly changed in a positive direction from preintervention to postintervention, $p < 0.005$. Reliability measures for the self-care outcomes are displayed in Table 3. Perceptions of social support, emotional well-being, and confidence in self-management did not change.

Two significant differences in physiologic measures were detected (see Table 4). The average diastolic blood pressure dropped from 85.39 to 76.27 mmHg ($p < 0.001$), and the average A1C values changed from 11.10 to 8.31 % ($p < 0.005$). Seven participants had a pre-A1C value of ≤ 7 % while 13 participants had a post-A1C value of ≤ 7 %. Average BMI values and categories did not change.

Measurement of the Intervention

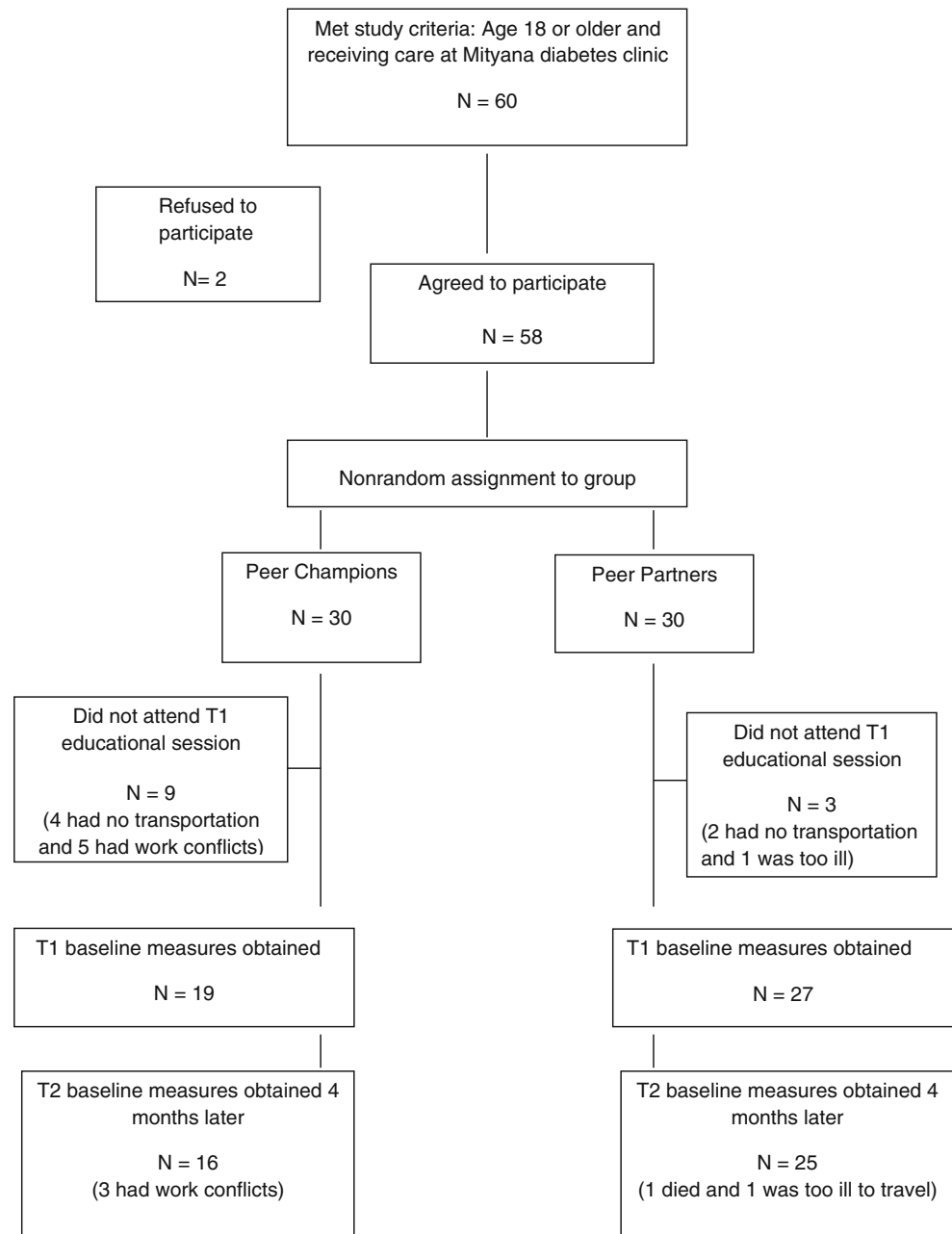
Electronic phone logs and data from participant logbooks show that most participants both utilized the telephones and network of peer supporters and contacted the diabetes clinic more often than preintervention. Electronic phone records showed that 68 % of participants made a phone contact with a peer at least weekly. Attendance for the first and second educational meetings was 76 ($n=31$) and 88 % ($n=36$), respectively. When reporting total contact with peers, 93 % ($n=40$) used cell phones, and 60 % ($n=28$) reported personal contact. Of participants who completed the study, no one had fewer than six contacts with a peer during the intervention period. An item from the post-questionnaire about how often they contacted the diabetes clinic, using a three-point scale (more often, less often, or same as before the program), showed that 89.7 % ($n=35$) of the participants reported increased contact with a health care provider during the intervention.

Responses to items about the problems and benefits of the intervention showed that 80 % ($n=33$) of the participants indicated that they received helpful advice and were encouraged to contact the clinic; 72 % ($n=30$) reported receiving encouragement in their diabetes care, learned a lot, and could talk to someone else about diabetes. The most frequent problems reported included not talking often enough (56 %, $n=23$), not being able to contact their peer (44 %, $n=18$), being told what to do (31 %, $n=13$), and having a peer that was not motivated to change (25 %, $n=10$).

Qualitative data from the final evaluation meeting included a participant who testified that one sentence in the training booklet struck him deeply "You are not alone with diabetes." These words made him realize how isolated he had felt with this condition before the peer intervention. In the postintervention evaluation meeting, several participants reported that they felt that their care had improved, even in the hypertension clinic, since they felt more knowledgeable as patients. Participants also reported experiencing more energy and less pain as a result of making changes.

Content analysis of logbook notes from nine champions and five partners revealed that conversations focused on the following: healthy eating, taking medication consistently instead of only when you feel ill, exercising more, knowing when to contact the clinic nurse, and emotional well-being and support. Content analysis also showed that both champions and partners gave support and answered questions.

The ES was greatest for eating behaviors, moderate for A1C, and small for the other behavioral and psychosocial measures (see Table 5). These estimates suggest that to study peer support on a comprehensive set of self-care behaviors, a sample size of 190 participants would be needed to detect a small ES at an acceptable power level and that some items with a very small ES, such as physical activity, will require further examination.

Fig. 1 Participant recruitment and retention

Discussion

The purpose of this intervention was to test the feasibility of a peer support intervention for impacting key diabetes self-care outcomes. Even though we did not meet our recruitment goal, the study demonstrated that we were able to successfully retain participants. We had some success in demonstrating improvements in self-reported eating behavior, glycemic control, and diastolic blood pressure.

Self-Care Behaviors The intervention did not demonstrate a change in diabetes self-care behaviors, with the

exception of eating behavior. However, the low reliability of the healthy eating index measure suggests the need for a better measurement in this population. Telephone records and patient logs show that a large portion of the partner-champion interactions focused on diet, specifically eating less sugar and more fruits and vegetables. This increased awareness of healthy eating through discussions with peers may be a reason for the significant improvement in self-reported eating behavior over the study period. However, in this community, all dietary change may not have been voluntary, since participants reported reducing the number of meals they ate per day due to local food shortages.

Table 1 Demographic characteristics ($n=41$)

	Champions ($n=16$)			Partners ($n=25$)		
	n (%)	Md	IQR	n (%)	Md	IQR
Age in years		53	13		53	11
Distance in kilometers		6	11		6	22
Diabetes duration in years		4	9		6	9.5
Family history of diabetes	10 (62.5)			12 (48.0)		
Female	10 (62.5)			18 (72.0)		
Educational level ^a						
Primary	3 (15.8)			21 (84.0)		
Secondary	8 (50.0)			4 (14.8)		
Tertiary	5 (26.3)			0 (0)		
Do you smoke? (No)	16 (100)			21 (84.0)		
Do you drink alcohol (No)	16 (100)			25 (100)		

Md median, *IQR* interquartile range

^a Chi square=21.85 (1.44), $p<0.001$ based on preintervention data from 19 champions and 27 partners

Glycemic Control The average A1C levels demonstrated a significant change in preintervention to postintervention, from 11.1 to 8.3 %, representing a drop of 2.8 %. This large drop in A1C is difficult to attribute to dietary changes alone. One explanation is that despite no difference in pre- and post-ratings of frequency of missing medications, this item may not have accurately captured medication-taking behavior. To many participants, “missing medications” meant that they could not obtain medications due to lack of availability or high cost, not simply forgetting to take them, and that they stopped daily medication when they felt better. Other studies on diabetes conducted in African countries [30, 31], where beliefs in traditional medicine and folk healers who suggest diabetes has spiritual causes and is curable rather than controllable, may contribute to poor adherence to medications [32, 33]. This commonsense thinking about a chronic condition as an acute, symptomatic condition is a major barrier to controlling chronic disease outcomes [34]. Data from participant logbooks and meeting notes provided evidence that a frequent topic of conversation was how to properly take medications, not only when one is feeling sick but consistently everyday. Therefore, it is possible that the significant drop in

A1C resulted from more consistent medication taking combined with dietary changes.

Blood Pressure The drop in mean diastolic blood pressure (DBP) postintervention, from 85 to 76 mmHg, is clinically significant. Data from logbooks showed that participants encouraged each other to exercise as much as they encouraged healthy eating and consistency in taking medication daily. It is possible that the heightened awareness of lifestyle habits during the study period resulted in changes that impacted blood pressure. Eighty percent of participants had a blood pressure reading that exceeded 130/80-mmHg preintervention compared to 56 % postintervention. Chodosh and colleagues [5] suggest that A1C and DBP are measures that can be improved or controlled with medications. Heisler and colleagues [7] provide evidence that while self-reported medication adherence did not differ between the control and peer support participants, A1C improved in the peer support group.

The intervention was designed to address the four key functions of peer support: (1) assistance with daily management, (2) social and emotional support, (3) linkages to clinical care, and (4) ongoing availability of support.

Table 2 Preintervention and postintervention ratings of diabetes self-care measures

Variable	Preintervention	Postintervention	Two-tailed test		
	Mean (SD)	Mean (SD)	t	df	Adjusted p^*
Healthy eating index ($n=5$) ^a	11.55 (3.87)	22.4 (2.09)	14.64	32	<0.005
Physical activity ^a	4.31 (1.33)	4.47 (0.97)	0.67	35	1.00
Missed medication ^a	1.92 (1.36)	1.62 (1.09)	1.065	36	1.00
Helpfulness of social support ^b	3.43 (.93)	3.00 (.94)	2.30	36	0.27
Emotional well-being ($n=5$) ^a	13.58 (3.82)	13.02 (3.45)	0.79	40	1.00
Confidence ^b	3.49 (0.76)	3.10 (.72)	2.50	38	0.17
Barriers ($n=14$) ^b	27.81 (6.99)	29.91 (5.15)	1.60	31	1.00

*Bonferroni adjusted p

^a Rating scale 1=never/rarely, 5=daily

^b Rating scale 1=never/not at all, 4=a lot/always

Table 3 Diabetes self-care outcome measures

Measure	Rating scale	Number of items	Cronbach alpha	
			Preintervention	Postintervention
Healthy eating index	1–5	5	0.27	0.32
Physical activity	1–5	1		
Missed medication	1–5	1		
Helpfulness of social support	1–4	1		
Emotional well-being ^a	1–5	5	0.73	0.82
Confidence	1–4	1		
Barriers	1–4	14	0.77	0.83

Rating scales 1=never/rarely, 5=daily, 1=never/not at all, 4=a lot/always

^a One item asking about interference in sexual functioning was dropped from the scale because a number of participants did not have a sexual partner

Assistance With Daily Management Consistent with others [7, 35], participants in this study did not use a champion and partner model but engaged in providing reciprocal support. Participants who share life experiences, benefiting from both providing and receiving social support, may be “activated” by helping someone else [36]. The initial rationale for the champion role was to ensure engagement of participants. However, at the first meeting, partners asked if they could share advice in addition to asking questions of the champion. Therefore, it is not surprising that both groups of participants initiated contacts, provided supportive communications, and reported knowledge gaps. We found no differences in study outcomes by the role of champion or partner. Mbeba and colleagues [37] used a ten-session peer group intervention to provide help for health care workers in Malawi to care for people living with HIV/AIDS. She found that the peer interaction reduced stigmatizing attitudes and improved perceptions of quality of care. This supports the comments from our postintervention meeting that participants perceived that their care had improved “even in the hypertension clinic” (see page 12).

Social and Emotional Support The five-item measure of emotional well-being showed no significant change in postintervention. However, the data reflect the emotional burden of diabetes. For one item on this scale “diabetes makes me feel sad and depressed,” 47.8 % of the participants reported this to occur “sometimes” or “a lot” in preintervention and 43.9 % in postintervention. The strong association between depression and diabetes are derived from predominantly US samples;

however, a Nigerian study [38] found a 20 % prevalence of depression among persons with diabetes compared to 14 % in patients with asthma and 4 % of a healthy population.

Linkages to Care All participants reported increased contact with the diabetes clinic nurse, through telephone or by attending the clinic during the intervention. Participants were highly satisfied with the program and were especially appreciative of the clinic nurse. In low-resource settings, peer support takes on even greater relevance, as it reflects a form of task shifting. Task shifting is the delegation of tasks associated with providing disease management care traditionally performed by physicians to other health care workers, such as nurses or trained lay people. The low cost of peer support interventions is especially well suited to African chronic disease management where resources are severely limited [33]. In our study, we relied on district hospital personnel who manage the diabetes clinic in addition to their other work duties and can devote only a part of their time to diabetes care, despite the growing need.

Ongoing Support Although the free telephone network could not be sustained after intervention, the clinic staffs were left with written bilingual (English–Luganda) educational materials that could be used as resources that could be shared with others. The upgraded clinic facilities could better accommodate patients, and a covered porch provided space for future diabetes club meetings. Participants were offered corrective eyeglasses, as discussed below, to facilitate the ongoing use of written materials.

Table 4 Physiologic and anthropometric measures ($n=41$)

Variable	Preintervention Mean (SD)	Postintervention Mean (SD)	t	df	Adjusted p
Systolic blood pressure (mmHg)	146.34 (24.39)	140.17 (28.77)	2.32	40	0.25
Diastolic blood pressure (mmHg)	85.39 (12.34)	76.27 (14.63)	4.48	40	.001
Weight in kilograms	68.95 (11.71)	68.76 (11.85)	0.391	40	1.00
Body mass index	26.79 (4.95)	26.96 (4.95)	0.79	40	1.00
A1C	11.10 (4.30)	8.31 (2.12)	4.651	40	.005

Bonferroni adjusted p

Table 5 Effect size and 95 % confidence interval for outcome measures

Outcome measure	Effect size	95 % Confidence interval
A1C	0.888	[0.447, 1.329]
Healthy eating	-3.579	[-4.295, -2.863]
Physical activity	0.007	[-0.426, 0.440]
Helpfulness of social support	0.327	[-0.108, 0.763]
Emotional well-being	0.173	[-0.248, 0.595]
Confidence	0.418	[-0.0134, 0.849]
Barriers	-0.259	[-0.710, 0.192]

Challenges of the Research Setting The intervention involved a team of two nurses, a medical officer, and a laboratory technician who were trained to deliver diabetes care. Most participants, 71 %, reported difficulty obtaining medications because of cost or availability. Although we used materials written in English, the educational sessions were conducted in both English and Luganda. Even with these efforts, we did not reach everyone since some spoke a tribal language other than Luganda and little English. In addition to the challenge of translation, many participants had difficulty reading. Ninety-two percent of the participants reported blurred vision; this may be secondary to diabetic retinopathy, which is especially high in African populations [39], or to a lack of corrective eyewear to correct vision changes associated with aging.

We addressed the low literacy by administering all study materials in the group meetings. Items were read aloud in either English or Luganda, depending on requests from the participants, and researchers and clinical staff were available to assist individuals. Participants could listen to the question and be assisted in recording their answer.

There were several limitations to this study. Although the goal was to recruit 30 participants for each group, on the day of the education meeting for champions, a national road rally caused the closure of roads and disruption in public transportation. As with any feasibility study, statistical power is not sufficient to generalize our findings. Also, a predesign and postdesign without a control group do not address potential historical threats to validity. We were able to calculate ESs to compare to the literature, as well as to identify an optimal sample size for key outcomes that have clinical significance [40]; however, the ES for the healthy eating index has to be interpreted with caution due to a low reliability of the index. Yet, traditional measures of reliability assume that multiple items measure the same construct, whereas different behaviors, even within the healthy eating domain, are conceptually independent, that is, eating fats and eating fruits/vegetables are different behaviors, not different measures of the same behavior [27].

The low return rate of the logbooks, 14 of 41, was partially due to a failure to remind participants to bring these records with them at the final meeting. Our peer training program was

short and consisted of 5 h of instruction. However, others have achieved results in low-resource settings by providing very basic diabetes education [8]. A review of peer education programs found that peer training ranged from 4 to 74 h [21, 41]. Further, our intervention was conducted over 4 months, the minimal duration needed to detect changes in A1C. Norris and colleagues [42] reviewed 72 RCTs on self-management training and identified the need to assess sustained impact on glycemic control and as well as other outcomes.

Dissemination and Sustainability In this partnership, we jointly presented study results at international meetings and scientific and professional meetings held in Uganda. Bilingual materials produced for the study, such as a foot care poster and a bilingual diabetes self-care education booklet, were disseminated several ways: (1) Foot care posters were distributed to all district hospital diabetes clinics, about 40, in the country; (2) bilingual self-care booklets were given to all participants, and several reported that this material was a valuable resource shared with other villagers who had questions about diabetes; booklets were also used by health care professionals for diabetes education; and (3) the foot care poster and booklet were presented to the Ugandan Ministry of Health for Chronic Disease Management for official approval and distribution to public service clinics.

To assess sustainability of the project, a site visit was conducted 18 months after the conclusion of the funded project. Key informant interviews were conducted with the diabetes clinic team, district hospital administrator, and three patients who participated in the study. From the provider perspective, a lasting effect of the intervention was the positive experience of clinic personnel in having knowledgeable and engaged patients. Clinic management changed in several ways. First, because of the increased numbers of persons with diabetes needing care, routine follow-up was changed to every 2 months from monthly. Patients have a 15–30-min appointment with the nurse that occurs during a scheduled time; in Uganda, it is uncommon for patients to honor appointments in seeking care and often results in extensive waiting times at clinics. Second, patients who had been participants in the peer support intervention are scheduled for appointments on the same clinic day as their partner to facilitate ongoing contact. And finally, every diabetes clinic day now begins with a 1-h education session. The hospital director reports that the diabetes clinic has the lowest missed appointment rate and best adherence to treatment rates than other clinics in the district hospital.

The participants who were interviewed said that they still interact with and receive support from study participants, although their contact is less frequent. They remember the education they received about diabetes self-care and noted that they value and continue to use the

printed booklet. One participant said “since eating more green vegetables is encouraged when I see my partner at the clinic I share with them vegetables from my garden.” Participants said that transportation problems in getting to the clinic and access to medications remain challenges.

Another initiative that emerged from this project was furthering the reach and evaluation of the potential benefit of a peer support intervention for diabetes. The two Ugandan physicians on this project received further funding to demonstrate a peer support model in ten additional district hospital diabetes clinics. The results of this work are not yet available.

In summary, our findings support others who have found that telephone-based peer support can be used alone or with other peer support interventions and is especially useful when patients are divided by distance as they are in rural settings. Participant satisfaction was high, and A1C and DBP improved over a 4-month intervention. Aspects of the intervention were sustained 18 months after funding ended and incorporated into the delivery of diabetes care. The intervention effected recognition of how education and active engagement of both patients and providers can improve both physiologic outcomes and patient and clinician satisfaction.

Acknowledgments This project was supported by a grant from Peers for Progress, a program of the American Academy of Family Physicians Foundation supported by the Eli Lilly Company Foundation. We would like to thank US and Ugandan colleagues who helped to develop and deliver this intervention, especially Dory Blobner, RN, CDE, who provided expert clinical knowledge and experience in diabetes education in developing countries.

Ethical Standards All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from all patients for being included in the study.

Conflict of Interest Authors Linda C. Baumann, Nakwagala Frederick, Nankwanga Betty, Ejang Josephine, and Nambuya Agatha declare that they have no conflict of interest.

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