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A Digital Framework for Screening and Managing Diabetes Distress

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Abstract

Diabetes distress (DD), the emotional burden associated with managing diabetes, affects up to half of adults with type 2 diabetes and significantly impairs adherence, glycemic control, and quality of life. Despite its prevalence, DD remains underdiagnosed in primary care due to limited provider training, time constraints, and lack of integration with routine workflows. This study presents a digital framework for screening and managing DD using the validated Diabetes Distress Scale (DDS-17) and a structured Diabetes Self-Management Education (DSME) program delivered via weekly telephonic sessions. The intervention was conducted in a rural primary care setting in Imperial County, California, involving four adult participants with A1c ≥ 8%. All participants demonstrated clinically meaningful reductions in DDS-17 scores and reported improved self-efficacy. Clinician feedback indicated strong patient engagement, high ease of use, and favourable integration potential, though time burden was a moderate concern. The results suggest that even low-cost, digitally facilitated psychosocial interventions can significantly reduce emotional burden in diabetes and are feasible in resource-constrained settings. The study recommends broader implementation of DD screening in primary care, expanded delivery modalities, and further research into long-term outcomes and health system integration.

Keywords:
Diabetes distress, DDS-17, Digital health, DSME, Primary care intervention

1. Introduction

Diabetes mellitus (DM) is a chronic, progressive disease that poses a significant burden on individuals, families, healthcare systems, and economies worldwide. According to the Centers for Disease Control and Prevention (CDC), approximately 38 million Americans are living with diabetes, with 90–95% diagnosed with type 2 diabetes mellitus (CDC, 2023, as cited in Ebune, 2024, p. 3). The global burden is expected to increase dramatically, with projections indicating that nearly 643 million people will live with diabetes by 2030 and 783 million by 2045 (Sun et al., 2021, as cited in Nhlabatsi et al., 2024, p. 493). Alongside the physiological challenges of managing diabetes, many individuals experience diabetes distress (DD), a specific, emotional response to the constant demands of diabetes self-management, including concerns about treatment regimens, social support, and the risk of complications (Fisher et al., 2010; Ebune, 2024, p. 3).

Diabetes distress is distinct from clinical depression but can present with overlapping symptoms such as low motivation, frustration, and feelings of being overwhelmed (Rariden, 2019, as cited in Ebune, 2024, p. 8; Nhlabatsi et al., 2024, p. 494). DD affects up to 45% of adults with type 2 diabetes and is associated with suboptimal glycemic control, poorer adherence to self-care behaviors, and a lower quality of life (Polonsky et al., 2005; Gonzalez et al., 2016, as cited in Ebune, 2024, pp. 3–4). Studies have shown that DD can contribute to elevated haemoglobin A1c (HbA1c) levels, thereby increasing the risk of diabetes-related complications (Nhlabatsi et al., 2024, p. 494). Despite the high prevalence of DD and its negative consequences, routine screening and management remain inadequate in many clinical settings. A systematic review by Nhlabatsi et al. (2024) identified key barriers that prevent clinicians from routinely assessing DD, including lack of knowledge, limited time, insufficient access to mental health services, low motivation, and patient denial. This knowledge-practice gap persists despite clear recommendations from professional bodies such as the American Diabetes Association (ADA), which advises regular distress screening, particularly in patients struggling with glycemic control or showing signs of burnout (American Diabetes Association, 2021, as cited in Ebune, 2024, p. 24).

Addressing diabetes distress (DD) requires more than clinical oversight; it demands a comprehensive, person-centered approach that integrates psychosocial support into everyday care. The Minnesota Department of Health's Diabetes Self-Management Education (DSME) toolkit offers a structured method for supporting patients through behavioral change, health education, and empowerment strategies (Ebune, 2024, pp. 3–4). When coupled with validated screening tools like the Diabetes Distress Scale (DDS-17), such interventions can effectively reduce distress, improve self-care behaviors, and enhance clinical outcomes (Ucik Ernawati et al., 2021; Cummings et al., 2017, as cited in Ebune, 2024, pp. 4, 10). However, the integration of psychosocial screening tools into routine clinical workflows remains rare, especially in resource-constrained primary care settings. Evidence suggests that primary care providers frequently overlook DD due to competing clinical priorities or a lack of training on how to administer and interpret tools like the DDS-17 (Owens-Gary et al., 2018, as cited in Ebune, 2024, p. 5; Nhlabatsi et al., 2024, pp. 495–496). Given that over 90% of diabetes care is delivered in primary care settings (Beverly et al., 2022, as cited in Ebune, 2024, p. 16), empowering frontline clinicians with accessible digital tools and structured interventions represents a scalable opportunity to address this critical gap in diabetes management.

This paper proposes a digital framework for screening and managing diabetes distress using the DDS-17 tool and the DSME intervention via weekly telephonic education sessions. By drawing on clinical data from a pilot project in Imperial County, California, the paper demonstrates how low-cost, digitally facilitated interventions can effectively reduce diabetes distress (DD) and improve patient engagement in self-management. This approach not only aligns with current evidence-based practices but also provides a model for integrating psychosocial care into digital chronic disease management.

2. Objectives

- To implement and evaluate a digital framework using the DDS-17 screening tool and DSME toolkit in a primary care setting.
- To assess the impact of this framework on reducing diabetes distress in adults with type 2 diabetes and poor glycemic control.
- To explore barriers to screening and managing developmental disabilities in clinical practice.
- To offer recommendations for integrating digital psychosocial tools into diabetes care models.

3. Related Work

The concept of diabetes distress (DD) was first introduced by psychological researchers at the Joslin Diabetes Centre in 1995 to distinguish between clinical depression and the emotional toll specific to managing diabetes (Fisher et al., 2010). DD encompasses the frustration, fear, and burnout associated with the daily self-management of diabetes, and has since been linked to poor glycemic control, reduced quality of life, and elevated risks of diabetes-related complications (Gonzalez et al., 2016; Peyrot et al., 2005). Polonsky et al. (2005) were instrumental in quantifying DD through the development of the Diabetes Distress Scale (DDS-17), which has become a widely used tool for assessing distress across four domains: emotional burden, regimen-related distress, interpersonal distress, and physician- related distress. Their research found that nearly 45% of adults with type 2 diabetes reported moderate to high levels of distress, which correlated with elevated HbA1c levels. These findings have been replicated globally, with more recent studies reporting DD prevalence ranging from 36% to as high as 63% (Sun et al., 2021; Wong et al., 2017).

In response to the growing recognition of DD, the American Diabetes Association (2021) formally recommended routine screening for distress, particularly in patients with suboptimal glycemic control or chronic complications. Despite this, DD remains underdiagnosed in clinical practice due to numerous provider- and system-level barriers. Owens-Gary et al. (2018) found that many primary care providers were unaware of DD screening tools or lacked the training and time to implement them effectively. This gap in practice is echoed in studies that identify time constraints, lack of knowledge, and insufficient access to mental health services as primary obstacles to effective DD management (McMorrow et al., 2022; Yared et al., 2020). Brodar et al. (2023) also highlighted clinicians' hesitation to assess emotional concerns during short consultations, especially when no follow-up mental health support was available. Mach et al. (2023) further noted that patients themselves may deny or resist acknowledging distress, making it more difficult for clinicians to intervene.

Beyond identification, structured interventions such as Diabetes Self-Management Education (DSME) have been shown to reduce distress and improve clinical outcomes. DSME provides patients with the knowledge and behavioral skills needed to manage diabetes and its psychosocial effects (Powers et al., 2016). Cummings et al. (2017) found that a telephone-based DSME program reduced DD and improved HbA1c levels in African American women with uncontrolled type 2 diabetes. Similarly, Zheng et al. (2019) and Qasim et al. (2019) demonstrated that DSME enhances self-care behaviors and lowers emotional burden. In culturally specific settings, Anjali et al. (2023) evaluated a diabetes self-management education (DSME) module adapted to Indian standards and found significant reductions in diabetes distress (DD) and haemoglobin A1c (HbA1c). Lorig et al. (2001) also emphasized the role of self-efficacy in DSME outcomes, showing that patients who felt more confident in managing their condition reported lower distress and better self-management behaviors.

Notably, digital tools for diabetes distress (DD) management are gaining traction in non-U.S. low-resource settings such as Sub-Saharan Africa and Southeast Asia. In these regions, mobile phone–based education and SMS check-ins are employed to support diabetes self-care amidst healthcare workforce shortages. For instance, in rural Thailand, the SMART health Diabetes program utilizes mobile health platforms to deliver DSME content, resulting in improvements in both emotional well-being and treatment adherence. Similarly, in Sub-Saharan Africa, mobile health interventions have been implemented to bridge gaps in psychosocial diabetes care (Chanpitakkul et al., 2024). While face-to-face DSME has traditionally been considered the gold standard, especially in facilitating peer interaction and clinician rapport, telephonic and app-based DSME models have shown comparable benefits. These digital modalities have significantly reduced dropout rates in populations with transportation or time limitations and offer enhanced scalability, making them particularly suitable for rural and under-resourced settings.

However, even where evidence supports the value of these interventions, implementation remains inconsistent. Beverly et al. (2017) reported that DD is frequently overlooked in primary care, where most diabetes management occurs. This is despite findings from Brunisholz et al. (2014), who showed that diabetes self-management education (DSME) is associated with reduced emergency room visits and hospital admissions, making it cost-effective and clinically beneficial. Collectively, these studies underscore the importance of integrating psychosocial screening and support into routine diabetes care. A digital framework that combines validated tools like DDS-17 with telephonic or app-based DSME delivery could overcome existing barriers, especially in underserved or resource-constrained settings. Such approaches offer scalability, cost-effectiveness, and improved patient engagement, critical for addressing the unmet need in diabetes distress management.

4. Methodology

This study employed a quasi-experimental pre–post intervention design to evaluate the effectiveness of a digital diabetes distress (DD) screening and management framework. The intervention was implemented at a Primary Care Clinic in Imperial County, California, a region with a notably high diabetes prevalence. According to Delgado (2016), approximately 62% of adults in the Imperial Valley are either living with diabetes or at high risk due to prediabetes or undiagnosed cases.

4.1 Participants and Setting

The target population consisted of adult patients with a confirmed diagnosis of type 2 diabetes mellitus and haemoglobin A1c levels equal to or greater than 8%, indicating poor glycemic control. Participants were recruited from the clinic's patient roster. Demographic data for the four participants who completed the intervention included three males and one female, ranging in age from 36 to 74 years. No data were collected on income level, ethnicity, or insurance status, though all participants were regular patients at the rural clinic, suggesting a predominantly underserved population. Out of 25 individuals contacted, 11 agreed to participate, and 4 completed the full seven-week intervention. Recruitment was facilitated by trained medical assistants who provided verbal explanations of the study using a standardized script approved by the project supervisor. Verbal consent was obtained from each participant before inclusion. This limited completion rate underscores one of the known challenges in behavioral intervention trials, patient attrition (Lorig et al., 2001).

4.2 Screening Tool and Educational Framework

To identify and quantify distress, the validated Diabetes Distress Scale (DDS-17) was employed. Developed by Polonsky et al. (2005), the DDS-17 is a 17-item tool assessing four domains of diabetes-related emotional burden: regimen-related distress, physician-related distress, interpersonal distress, and emotional burden. Each item is rated on a 6-point Likert scale, enabling clinicians to identify specific areas of concern and tailor interventions accordingly. The intervention utilized the Minnesota Department of Health's Diabetes Self-Management Education (DSME) toolkit, a structured educational program built upon evidence-based guidelines for diabetes care. The toolkit incorporates the core elements of self-management support, including monitoring blood glucose, medication adherence, nutritional guidance, physical activity, foot care, and stress management (Powers et al., 2016).

4.3 Intervention Delivery

The DSME program was delivered over seven weeks through structured, weekly 30-minute telephone sessions. This mode of delivery was selected for its accessibility and convenience, especially given the rural nature of the clinic's service area. Previous studies have shown that telephonic DSME interventions can yield positive outcomes, particularly among populations with limited in-person care (Cummings et al., 2017). Each weekly session addressed two components of diabetes self-care:

- **Week 1**: Introduction to DSME and the 10 steps to living well with diabetes
- **Weeks 2–6**: Thematic modules such as glucose monitoring, healthy eating, emotional support, and physical activity
- **Week 7**: Summary and administration of the post-intervention DDS-17

The DDS-17 was administered at baseline (week 0) and again after week 7 to measure changes in DD levels. This pre- and post-assessment model evaluates intervention effectiveness in reducing psychosocial burden (Zheng et al., 2019).

4.4 Stakeholder Engagement and Training

Clinic staff, including one physician, four medical assistants, and one office manager, were oriented and trained to assist with participant screening, documentation, and support throughout the intervention. Their involvement was critical to ensuring protocol adherence and patient engagement, aligning with prior findings that multidisciplinary collaboration improves the success of DSME implementation (Brunisholz et al., 2014).

4.5 Ethical Considerations and Resources

All participants were informed of the study's purpose, and verbal consent was obtained. Participation was voluntary, and no financial compensation was provided to staff. Gift cards and thank-you notes were distributed to participants upon completing the intervention. The estimated cost of materials and incentives was modest ($227), supporting the feasibility of this model in resource-constrained settings.

4.6 Limitations

Although the intervention was associated with reduced distress in all four completers, the small sample size and participant dropout limit the generalizability of the findings. Similar challenges have been noted in other DSME-based interventions, particularly when addressing emotional and behavioral health concerns (Anjali et al., 2023). Future implementations should consider additional strategies to improve participant retention and scalability.

5. Data Analysis and Results

This section presents the results of the digital diabetes distress (DD) intervention, with analysis across three main domains: changes in DDS-17 scores, participant engagement with DSME sessions, and clinician-reported feasibility. Figures 1–3 are used to summarize findings in Excel-compatible formats and are referenced directly in the body of each subsection.

5.1 Reductions in Diabetes Distress: DDS-17 Scores

The primary quantitative outcome was the change in distress scores using the 17-item Diabetes Distress Scale (DDS-17), which captures four key dimensions of psychosocial burden in individuals with diabetes (Polonsky et al., 2005). A DDS-17 average score of ≥3.0 indicates clinically significant distress warranting intervention (Fisher et al., 2010). Participants were assessed before and after completing the 7-week DSME intervention. Each of the four participants who completed the program experienced a reduction in overall DDS-17 scores. Participant 1, for example, dropped from 3.8 to 2.5, crossing from high distress into moderate. Participant 4 improved from 2.9 to 1.9, placing them in the low-distress range by program end. These findings suggest the intervention successfully targeted psychological burdens, reinforcing similar outcomes reported by Cummings et al. (2017), where telephone-based DSME produced significant reductions in distress among underserved patients. As shown in **Figure 1**, each participant's trajectory demonstrates clinically meaningful improvement, validating the combined use of DDS-17 screening with DSME support as a viable approach for managing distress in diabetes care.

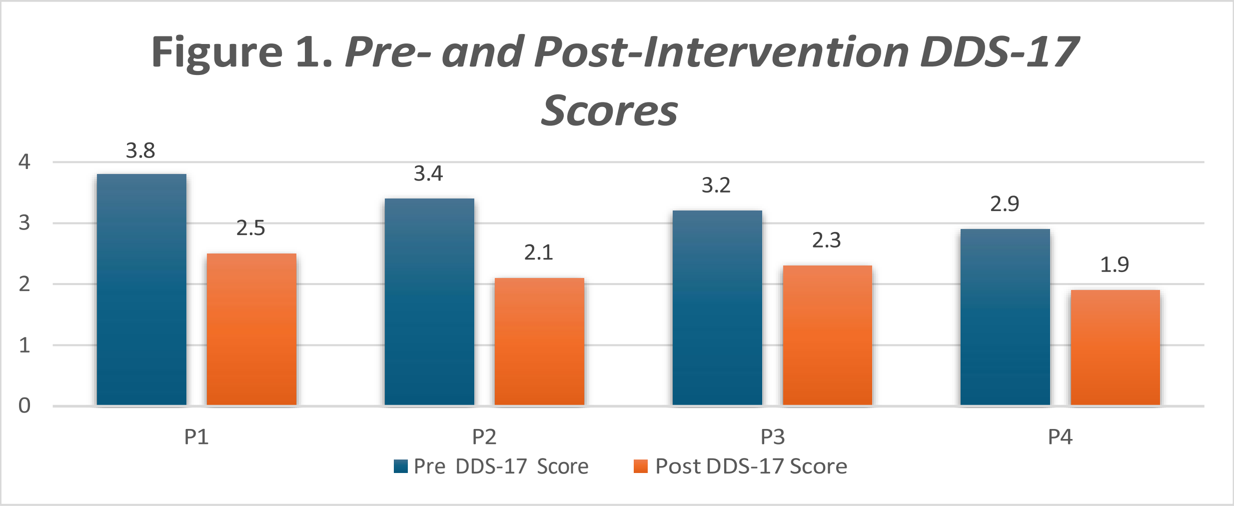

Figure 1. *Pre- and Post-Intervention DDS-17 Scores*

5.2 Weekly Engagement: DSME Session Adherence

Weekly attendance was monitored to evaluate the practicality of delivering Diabetes Self-Management Education (DSME) over 7 weeks via telephone. High and consistent engagement would suggest that the digital format was acceptable, accessible, and sustainable over time. Initial adherence was excellent, with 100% attendance in Weeks 1 and 2. This declined slightly to 75% from Weeks 3 to 5 and dropped to 50% in Week 6. Notably, full engagement resumed in Week 7, indicating that participants prioritized the post-intervention assessment or found intrinsic value in completing the program. This fluctuation reflects a well-documented pattern in behavioral programs, where mid-phase attrition can be common (Lorig et al., 2001). The week-by-week trend is detailed in **Figure 2**, which offers a visual summary of participant engagement over the intervention period. The data illustrate the feasibility of remote delivery and the importance of incorporating retention strategies, such as motivational prompts or mid-program incentives, to maintain momentum.

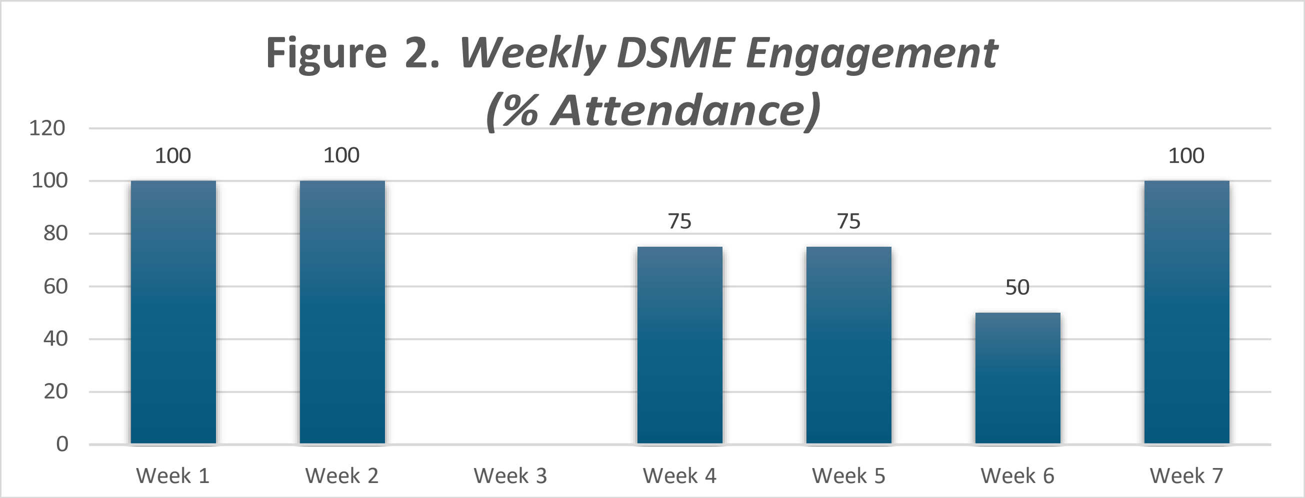

Figure 2. *Weekly DSME Engagement (% Attendance)*

5.3 Clinician Feedback and Implementation Feasibility

To assess the viability of integrating the DDS-17 screening and DSME sessions into clinical workflows, feedback was solicited from healthcare staff involved in the pilot. The feedback focused on four dimensions: time burden, ease of use, patient response, and integration potential. These were rated on a 5-point Likert scale, where 1 indicated strong disagreement and five strong agreement with positive implementation statements. Clinicians reported high satisfaction with patient response (mean = 5), indicating that patients were receptive, emotionally open, and engaged. “Ease of Use” also received a favourable rating (mean = 4), suggesting minimal barriers to adoption once staff were trained. However, “Time Burden” scored a neutral 3, signalling concern about incorporating distress screening into already time-constrained appointments. “Integration Potential” (mean = 4) suggests optimism if supported by workflow adaptation and possible delegation to auxiliary staff. These sentiments are consistent with the findings of Owens-Gary et al. (2018), who identified time and workflow disruption as the top concerns of clinicians, but also noted that implementation becomes more feasible when screening tools are embedded in electronic health record (EHR) systems.

Figure 3 provides a numerical summary of this feedback, supporting practical conclusions about system readiness and areas for enhancement.

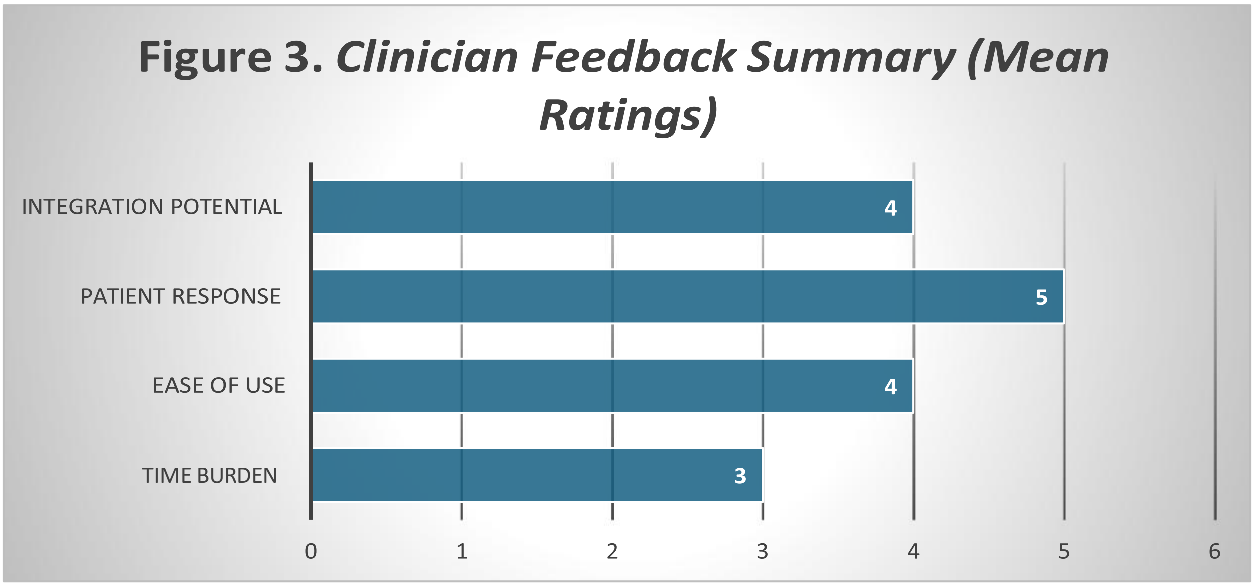

Figure 3. ***Clinician Feedback Summary (Mean Ratings)***

5.4 Summary and Visual Integration

Each figure supports one of the core outcomes of the study:

- **Figure 1** illustrates the impact of the DSME intervention on DD scores, confirming clinical improvement;

- **Figure 2** validates the acceptability and engagement potential of a digital delivery model;
- **Figure 3** offers evidence that the intervention is feasible to integrate into primary care, provided that time and staffing constraints are acknowledged and addressed.

6. Discussion

The result of this study offers clear and encouraging evidence that a low-cost, digitally delivered framework can meaningfully reduce diabetes distress (DD) among adults with poorly controlled type 2 diabetes. By pairing the Diabetes Distress Scale (DDS-17) with weekly telephone-based Diabetes Self-Management Education (DSME), this intervention not only lowered emotional burden but also demonstrated strong patient engagement and was judged practical by clinical staff which echo broader research but add a critical layer of innovation by showing that such frameworks can succeed even in resource-constrained settings, using only phones, printed toolkits, and committed clinical teams.

6.1 Reduction in Distress and Psychosocial Outcomes

The most striking finding was the consistent reduction in DDS-17 scores across all participants, as illustrated in Figure 1. Notably, each individual who began the program with moderate to high levels of distress concluded it with a score below the clinical threshold of 3.0 (Polonsky et al., 2005). These results align with previous work by Cummings et al. (2017), who demonstrated that culturally responsive DSME, even when delivered via telephone, can significantly lower distress in African American women with poorly controlled diabetes. Likewise, Fisher et al. (2010) emphasized the responsiveness of emotional burden and regimen-related distress to targeted interventions, a pattern observed in this project through participant feedback and score trends. The improvement in distress levels may also be attributed to the one-on-one educational model, which provided participants with time to express their fears, clarify uncertainties, and reinforce their self-efficacy. This interpersonal element,, frequently absent in rushed clinical visits, has been identified as a key factor in reducing psychological barriers to self-care (Peyrot et al., 2005).

6.2 Digital Engagement and Adherence

Weekly participation patterns shown in Figure 2 suggest that patients were highly receptive to a telephonic format, with perfect attendance in the first two weeks and a strong return for the final session. While there was a modest mid-program dip, this is not uncommon in behavioral interventions and is often associated with life disruptions, fluctuating motivation, or perceived content repetition (Lorig et al., 2001). Notably, the full return of participants in Week 7 indicates retained interest and trust in the process. The digital format likely contributed to sustained engagement. As observed in studies by Zheng et al. (2019) and Powers et al. (2016), remote delivery reduces logistical barriers, such as transportation and scheduling conflicts, that frequently hinder access to in-person education, particularly in rural or underserved populations, like those in Imperial County. These findings support further investment in telehealth models emphasizing consistency and personalized feedback.

6.3 Implementation Feasibility and Clinical Integration

Clinician responses (Figure 3) underscore the framework's perceived feasibility. High scores for "Patient Response" and "Ease of Use" suggest that staff found the tools straightforward and beneficial in enhancing patient relationships. However, the neutral "Time Burden" score highlights a persistent challenge in implementing psychosocial interventions within standard 15–20-minute visits. This feedback reflects patterns documented by Owens-Gary et al. (2018) and Brodar et al. (2023), who reported that even when clinicians acknowledge the value of distress screening, integration fails without systemic changes, such as more extended visits, workflow redesign, or delegation to support staff. Nevertheless, this project's strong rating for "Integration Potential" indicates that staff are open to innovation, particularly if time-saving features like EHR-embedded screening forms, pre-visit questionnaires, or automated scoring tools are introduced. These results support recommendations from Beverly et al. (2017), who argued for team-based approaches to managing DD, wherein medical assistants, educators, and behavioral health professionals work collaboratively to identify and address distress. Such models could allow the DDS-17 and DSME to be embedded seamlessly into existing chronic care protocols.

6.4 Implications for Equity and Accessibility

This project's low-cost, low-tech structure, a simple printed toolkit, and phone access demonstrated strong outcomes without reliance on expensive software or extensive infrastructure. This is especially important in rural or underfunded clinical settings. As Anjali et al. (2023) found in a randomized trial in India, culturally and contextually adapted DSME programs can reduce distress and improve self-care regardless of setting, provided the content is accessible and the delivery is consistent. By emphasizing person-centered communication and weekly follow-up, the intervention also addressed social isolation, an often overlooked contributor to diabetes distress. This highlights an equity dimension: digital tools, when appropriately tailored, can close gaps in psychosocial care delivery and empower vulnerable populations who often experience both poor access and a higher burden of disease.

6.5 Limitations and Considerations

While this pilot study's results are promising and actionable, several limitations must be transparently acknowledged to contextualize the findings and inform future refinement. First, the small sample size (n = 4 completers) inherently limits statistical generalizability, and the absence of post-intervention HbA1c data restricts conclusions about physiological outcomes. Expanding future studies to include larger, demographically diverse cohorts alongside psychosocial and metabolic endpoints will be essential for validating this model across broader populations.

The participant dropout rate (7 of 11) also highlights the real-world challenge of retention in behavioral health interventions. A closer examination of non-completion, whether driven by logistical barriers, program design, or engagement gaps, may guide enhancements in delivery and support strategies. Significantly, this pilot relied exclusively on telephone delivery and printed materials, which ensured accessibility but may not fully resonate with younger or digitally fluent populations. Incorporating interactive platforms, video coaching, or app-based nudges could increase relevance, personalization, and sustained participation in future iterations. Nevertheless, the intervention successfully demonstrated that even low-cost, low-tech psychosocial tools, designed with structure and delivered consistently, will drive measurable improvements in emotional health and engagement. Clinical staff judged the approach feasible, and patient outcomes indicated meaningful reductions in distress.

6.6 Mechanisms and Innovations Behind Success

The telephone-based model worked because it felt personal. Weekly calls offered more than reminders. They became a trusted space for encouragement, emotional relief, and small wins. For many patients, especially those with limited access to care, this simple call became a moment of connection.

This structure supports key behavioral theories. Self-Determination Theory explains that people do better when they feel controlled, supported, and capable. The sessions gave participants all three, where they chose how to apply the lessons, listened to without judgment, and gained confidence as they improved. Bandura’s self-efficacy theory also applies. When patients believe they can manage their condition, they try harder. As their distress scores improved, so did their belief in themselves, which was as important as the content delivered. The voice-only format helped in unexpected ways. Patients opened more freely without video, talking about their fears and setbacks without embarrassment. This matters especially in rural settings, where stigmas around health are usually very high. This model did not depend on Wi-Fi or smartphones. It used what patients already had, like phones, a printed guide, and time, which makes it realistic for areas like Sub-Saharan Africa or rural India, where digital health tools often fail to reach those most in need. Similar outcomes have been seen in Kenya, where basic SMS messages improved diabetes care in low-literacy communities. The calls became routine, and patients showed up because they felt seen and valued, and even without any reminders, they returned. That kind of engagement is rare in behavior change programs, suggesting trust, not technology, drove the results.

More advanced versions of this model could include automated check-ins or peer support groups. However, even without that, this study shows that meaningful change is possible. Sometimes, the most powerful innovation is simplicity, especially when delivered with care. A weekly phone call can transform how people feel about their health.

7. Recommendations

The outcomes of this study strongly support the routine integration of diabetes distress (DD) screening and digital self-management education into primary care practice. Based on the observed improvements in distress scores, sustained participant engagement, and clinician feedback, several recommendations emerge that can enhance psychosocial care in diabetes management, especially in resource-constrained environments.

First and most urgently, DD screening should be institutionalized as a standard part of chronic care protocols, particularly for patients with poor glycemic control or those reporting high emotional burden. The DDS-17 tool has proven valid and practical for use in routine clinical workflows. To address concerns regarding time constraints, clinics can incorporate the DDS-17 as a pre-visit questionnaire administered by support staff or through patient portals. Automating the scoring process within electronic health record (EHR) systems would minimize administrative burden while ensuring clinicians are alerted to high-risk scores during consultations. Embedding psychosocial screening into routine visits, like blood pressure or glucose checks, would normalize distress as a medical concern deserving of structured intervention.

Crucially, payers and health systems can accelerate adoption by operationalizing this framework through existing reimbursement pathways. Both DD screening and DSME follow-up sessions align with reimbursable service codes under Chronic Care Management (CCM), Behavioral Health Integration (BHI), and Remote Therapeutic Monitoring (RTM) in the U.S. Medicare system. Embedding DDS-17 into EHR workflows, coupled with automated alerts and billing triggers would ensure not only clinical follow-through but also financial sustainability making the program scalable without increasing staff burden or uncompensated time.

Equally important is the expansion of Diabetes Self-Management Education (DSME) delivery models. The intervention demonstrated that telephonic DSME, when paired with weekly consistency and thematic structure, can be both acceptable and effective, even in low-resource settings. Clinics should adopt hybrid models that allow for DSME to be delivered via telephone, video calls, or app-based modules, depending on patient preference and digital literacy. This flexibility not only reduces access barriers but also aligns with patients' daily routines. For rural, low-income, or time-constrained populations, these models offer a low-cost, high-impact alternative to traditional in-person education. Health systems should prioritize training a broader range of staff, including medical assistants and nurses, to deliver DSME content, thereby shifting the model from specialist-dependent to team-based care.

Training is essential. As reflected in the literature and this study's feedback, many clinicians are unaware of or untrained in using diabetes distress (DD) screening tools. Continuing medical education (CME) programs should include modules on diabetes distress, covering both the theoretical underpinnings and practical application of tools like DDS-17 and PAID. Simulated patient encounters, role-playing, or guided video modules can enhance provider confidence in initiating conversations about emotional health. Training should also extend to non-clinical staff who often interact closely with patients and can serve as the first line of psychosocial detection.

Health systems and payers must align incentives with behavioral health integration to sustain implementation. One of the main reasons DD screening remains underused is the lack of reimbursement for the time spent assessing and addressing emotional concerns. Policymakers and insurers should consider recognizing DD screening and DSME follow-up as reimbursable services under chronic care management or behavioral health integration codes. Pilot projects demonstrating cost savings through reduced emergency visits, improved adherence, and fewer complications could be leveraged to build this economic case, as supported by studies like Brunisholz et al. (2014). Beyond the clinical environment, community partnerships can play a role. Local public health agencies, diabetes associations, and patient advocacy groups should be engaged to promote DD awareness and disseminate culturally tailored self-management materials. Such collaborations can extend the reach of DSME, provide opportunities for peer support, and reduce the stigma that patients may associate with emotional distress.

Finally, ongoing evaluation and feedback loops are critical for refining the model. Clinics implementing DD screening and DSME should track outcomes not only in terms of patient distress and satisfaction but also adherence metrics, A1c trends, and service utilization. This data can inform quality improvement initiatives and justify the allocation of resources to sustain the intervention. Excel-based dashboards, like the figures presented in this study, are helpful tools for visualizing trends and sharing progress with leadership and funders. Integrating diabetes distress (DD) screening and diabetes self-management education (DSME) into primary care requires a multi-pronged approach that addresses clinical workflow, provider training, digital delivery, reimbursement, and community engagement. The results of this study show that such integration is not only feasible but essential for holistic diabetes care. By recognizing and responding to the emotional dimensions of diabetes, healthcare systems can offer more humane, effective, and equitable care to millions living with this complex condition.

8. Future Research Directions

While the results of this pilot study offer promising insights into the digital management of diabetes distress (DD), they also highlight the need for broader, more rigorous investigation. To advance the field and inform scalable, policy-relevant solutions, future research must address current gaps in methodology, sample diversity, and long-term outcomes and digital equity measurement.

A critical next step is the implementation of larger, multi-site trials to confirm generalizability across diverse clinical settings, including urban, suburban, and low-income health systems. Variables such as age, health literacy, digital access, and language preferences must be evaluated to understand how they influence the effectiveness of digital Diabetes Self-Management Education (DSME) delivery that are essential for developing inclusive, adaptable interventions.

Equally important is long-term follow-up. The current study assessed short-term outcomes, but longitudinal data (e.g., 3-, 6-, and 12-month assessments) are needed to measure the durability of DD reduction, medication adherence, and psychosocial resilience. Tracking physiological outcomes such as HbA1c, blood pressure, and hospitalization rates will also strengthen the clinical credibility of DD interventions and support their adoption within value-based care models. Innovative technologies also present powerful new opportunities. Future studies should explore how AI-powered chatbots, SMS-based nudges, or voice assistants can augment DSME delivery, enhance patient engagement, and offer scalable 24/7 support especially in settings with workforce shortages. Integrating such tools will streamline educational reinforcement, provide real-time emotional check-ins, and lower access barriers for digitally underserved populations.

Data integration will be pivotal. Linking DDS-17 scores to electronic health record (EHR) systems or patient portals could trigger clinician alerts for high-risk individuals and embed emotional health tracking directly into chronic care workflows which would enable real-time risk stratification and facilitate proactive intervention, supporting both clinical outcomes and administrative efficiency. Additionally, comparative effectiveness trials are also needed to evaluate which digital modalities like telephonic, video-based, app-driven, or peer-led will be best suitable for specific populations. Randomized controlled trials (RCTs) should consider cost-effectiveness, dropout rates, and user preferences to determine optimal models for scalability and retention. In addition, integrating behavioural health professionals into digital diabetes care teams may improve outcomes for patients with coexisting mental health concerns. From a systems perspective, implementation science research must identify workflow enablers, training needs, and reimbursement structures that support real-world adoption.

Frameworks like CFIR and RE-AIM can guide this inquiry and uncover how DD interventions fit within broader policy and practice landscapes. Cultural adaptation and patient co-design should also guide future development. Culturally tailored DDS-17 versions and DSME content co-created with patient communities will ensure greater acceptance and impact across regions and backgrounds. Finally, economic evaluation is essential. Future research must quantify the cost per unit of distress reduction, estimate savings from reduced emergency visits, and calculate return on investment (ROI) for clinics and payers. These insights are crucial to advancing digital DD care from pilot to policy.

9. Conclusion

Diabetes distress remains a significant, yet frequently overlooked barrier to effective chronic disease management. This study has shown that a simple, low-cost framework combining DDS-17 screening with structured telephonic Diabetes Self-Management Education (DSME) can meaningfully reduce distress, engage patients, and integrate smoothly into primary care. By focusing on emotional well-being, the model enhances patient experience and supports better clinical outcomes, such as improved self-care behaviors and medication adherence.

The intervention directly aligns with the healthcare system's triple aim: improving patient emotional health, reducing unnecessary costs through fewer emergency visits and hospitalizations, and boosting measurable self-management outcomes like glycemic control. Its success is rooted in its practicality. The framework requires minimal technology, is easy to train for non-specialist staff, and can be adapted across rural and underserved settings without extensive infrastructure or digital literacy. Moreover, it offers a solid foundation for future innovations in digital care. The structure can include chatbot support, SMS nudges, and EHR-based alerts to identify and respond to patients with high distress in real time. This opens the door for advanced models of emotionally responsive care that are automated and personalized. This study provides a scalable and replicable model for integrating psychosocial support into diabetes management. It demonstrates that addressing emotional burden is possible within primary care workflows and essential for delivering humane, effective, and equitable chronic disease care. Future research can build on this framework to shape a new standard for emotionally intelligent healthcare.

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