A pilot study testing a new transition of care model from hospital to the community for Hispanic/Latino adults with diabetes to reduce emergency department visits and hospital re-admissions

Lucy Marie Alice Esteve[1], Blanca Iris Padilla[1,2], Ariana Pichardo-Lowden[4], Isa Granados[3], Scott Carlson[1] and Leonor Corsino[1]*

Abstract

Background Hispanic/Latino populations have the second highest prevalence of diabetes (12.5%) among ethnic minority groups in the USA. They also have higher rates of uncontrolled diabetes and diabetes-related complications. Approximately 29% of diabetes care costs are attributed to inpatient hospital care. To reduce hospital length of stay and re-admission rates for diabetes, the American Diabetes Association (ADA) recommends a "structured discharge plan tailored to the individual patient with diabetes." However, limited research exists on the feasibility and applicability of a transition of care model specifically tailored for the Hispanic/Latino population.

Methods We conducted a 2-year pilot study to develop a practical, patient-centered, and culturally competent transition of care (TOC) model for Hispanic/Latino adults with diabetes discharged from the hospital to the community. Feasibility outcomes included recruitment rates, questionnaire completion rates, adherence to a 30-day post-discharge phone call, and resource needs and utilization for study implementation. Participant-centered outcomes included 30-day post-discharge emergency department (ED) visits, 30-day post-discharge unplanned re-admissions, follow-up visits within 2 weeks of discharge, and patient satisfaction with the TOC model.

Results Twelve participants were enrolled over the study period, with weekly enrollment ranging from 0 to 4 participants. Participants' average age in years was 47 (± 11.6); the majority were male (85%), and 75% had type 2 diabetes. Recruitment involved the support of 4 bilingual staff. The estimated time to review the chart, approach participants, obtain informed consent, complete questionnaires, and provide discharge instructions was approximately 2.5 h. Of the 10 participants who completed the 30-day post-discharge phone call, none had ED visits or unplanned hospital re-admissions within 30 days post-discharge, and all had a follow-up with a medical provider within 2 weeks.

Conclusions Implementing a patient-centered and culturally competent TOC model for Hispanic/Latino adults with diabetes discharged from the hospital to the community is feasible when considering key resources for success.

*Correspondence:
Leonor Corsino
corsi002@mc.duke.edu; leonor.corsinonunez@duke.edu
Full list of author information is available at the end of the article

These include a bilingual team with dedicated and funded time, alignment with existing discharge process and integration into the Electronic Medical Record (EMR) systems.

Keywords Hispanic/Latino, Diabetes, Transition, Hospitalization, Community, Emergency department, Re-admissions

Key messages regarding feasibility

1) What uncertainties existed regarding the feasibility?

   a   Ability to recruit, enroll, and retain a statistically significant number of participants in the absence of bilingual staff.
   b   Availability of resources (i.e., time/staff) required to recruit and enroll participants, review discharge instructions, and closely follow patients post-discharge.
   c   Patient and provider engagement with a new discharge summary.
   d   Integration of new discharge summary into Electronic Medical Records (EMR).
   e   Assumption that this new transition of care (TOC) model will decrease hospital re-admission rates.

2) What are the key feasibility findings?

   a   To achieve the targeted recruitment effort, a fully bilingual staff is needed.
   b   Despite a small number of enrolled participants, positive feedback from patients highlighted the applicability and readability of the new discharge summary.
   c   There is the need to incorporate the TOC into the existing EMR discharge instructions section.
   d   There were no hospital re-admissions or emergency department visits within the 30-day post-discharge period.

3) What are the implications of the feasibility findings for the design of the main study?

   a   With a large randomized control trial, the goal would be to demonstrate and replicate the findings of reduced emergency department visits and re-admission rates with our new TOC model for Hispanic/Latino patients with diabetes.
   b   Funding is crucial to sustain bilingual staff and support the rigorous testing of the model in a larger trial.
   c   Effective integration of the new discharge summary into the existing EMR requires collaboration with the inpatient provider team and EMR experts.

Background

The rising burden of diabetes encompasses the increasing incidence, prevalence, complications, and care cost of diabetes and is a primary concern in healthcare worldwide [1]. There are 537 million adults living with diabetes around the globe [2]. In the USA, over 30 million individuals have diabetes, with a disproportional burden on those of Hispanic/Latino ethnicity [3]. Among ethnic minority groups in the USA, Hispanic/Latino populations have the second highest prevalence of diabetes (12.5%) [3], with subgroups such as Mexican, Dominican, and Puerto Rican heritage backgrounds experiencing even higher rates (18.3%, 18%, 18%, respectively) [4]. Additionally, they have higher rates of uncontrolled diabetes and diabetes-related complications, including cardiovascular disease, blindness, kidney failure, and non-traumatic lower-limb amputations. These complications significantly impede individual functional capacities and quality of life, leading to significant morbidity and premature mortality [5, 6]. According to the American Diabetes Association (ADA), the cost of diabetes care in the USA was $412.9 billion in 2022 [6, 7]. Most of the medical expenditure includes hospital inpatient days (29%) and prescription medications to treat diabetes (44%) [6, 7]. Recent studies estimated the average 30-day re-admission rate for hospitalized patients with diabetes to be between 14.4 and 22.7%, much higher than the average for all hospitalized patients (8.5–13.5%) [8, 9]. The annual cost of these 30-day post-discharge re-admission rates is $20–25 billion [8]. Marginalized racial and ethnic groups have been shown to have higher rates of ED visits and hospital admissions/re-admissions related to diabetes than non-Hispanic White patients [10, 11].

Multiple genetic and pathophysiological factors have been identified as causes for the increased prevalence and comorbidities of diabetes in the Hispanic/Latino population [12, 13]. However, just like other marginalized racial and ethnic groups, the disparities and burden of diabetes experienced by the Hispanic/Latino populations are highly driven by social drivers of health, such as lower access and quality of healthcare due to insurance status, health literacy, socio-economic status, language proficiency, immigration status, and level of acculturation [14–16].

Esteve *et al. Pilot and Feasibility Studies*   (2024) 10:122

Page 3 of 10

Addressing these preventable factors is crucial to reducing ED visits, re-admission rates, and diabetes-related complications. The ADA recommended a "structured discharge plan tailored to the individual patient with diabetes" to reduce hospital length of stay (LOS) and re-admission rates among persons with diabetes [17–19]. However, there is limited literature regarding the feasibility and applicability of this transition of care (TOC) model for the Hispanic/Latino population with fewer resources and multiple socio-economic factors discussed above [15, 16].

To bridge this critical gap in the literature, we conducted a comprehensive 2-year pilot study aimed at developing and testing an effective, practical, and culturally competent TOC model for Hispanic/Latino adults with diabetes discharged from the hospital to the community [20]. The study consisted of two main aims. Firstly, for aim 1, we collected qualitative data through semi-structured interviews with Hispanic/Latino adults with diabetes and healthcare providers to inform the development of a new TOC model. Secondly, for aim 2, we pilot tested the newly developed TOC model for the Hispanic/Latino adults with diabetes discharged from the hospital to the community. This manuscript describes the results of the pilot study testing and implementation of the newly revised TOC model based on feedback collected during aim 1.

Methods
Study design
We conducted a pilot study to develop and test a TOC model tailored for Hispanic/Latino adults with diabetes transitioning from hospital care to the community. Detailed study design and methods were published previously [20]. In brief, the study included two aims. Aim 1 involved developing a new TOC model by integrating patient and provider perspectives through qualitative data collection via semi-structured interviews. This manuscript focuses on aim 2, which involves the pilot-testing of the new TOC model using the Plan-Do-Study-Act (PDSA) framework, an adaptable and iterative approach for small-scale changes in healthcare settings [21]. Only one PDSA cycle was completed during this study.

Transition of care model
During the study design phase, the usual TOC process consisted of an electronically generated discharge summary from the EMR which included the admission diagnosis, patient problem list, medication details (new and discontinued), follow-up visits, and patient education related to the condition of admission. Specific instructions regarding new or discontinued medications, along with the method and timing of administration, were included in the discharge instructions if the patient had been seen by the diabetes service provider. Additionally, patients identified with barriers to care during admission were added to the nurse navigator list.

The development of the new TOC model was informed by insights obtained during aim 1 of the study, involving feedback from both patients and healthcare providers on the discharge process. First, we streamlined the model for clarity and brevity, incorporating visual aids and intuitive design elements. Second, to empower patients for effective self-management, we included content on the fundamentals of diabetes and blood glucose monitoring. Third, clear instructions on the timing and method of diabetes medication administration were added. Fourth, comprehensive information on recognizing and managing hypoglycemic episodes was integrated, empowering patients to respond adeptly to critical situations. Lastly, to enhance adherence to post-discharge care plans, we provided explicit instructions for follow-up visits, including a visual calendar with the date, time, location, and contact details of appointment challenges. For participants with healthcare providers outside the hospital system of enrollment, the most recent laboratory results from the hospitalization were included (see Additional file 1).
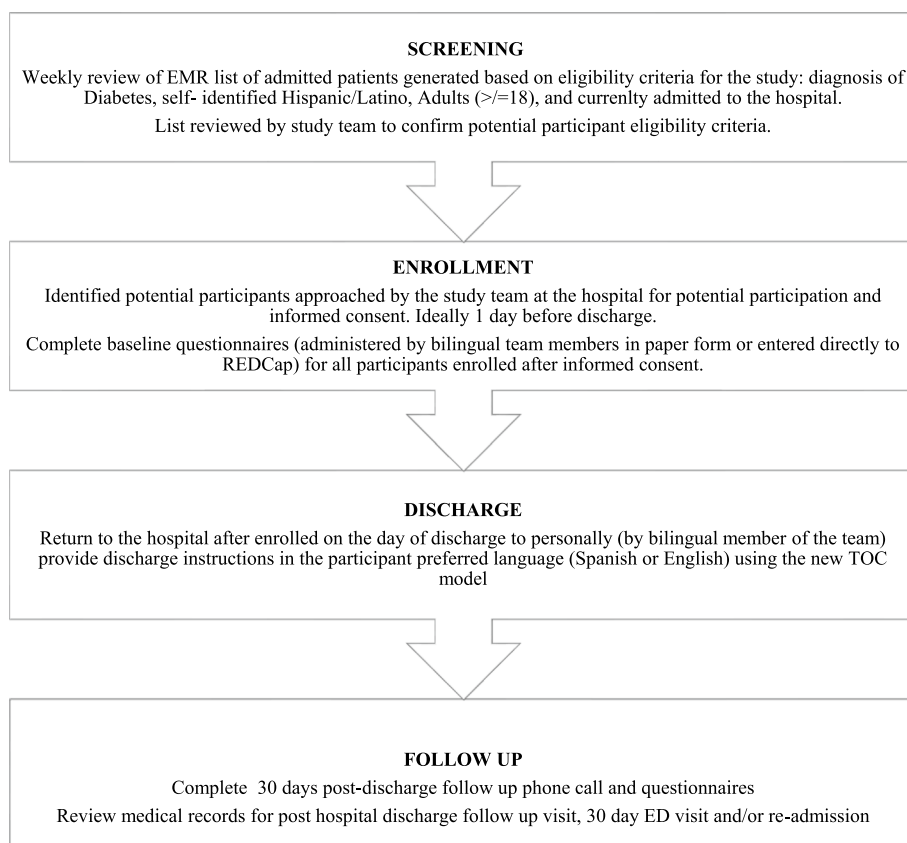
Participants
Eligible participants included adults (18 years or older) who self-identified as Hispanic/Latino and had a diagnosis of diabetes. These individuals were hospitalized in either of two hospitals affiliated with a large academic health system in the southeast of the USA. Participants needed to speak Spanish or English and have the capacity and willingness to provide informed consent. There were no exclusion criteria based on health status or comorbid conditions.

Sample size
For a randomized pilot study, we estimated a sample of 28 to 61 participants. Our initial goal, after the study re-design to PDSA cycle, was to recruit 16 participants [20]. However, due to challenges faced due to the COVID-19 pandemic and limited funding and resources, we ultimately enrolled 12 participants in the study.

Recruitment
A purposive sampling method was used to identify potential participants using the Electronic Medical Record (EMR). Bilingual research team members contacted eligible individuals during hospitalization to determine interest and obtain informed consent. Participant screening, enrollment, and study processes are described in Fig. 1. All participants provided written informed

SCREENING
Weekly review of EMR list of admitted patients generated based on eligibility criteria for the study: diagnosis of Diabetes, self- identified Hispanic/Latino, Adults (>/=18), and currenlty admitted to the hospital.
List reviewed by study team to confirm potential participant eligibility criteria.

ENROLLMENT
Identified potential participants approached by the study team at the hospital for potential participation and informed consent. Ideally 1 day before discharge.
Complete baseline questionnaires (administered by bilingual team members in paper form or entered directly to REDCap) for all participants enrolled after informed consent.

DISCHARGE
Return to the hospital after enrolled on the day of discharge to personally (by bilingual member of the team) provide discharge instructions in the participant preferred language (Spanish or English) using the new TOC model

FOLLOW UP
Complete 30 days post-discharge follow up phone call and questionnaires
Review medical records for post hospital discharge follow up visit, 30 day ED visit and/or re-admission

Fig. 1 Screening, enrollment, and study process

consent in their preferred language, and the Institutional Review Board approved the study.

Data collection

Data collection for the study involved the completion of questionnaires by participants, follow-up phone calls, and thorough chart reviews. Participants provided responses to a comprehensive questionnaire in their preferred language (Spanish or English) encompassing demographic, sociocultural, and health-related information. Sociocultural questions incorporated the Single-Item Measure of Social Support (SIMSS) [22], the Single Item Literacy Screener (SILS) [23], barriers to accessing healthcare, identity, and perceived discrimination. All questionnaires were adapted from the Hispanic Community Health Study/Study of Latinos and/ or the Mi Puente Trial [24, 25]. The 30-day post-discharge phone call assessed follow-up care and gathered participants' perspectives about the TOC model. Process questions included provider follow-up visits, ED or urgent care visits, and hospital re-admissions following their discharge. Participants were asked process-related questions, inquiring about diabetes education during hospitalization, post-discharge calls from the diabetes navigator, the helpfulness of discharge instructions, the impact of study participation, specific elements in the new discharge summary that were beneficial, aspects that were less helpful, and any missing components. The 30-day post-discharge chart review included ED visits or hospital admissions within 30 days of discharge, and post-discharge follow-up visits. Informed consent and the questionnaire data were collected on paper or directly entered to REDCap [26, 27].

Measures
Demographic characteristics
Demographic characteristics included date of birth, preferred language spoken, place of birth, years in the USA (if applicable), marital status, gender, insurance status, education level, diabetes type, years since diagnosis of diabetes, and comorbid conditions (hypertension, hyperlipidemia, coronary artery disease, obesity, sleep apnea, chronic kidney disease, end-stage renal disease, heart failure, admitted for COVID-19, others).

Primary feasibility outcomes

Primary feasibility outcomes included recruitment and enrollment rates, study retention, and required staffing effort. Recruitment was evaluated by monitoring several key metrics, including the total number of participants identified and subsequently enrolled, those who completed all questionnaires, and those who declined participation. The enrollment rate was calculated by dividing the number of enrolled participants by the duration of recruitment in months and weeks. Study retention was measured at the 30-day follow-up by dividing the number of participants who completed all required questionnaires (at baseline, 30-day follow-up phone call, and 30-day post-discharge questionnaires) by the total number of participants enrolled in the study. To determine the required staffing, we tracked the estimated time spent per study team member on chart review, approaching participants, obtaining informed consent, completing the study questionnaires, and providing discharge instructions.

Participant-centered outcomes

Participant-centered outcomes included ED visits within 30 days post-discharge and unplanned re-admissions within 30 days post-discharge. Additional outcomes included provider post-hospital follow-up visits, the participant's perception of the study process, how the program helped, what aspects worked best, which worked less well, and what was missed. These process-related questions are described in detail above in the Data collection section.

Criteria considered while assessing the success of this pilot study

- 90% or more of participants complete all required questionnaires
- 90% or more of participants did not have ED visits or unplanned re-admissions related to diabetes within 30 days post-discharge.
- 100% of participants with post discharge follow up had a post-hospital follow-up visit within 2 weeks
- 100% of participants with post discharge follow up reported satisfaction with the TOC model

Statistical analysis

For the analysis of primary feasibility outcomes, recruitment was tracked from initial identification through EMR review to the final enrollment of participants. Enrollment metrics, including accrual rates and

adjustments to the timeline, were calculated to assess the study's efficiency. Retention rates were determined by evaluating the number of participants who completed all required questionnaires at baseline and the 30-day post-discharge follow-up. The analysis of key resources involved tracking the estimated time spent by each study team member on various tasks, such as chart review, participant approach, informed consent, questionnaire completion, and providing discharge instructions. This information was crucial for understanding resource utilization and informing potential adjustments for a larger trial.

Participant-centered outcomes were analyzed by summarizing the demographic characteristics of the enrolled participants. Health profiles, including comorbidities and diabetes-related factors, were presented using descriptive statistics. Responses to questions related to health literacy, access to healthcare, social support, and identity were analyzed to identify patterns and challenges.

Re-admissions and follow-up outcomes were assessed by reviewing the 30-day post-discharge data, including ED visits, unplanned hospital re-admissions, and the timing of follow-up visits. Participant satisfaction was analyzed based on feedback obtained during the 30-day post-discharge phone call, focusing on the clarity and helpfulness of discharge instructions and the visual elements of the TOC model.

Descriptive statistics, including means, standard deviations, frequencies, and percentages, were used for summarizing continuous and categorical variables. The absence of ED visits and unplanned re-admissions within the specified timeframe was a key outcome, corroborated by comprehensive EMR reviews.

Results

Primary feasibility outcomes

Recruitment

A total of 154 potential study participants were initially identified through EMR review. After screening for eligibility criteria (Fig. 1), 35 patients met the inclusion criteria. Of these 35 eligible patients, only 17 were approached for study participation due to staffing availability to approach potential participants prior to discharge; 12 consented to enroll in the study, and 5 declined.

Enrollment

The accrual or enrollment rate was 4 participants per month and anywhere from zero to 4 participants per week. The initial timeline to recruit participants was

Esteve *et al. Pilot and Feasibility Studies*   (2024) 10:122

Page 6 of 10

6 months but due to the loss of our study coordinator and funding, this was shortened to 3 months.

Retention

A total of 12 participants completed all baseline questionnaires, and 10 completed the 30-day post-discharge phone call and associated questionnaires. One participant unfortunately died after being discharged from the hospital, and another participant could not be reached for the 30-day post-discharge follow-up.

Key resources

The estimated time to review the chart, approach participants, obtain informed consent, and complete questionnaires was approximately 2 h. The estimated time spent providing discharge instructions was approximately 30 min. There was a total of 4 bilingual staff available to complete each step.

Participant-centered outcomes
Participant demographics

A total of 12 participants were enrolled in the pilot study. The average age of participants was 47 years/old (± 11.6), and the majority identified as male (85%). Participants reported living in the USA for an average of 23 years (± 12). Participants were born in Mexico ($n = 7$), Dominican Republic ($n = 1$), Guatemala ($n = 1$), El Salvador ($n = 1$), and the USA ($n = 2$). Spanish was the preferred spoken language for 82% of participants. Over half (58%) of participants were married or in a relationship. Among the participants in the study, 50% had a high school education, and 58% had no health insurance. Seventy-five percent reported a diagnosis of T2DM, and 25% reported not knowing what type of diabetes they have. Participants reported that it had been on average 4.5 years (± 6.5) since their diabetes diagnosis and that the most prevalent diabetes-related comorbidities included obesity (50%), hypertension (42%), hyperlipidemia (42%), and heart failure (17%) (see Table 1).

Participants were asked multiple questions pertaining to health literacy, access to healthcare, the doctor-patient relationship, social support, identity, and perceived discrimination. Half of the participants ($n = 6$) stated that they needed help with reading instructions or pamphlets pertaining to their health. Additionally, one-third of patients ($n = 4$) stated that they did not have access to a regular clinic for healthcare and could not get their healthcare needs addressed when they needed to in the last 3 months. Regarding their interactions with their doctor, 75% of participants ($n = 9$) felt that they were "equal partners" in the decision-making process "a little"

Table 1 Baseline characteristics of participants enrolled

Variable	Total ($n = 12$)
Age (yr) mean ± SD	47 ± 11.6
Male—no. (%)	11 (85%)
Years in USA mean ± SD	23 years ± 12
Country of origin—no. (%)	
Mexico	7 (58%)
Dominican Republic	1 (8%)
Guatemala	1 (8%)
El Salvador	1 (8%)
USA	2 (17%)
Preferred language spoken (Spanish)—no. (%)	9 (82%)
Marital status—no. (%)	
Married	4 (33%)
Single	2 (17%)
Divorced	2 (17%)
Widow	1 (8%)
Partnership	3 (25%)
Education—no. (%)	
Elementary	3 (25%)
Middle school	2 (17%)
High school	6 (50%)
Vocational	1 (8%)
Number insured—no. (%)	
No insurance	7 (58%)
Insurance	5 (42%)
Diabetes type—no. (%)	
Type 1	0
Type 2	9 (75%)
Unknown	3 (25%)
Years since diagnosis of diabetes ± SD	4.5 ± 6.5
Hypertension—no. (%)	5 (42%)
Hyperlipidemia—no. (%)	5 (42%)
Coronary artery disease—no. (%)	1 (8%)
Obesity—no. (%)	6 (50%)
Sleep apnea—no. (%)	1 (8%)
Chronic kidney disease—no. (%)	1 (8%)
End stage renal disease- no (%)	1 (8%)
Heart failure—no. (%)	2 (17%)
Admitted for COVID—no. (%)	1 (9%)

to "not at all," and over 80% ($n = 10$) did not feel confident that they would be able to follow through on medical treatments recommended for home. Over half of the participants ($n = 7$) did not feel like their provider listened carefully to what they had to say about their health, and 75% of participants ($n = 9$) did not know the indication for their medications. Only half of the participants ($n = 6$) felt that test results were thoroughly explained. Fifty-eight percent ($n = 7$) of participants stated they have a

place that they usually go to when they are sick for health care.

Over 60% of participants ($n=8$) stated that family and friends exercised with them or bought/prepared food that was particularly healthy or recommended only "a little" to "not at all" over the last 3 months. Sixty-seven percent of participants ($n=8$) reported having 2–5 people that can help them during difficult times, including when sick.

Over 90% of participants ($n=11$) did not have a sense of belonging to their ethnic group. Half the participants ($n=6$) felt that they were treated unfairly due to being Hispanic/Latino "at times" or "a little."

Re-admissions and follow-up

Of the 10 participants who completed the 30-day post-discharge phone call, none experienced ED visits or unplanned hospital re-admission within 30 days following their discharge. All had a post-discharge follow-up with a healthcare provider within 2 weeks post-discharge, and 67% had the follow-up within 1 week. To validate our findings, a comprehensive review of the EMR at the 30-day post-discharge mark was performed, including the one participant we could not reach. This review of the EMR confirmed that there were no documented ED visits or unplanned hospital re-admissions post-discharge within any of the local hospitals that we can access via EMR.

Participant satisfaction

All participants who completed the 30-day post-discharge phone call expressed that the provided "discharge instructions were clear and helpful" and "easy to read." Participants specifically highlighted that the instructions "help understand how to take the medications," "help understand more about diabetes," and are "better than those received by the hospital." Regarding the visual aspect of the discharge paperwork, participants noted that "the calendar and photos caught my eyes and the picture on hypoglycemia." One participant stated, "It was hard to determine whom to call," "I saw so many people during the discharge process." Participants felt nothing was missing from the new TOC model.

Discussion

This pilot study successfully achieved its goal of developing and testing a TOC model tailored for self-identified Hispanic/Latino adults with diabetes transitioning from the hospital to the community based on the criteria of success described above in the methods section.

The study was initially designed as a randomized pilot study to compare usual care versus a new transition of care but was subsequently modified to adjust to the realities of a pandemic-impacted healthcare system and research enterprise. Although patient care continued during the pandemic, the "usual care" was no longer the norm [28] because health systems worldwide had to change the usual process and procedures to accommodate the existing demands and overwhelming impact of the pandemic on healthcare systems, including limited bed availability, healthcare professional shortage and increased morbidity and mortality in the population due to COVID-19, particularly for patients with chronic diseases such as diabetes [29].

In our study, we utilized the Plan-Do-Study-Act (PDSA) framework, traditionally employed for system wide improvements [30], to craft a TOC model that adapts to patient, provider, and system preferences. This malleable approach was rooted in the practicality of creating an evidence-based TOC model that could be continually reassessed and adjusted based on patient and provider feedback and changes to the healthcare environment. We recognize that a rigid, one-size-fits-all TOC model might not be optimal, particularly in a changing healthcare landscape. The PDSA framework allows us to test and re-design evidence-based interventions that can be implemented in real-world settings and has been proven beneficial in recent trials such as the Strategies and Opportunities to STOP Colon Cancer in Priory Populations (STOP CRC) trial in 2016.

The COVID-19 pandemic significantly impacted our study, namely the loss of our study coordinator, limiting our ability to reach sample size and achieve our new design goals. Nevertheless, 4 bilingual research team members successfully enrolled 12 participants in our study over an approximate 3-month recruitment period. Extrapolating this accrual rate of 4 participants per month, we estimate that a 4-month recruitment period is needed to reach a target number of 16 participants and a 7- to 15-month recruitment period for a randomized pilot study with 28 to 61 participants. Targeting this sample size would achieve sufficient power to detect a clinically relevant and statistically significant difference in ED visits and re-admission rates between a control group and a TOC model group. There was only 1 participant that was lost to follow-up during the study, so the retention rate was excellent. While the current small sample size restricts our ability to draw definitive conclusions on the impact of our newly developed TOC model on the predefined participant outcomes, our findings provide new information in the limited available literature about the TOC for Hispanic/Latino adult patients with diabetes from hospital to community settings. Our study suggests that a streamlined, patient-centered TOC model featuring bilingual staff can potentially decrease 30-day post-discharge ED visits and unplanned hospital

Esteve *et al. Pilot and Feasibility Studies*   (2024) 10:122

Page 8 of 10

re-admissions. Furthermore, all participants enrolled in our study who completed the 30-day post-discharge phone call and of whom we had access to their medical records met the secondary participant outcomes. Indeed, none visited the ED or were readmitted to the hospital 30 days post-discharge. They also all had hospital follow-up visits with their providers within 2 weeks after discharge.

Our baseline questionnaires further identified critical healthcare concerns within the Hispanic/Latino community. These challenges included limited healthcare access before their hospitalization and issues with health literacy requiring assistance with reading instructions/pamphlets. Participant responses also suggested that a more paternalistic patient-provider relationship characterized their interactions with healthcare providers. Patients reported that they did not feel like "equal partners" in the healthcare relationship. Patients also expressed difficulty comprehending the purpose and effects of their prescribed medications, along with a sense of inadequacy in comprehending their medical test results. Lastly, patients did not feel confident in their ability to implement their medical treatment plans. Addressing these issues is key to the development of a successful TOC model.

In the context of our study, we draw attention to a relevant randomized controlled trial [25] known as the Mi Puente ("My Bridge") Care Transitions Program, which focused on Hispanic/Latino adults dealing with multiple health conditions. Mi Puente results highlighted the critical need for strong connection to outpatient care for participants to improve the transition of care [31].

Prior research highlights the importance of establishing a direct connection with outpatient services and leveraging pharmacist support for an effective discharge program. The Project RED Trial, [32] conducted at a Boston safety net hospital, particularly focused on bridging this gap for the discharge process of low-income Medicaid patients, predominantly of white or black non-Hispanic race. They piloted an "After-hospital care plan" (AHCP) that included critical components, including the reason for hospitalization, a discharge medication list, contact information with a picture of the primary care provider, follow-up guidance, and a calendar labeled with scheduled appointments and tests. Furthermore, a nurse discharge advocate was assigned during inpatient to address any barriers for patients, and a clinical pharmacist conducted telephone medication reviews 2–4 days post-discharge, resulting in a lower rate of hospitalization in the intervention group. Balaban et al. [33] performed a randomized control study at a Boston safety net hospital, demonstrating the benefits of having a primary "medical home" within the same healthcare system and

timely outpatient follow-up to reduce re-hospitalization. Notably, 40% of participants in the intervention group were non-English speakers. Coleman et al. demonstrated the importance of incorporating the family caregiver to the Care Transitions Intervention (CTI) to avoid re-hospitalization [34]. In our study, over 60% of our participants identified the lack of social support from family/friends about diet and exercise routine changes.

Overall, multiple systematic reviews [35–38] have shown beneficial effects of TOC interventions, but these have been performed on smaller sample sizes and not always consistent. To date, there is no clear consensus on the "critical ingredients" required for a successful TOC model. However, the most effective interventions appear to have focused on multiple aspects of the care transition and targeted the outpatient care follow-up and access, a key component of our proposed TOC model.

This TOC model, therefore, has potential for success but requires resources. We have demonstrated the need for a culturally sensitive and applicable TOC model for the Hispanic/Latino population with higher rates of diabetes, diabetes-related complications, and hospital admissions related to diabetes. Patients and providers have stated that an EMR-generated discharge summary with simple language, visual cues, and essential information, including discharge diagnosis, medications, and follow-up appointments is most helpful. A close link to outpatient healthcare and community organizations is essential to avoid any breakdown in transition.

It is important to acknowledge that our study was conducted in an urban setting with established community outpatient clinics with Spanish-speaking providers. This model may not be applicable to more rural centers or communities lacking these resources and infrastructure.

In the future, we envision testing this TOC model on a larger scale by implementing systematic changes that enhance the delivery of patient-centered discharge instructions to Hispanic/Latino patients. We would conduct a second pilot study with a larger sample size, which would enable us to detect clinical and statistically significant differences between groups and complete multiple PDSA cycles. Further, this TOC model requires additional changes and modifications, including further refinement of the summary, prototype testing for Hispanics/Latinos from different heritage backgrounds, and refining the implementation and incorporation into existing hospital processes and procedures. Additionally, and most importantly, it requires key resources for successful implementation and testing in a larger study that include a minimum of 4 bilingual staff with dedicated and funded research time as well as the involvement of Electronic Medical Record (EMR) experts and hospital staff and

leadership for the integration of the TOC model into the existing system and discharge process. After completion of this larger pilot study, we would move onto a full cluster randomized controlled trial directly comparing clinical outcomes in the control group versus the TOC model group.

Conclusions

It is feasible to implement a patient-centered and culturally competent transition of care (TOC) model for Hispanic/Latino adults with diabetes discharged from the hospital to the community but requires a recruitment period of at least 4 months and ideally 7 to 15 months to reach a statistically significant sample size. Our current study clearly demonstrates the potential for reducing 30-day ED visits or hospital re-admissions related to diabetes among the Hispanic/Latino population. These findings are attributed to the model's core components, which include diligent post-discharge follow-up and providing a culturally appropriate and adaptable discharge summary.

Abbreviations

ADA	American Diabetes Association
AHCP	After-hospital care plan
CTI	Care transitions intervention
ED	Emergency department
EMR	Electronic Medical Record
ITC	Ideal transitions in care
LOS	Length of stay
RED	Reengineered discharge
REDCap	Research Electronic Data Capture
SILS	Single item Literacy Screener
SIMSS	Single-Item Measure of Social Support
STOP CRC	Strategies and Opportunities to Stop Colorectal Cancer in Priority Populations
T2DM	Type 2 diabetes mellitus
TOC	Transitions of care
USA	United States of America

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s40814-024-01534-z.

Additional file 1.

Additional file 2.

Availability of data and materials

All data generated or analyzed during this study are available upon formal request.

Declarations

Ethics approval and consent to participate

The study is approved by the Duke University Health System Institutional Review Board (IRB). The study is registered on the United States National Institutes of Health Clinical Trials Registry (ClinicalTrials.gov identifier NCT04864639), available online at https://classic.clinicaltrials.gov/ct2/show/NCT04864639?term=NCT04864639&draw=2&rank=1.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

Author details

[1]Department of Medicine, Division of Endocrinology, Metabolism, and Nutrition, Duke University School of Medicine, Durham, NC, USA. [2]Duke University School of Nursing, Durham, NC, USA. [3]Department of Population Health Sciences, Duke University School of Medicine, Durham, NC, USA. [4]Departments of Medicine & Public Health Sciences, Division of Endocrinology, Diabetes and Metabolism, Penn State College of Medicine, Hershey, PA, USA.

References

1. Khan MAB, Hashim MJ, King JK, Govender RD, Mustafa H, Al KJ. Epidemiology of type 2 diabetes - global burden of disease and forecasted trends. J Epidemiol Glob Health. 2020;10(1):107–11. https://doi.org/10.2991/jegh.k.191028.001.
2. International Diabetes Federation Diabetes Atlas, 10th Edition Report 2021. https://diabetesatlas.org. Accessed 15 Oct 2023.
3. Centers for Disease Control and Prevention, National Diabetes Statistics Report 2020. https://www.cdc.gov/diabetes/data/statistics/statistics-report.html. Accessed 18 Sept 2023.
4. Schneiderman N, Llabre M, Cowie CC, Barnhart J, Carnethon M, Gallo LC, Giachello AL, Heiss G, Kaplan RC, LaVange LM, Teng Y, Villa-Caballero L, Avilés-Santa ML. Prevalence of diabetes among Hispanics/Latinos from diverse backgrounds: the Hispanic Community Health Study/Study of Latinos (HCHS/SOL). Diabetes Care. 2014;37(8):2233–9. https://doi.org/10.2337/dc13-2939.
5. Ali MK, McKeever Bullard K, Imperatore G, Barker L, Gregg EW. Characteristics associated with poor glycemic control among adults with self-reported diagnosed diabetes—National Health and Nutrition Examination Survey, United States, 2007–2010. MMWR Suppl. 2012;61:32–7.

Esteve *et al. Pilot and Feasibility Studies*   (2024) 10:122

Page 10 of 10

6.   Engelgau MM, Geiss LS, Saaddine JB, Boyle JP, Bengamin SM, Gregg EW, Tierney EF, Rios-Burrows N, Mokdad AH, Ford ES, Imperatore G, Narayan KM. The evolving diabetes burden in the United States. Ann Intern Med. 2004;140(11):945–50.
7.   Parker ED, Lin J, Mahoney T, Ume N, Yang G, Gabbay RA, ElSayed NA, Bannuru RR. Economic costs of diabetes in the U.S. in 2022. Diabetes Care. 2023;dci230085. https://doi.org/10.2337/dci23-0085
8.   Ostling S, Wyckoff J, Ciarkowski SL, et al. The relationship between diabetes mellitus and 30-day readmission rates. Clin Diabetes Endocrinol. 2017;22(3):3.
9.   Friedman B, Jiang HJ, Elixhauser A. Costly hospital readmissions and complex chronic illness. Inquiry. 2008;45(4):408–21. https://doi.org/10.5034/inquiryjrnl_45.04.408. 2009 Winter.
10. Rodriguez-Guiterrez R, Herron J, Lipska J, et al. Racial and ethnic differ-ences in 30-day hospital readmissions among US adults with diabetes. JAMA. 2019;2(10):e1913249. https://doi.org/10.1001/jamanetworkopen 2019.13249.
11. Uppal TS, Chehal PK, Fernandes G, et al. Trends and variations in emer-gency department use associated with diabetes in the US by sociode-mographic factors, 2008–2017. JAMA Netw Open. 2022;5(5):e2213867. https://doi.org/10.1001/jamanetworkopen.2022.13867.
12. Arksey H, O'Malley L. Scoping studies: towards a methodological frame-work. Int J Soc Res Methodol. 2005;8:19–32. https://doi.org/10.1080/1364557032000119616.
13. Chande AT, Rishishwar L, Conley AB, Valderrama-Aguirre A, Medina-Rivas MA, Jordan IK. Ancestry effects on type 2 diabetes genetic risk inference in Hispanic/Latino populations. BMC Med Genet. 2020;21:132.
14. Escarce JJ, Kapur K. ccess to and quality of health care. Hispanics and the Future of America. Washington D.C: National Academies Press; 2006. Tienda M, Mitchell F (ed).
15. Vidal TM, Williams CA, Ramoutar UD, et al. Type 2 diabetes mellitus in Latinx populations in the United States: a culturally relevant literature review. Cureus. 2022;14(3):e23173. https://doi.org/10.7759/cureus.23173.
16. Cartwright K. Social determinants of the Latinx diabetes health dispar-ity: a Oaxaca-Blinder decomposition analysis. SSM - Popul Health. 2021;15:100869. https://doi.org/10.1016/j.ssmph.2021.100869.
17. American Diabetes Association. Standards of medical care in dia-betes—2022 abridged for primary care providers. Clin Diabetes. 2022;40(1):10–38. https://doi.org/10.2337/cd22-as01.
18. Cook CM, Seifert KM, Hull BP, et al. Inpatient to outpatient transfer of diabetes care: planning for an effective hospital discharge. Endocr Pract. 2009;15(3):263–9. https://doi.org/10.4158/ep.15.3.263.
19. Black RL, Duval C. Diabetes discharge planning and transitions of care: a focused review. Curr Diabetes Rev. 2019;15(2):111–7. https://doi.org/10.2174/1573399814666180711120830.
20. Corsino L, Padilla BI. A transition of care model from hospital to commu-nity for Hispanic/Latino adult patients with diabetes: design and rationale for a pilot study. Research Square; 2022. https://doi.org/10.21203/rs.3.rs-1355870/v1.
21. Taylor MJ, McNicholas C, Nicolay C, et al. Systematic review of the applica-tion of the plan–do–study–act method to improve quality in healthcare. BMJ Qual Saf. 2014;23:290–8.
22. Blake RL, et al. A single-item measure of social supports as a predictor of morbidity. J Fam Pract. 1986;22(1):82–4.
23. Morris NS, MacLean CD, Chew LD, et al. The single item literacy screener: evaluation of a brief instrument to identify limited reading ability. BMC Fam Pract. 2006;7:21. https://doi.org/10.1186/1471-2296-7-21.
24. Sorlie PD, Avilés-Santa LM, Wassertheil-Smoller S, Kaplan RC, Daviglus ML, Giachello AL, et al. Design and implementation of the Hispanic Com-munity Health Study/Study of Latinos. Ann Epidemiol. 2010;20(8):629–41.
25. Gallo LC, Fortmann AL, Clark TL, Roesch SC, Bravin JI, Spierling Bagsic SR, Sandoval H, Savin KL, Gilmer T, Talavera GA, Philis-Tsimikas A. Mi Puente (My Bridge) care transitions program for Hispanic/Latino adults with multimorbidity: results of a randomized controlled trial. J Gen Intern Med. 2023;38(9):2098–106. https://doi.org/10.1007/s11606-022-08006-1.
26. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap) – a metadata-driven methodology and workflow process for providing translational research informatics sup-port. J Biomed Inform. 2009;42(2):377–81.
27. Harris PA, Taylor R, Minor BL, Elliott V, Fernandez M, O'Neal L, McLeod L, Delacqua G, Delacqua F, Kirby J, Duda SN. REDCap Consortium, The

REDCap consortium: building an international community of software partners. J Biomed Inform. 2019. https://doi.org/10.1016/j.jbi.2019.103208.
28. Huggins A, Husaini M, Wang F, Waken RJ, Epstein AM, Orav EJ, Joynt Mad-dox KE. Care disruption during COVID-19: a national survey of hospital leaders. J Gen Intern Med. 2023;38(5):1232–8. https://doi.org/10.1007/s11606-022-08002-5.
29. Muniyappa R, Gubbi S. COVID-19 pandemic, coronaviruses, and diabetes mellitus. Am J Physiol Endocrinol Metab. 2020;318(5):E736-e741. https://doi.org/10.1152/ajpendo.00124.2020.
30. Coury J, Schneider JL, Rivelli JS, Petrik AF, Seibel E, D'Agostini B, Taplin SH, Green BB, Coronado GD. Applying the Plan-Do-Study-Act (PDSA) approach to a large pragmatic study involving safety net clinics. BMC Health Serv Res. 2017;17(1):411. https://doi.org/10.1186/s12913-017-2364-3.
31. Burke RE, Guo R, Prochazka AV, Misky GJ. Identifying keys to success in reducing readmissions using the ideal transitions in care framework. BMC Health Serv Res. 2014;14:423. https://doi.org/10.1186/1472-6963-14-423.
32. Jack BW, Chetty VK, Anthony D, Greenwald JL, Sanchez GM, Johnson AE, et al. A reengineered hospital discharge program to decrease rehospi-talization. Ann Intern Med. 2009;150(3):178–87. https://doi.org/10.7326/0003-4819-150-3-200902030-00007.
33. Balaban RB, Weissman JS, Samuel PA, Woolhandler S. Redefining and redesigning hospital discharge to enhance patient care: a randomized controlled study. J Gen Intern Med. 2008;23(8):1228–33. https://doi.org/10.1007/s11606-008-0618-9.
34. Coleman EA, Roman SP, Hall KA, Min SJ. Enhancing the care transitions intervention protocol to better address the needs of family caregivers. J Healthc Qual. 2015;37(1):2–11.
35. Gonçalves-Bradley DC, Lannin NA, Clemson L, Cameron ID, Shepperd S. Discharge planning from hospital. Cochrane Database of Syst Rev. 2022;2:CD000313. https://doi.org/10.1002/14651858.CD000313.pub6.
36. Mabire C, Dwyer A, Garnier A, Pellet J. Effectiveness of nursing discharge planning interventions on health-related outcomes in discharged elderly inpatients: a systematic review. JBI Database Syst Rev Implement Rep. 2016;14(9):217–60. https://doi.org/10.11124/jbisrir-2016-003085.
37. Straßner C, Hoffmann M, Forstner J, Roth C, Szecsenyi J, Wensing M. Interventions to improve hospital admission and discharge manage-ment: an umbrella review of systematic reviews. Qual Manag Health Care. 2020;29(2):67–75. https://doi.org/10.1097/qmh.0000000000000244.
38. Hansen LO, Young RS, Hinami K, Leung A, Williams MV. Interventions to reduce 30-day rehospitalization: a systematic review. Ann Intern Med. 2011;155(8):520–8. https://doi.org/10.7326/0003-4819-155-8-201110180-00008.

Publisher's Note