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# Co-designed Integrated Care Services for Diabetes Management: A Patient Centered Service Design Study

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**ABSTRACT** The prominence of diabetes in the United States warrants holistic, collaborative, and patient-centered care in different healthcare touch points. The failure of traditional approaches is based on their inability to integrate services and patient perspectives into care designs. Through co-design interventions, healthcare professionals can optimize strategies for integrated care delivery. This exploratory pilot study examines the efficacy of co-designed integrated care services in the management of diabetes. The study specifically investigates healthcare providers' perceptions regarding potential enhancements in patient satisfaction relative to traditional care models. The study adopts a cross-sectional mixed-method service design strategy with a focus on quantitative data. In collecting the data, a survey was used to facilitate rapid collection while supporting systematic comparison of service models. The study indicates higher perceived levels of patient satisfaction in co-designed integrated care services. The scores were particularly higher in the areas of care coordination, communication, and patient engagement. Qualitative results further affirmed the significance of collaborative and continuous decision-making as well as the accessibility of services. However, these results should be interpreted cautiously, as they are based on provider-reported perceptions rather than actual patient outcomes. The results of the findings showcase the potential significance of co-design approaches in integrated diabetes management. The findings, therefore, provide preliminary insights into patient-centered service design intervention in primary healthcare.

**INDEX TERMS** co-design, diabetes, diabetes management, integrated care, patient satisfaction, service design

## Highlights

- The results indicate a significant increase in provider perceived patient satisfaction with co-designed care models.
- The research integrates provider feedback from surveys and interviews

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with service blueprints, offering actionable insights for improving service design in diabetes management.

- The findings suggest that healthcare providers can improve care delivery by adopting co-designed models.

## I. INTRODUCTION

The prominence of diabetes mellitus in the US has raised significant concerns regarding its management. Indeed, at least 30 million people in the US have been diagnosed with diabetes, posing significant health and economic concerns [1]. The disease is a key health challenge that imposes extensive pressure on healthcare systems at different levels of management. The effectiveness of diabetes management is not limited to pharmacological treatment but extends to include continuous support for behavioral changes, lifestyle management, and coordinated monitoring across different providers [2]. While the country has access to evidence-based approaches for its management, many patients do not benefit from effective care. In part, the fragmentation of care imposes hindrances in communication, continuous monitoring, and personalization of care.

The challenges emanating from fragmented care have necessitated the emergence of integrated care models. These models are structured to help in aligning care services in different care settings and disciplines. Through integrated diabetes care, healthcare providers collaborate in the management of diabetes and the provision of personalized care [3]. Its potential to support interactions among physicians, nurses, nutritionists, care coordinators, and diabetes educators renders integrated care highly effective. Although integrated care holds great potential, its execution has not always been successful because organizational structures have received a lot of attention, but patient-centered service experiences like engagement, trust, and personalization have not received enough attention [4]. The prioritization of patient satisfaction is based on its growing popularity in healthcare management. Recent studies have acknowledged patient satisfaction as a key indicator of the quality of healthcare services offered [2]. Indeed, higher levels of patient satisfaction are associated with better adherence to treatment recommendations, stronger patient-provider relationships, and improved self-management behaviors. These factors are inherently significant in the management of chronic diabetes as well as other chronic conditions. That notwithstanding, the reliance on traditional service

designs undermines the effectiveness of care because of the limited patient engagement in top-down structures [3]. In turn, traditional service designs are clinically sound but experientially disoriented from the expectations of patients.

The emergence of service design provides a new strategy for care management because of the prioritization of user perspectives in the design of processes, systems, and interactions. In particular, co-design prioritizes interactions between service users, designers, and providers in the development of solutions [5]. Within the healthcare sector, co-design has enhanced communication tools, patient pathways, and accessibility of services. However, there is still a significant gap in the literature on the particular use of co-design in integrated primary care for chronic illness. The complex, multi-stakeholder human interactions required for long-term diabetes management have often been disregarded, despite the fact that contemporary service design research has blossomed in areas of digital health and administrative efficiency. As a result, there is little data to show how switching from a provider-led to a co-designed integrated approach affects patient-perceived quality. In order to close this gap, this study critically assesses the shift from traditional, compartmentalized care to co-created service structures using a design-led paradigm. Specifically, it measures how these changes affect patient satisfaction in primary care settings. Through a mixed-method pilot study, this study enhances existing literature on patient-centered service interventions through practical insights into practice within primary healthcare. This study is specifically motivated by the hypothesis that, in comparison to conventional, provider-led service designs, integrated care services organized through co-design techniques result in noticeably greater levels of provider-perceived patient satisfaction and perceived care quality.

### ***A. DIABETES MANAGEMENT IN PRIMARY HEALTHCARE***

The management of diabetes in primary healthcare is achieved through regular screening, diagnosis, and treatment. Diabetes mellitus is a metabolic disorder that is marked by chronic hyperglycemia occasioned by defects in the secretion of insulin, insulin action, or other metabolic issues [2]. The management of this condition is lifelong and involves continuous interactions across different components of the healthcare system. In the US, the priority of primary healthcare management is clinical monitoring, patient education, and coordination among specialists. It is based on the

acknowledgement that clinical interventions are not sufficient for effective care management and that the promotion of self-efficacy, patient participation, and continuity of care are critical aspects [6]. A close look at these primary care models shows there is still a significant difference between what we expect from our professionals and how patients experience their own lives. Traditional models are medically effective; however, they typically fail to meet the needs of those living with chronic disease because they were developed with a "top down" perspective of providing quality medical services. Services for patients with diabetes in primary care facilities are often uncoordinated and provided by multiple specialists. As documented in the U.S., obstacles such as poor follow-up and inconsistent messages are some of the main reasons why patients do not receive high-quality care [7]. Most studies consider these systemic issues (i.e., poor coordination, fragmentation, etc.) to be errors made by administrators, rather than inherent flaws in the structure of the service delivery system. Approximately one out of five Americans with diabetes has yet to be diagnosed, thus preventing them from receiving appropriate primary healthcare [8]. While current research is successful in identifying these gaps as data points, it does not critically examine how these failures are sustained by the lack of a co-design framework. This challenge is further accentuated by the fact that more than 1.4 million new cases are diagnosed every year. With the increasingly growing complexity of healthcare systems, diabetes management demands adequate coordination and patient-centered interventions [4]. As a result, there is a critical need to shift from descriptions of service shortages to an analytical assessment of how service design might reconcile patient-centered delivery with medical necessity.

## ***B. INTEGRATED CARE MODELS***

The growing popularity of integrated care is driven by the heightened demand for improved patient experience in the administration of care. It entails the planning of care with people who work together while putting the service user and their caregiver in control, and coordinating the delivery of services for optimal outcomes [3]. The focus of integrated care models is the provision of coordinated, holistic, and continuous care to patients across diverse spectrums of their needs. Consequently, integrated care facilitates an alleviation of fragmentation in service delivery through alignment of services [9]. One of the most prominent features of integrated care is the collaboration across multidisciplinary healthcare providers, including

physicians, nurses, educators, and nutritionists. Similarly, integrated care is marked by improvements in communication through the sharing of care plans across different involved providers.

Although integrated care models have been shown to improve health outcomes [4] and increase access to relevant treatments, a rigorous analysis indicates that these benefits are frequently only realized at the clinical level. Integrated care reduces the likelihood of bad outcomes by reducing the referral process and enabling patients to receive a variety of complementary therapies from many disciplines. Still, the reliance on integrated care models is beneficial because it reduces the overall costs of primary healthcare through high-quality care and the aggregation of services [10].

However, despite these models' proven clinical and economic benefits, there remains a large research gap about why they are still underutilized. According to recent research, the idea of integrated care is severely underutilized due to a concern with administrative and structural integration that does not adequately take into account the real human experience. Because of this structural emphasis, patients still perceive care as disjointed and challenging to navigate, particularly in primary healthcare settings, even when providers may appear to be more "integrated" on paper. Examining how service design might transcend these inflexible organizational frameworks to jointly develop a model that is seamless for the patient's experience is the missing piece in current research.

### ***C. PATIENT EXPERIENCES AND SATISFACTION IN HEALTHCARE***

The levels of satisfaction in patients are determined through their perceptions of the quality of care, level of communication, support, and accessibility of services. The concept of patient satisfaction is a construct of patients' perceptions of how well the services offered met their expectations across different areas [11]. The conduct of the service provider imposes significant influence on the level of satisfaction experienced by the patients. Similarly, the effectiveness of coordination between service providers is also a key factor in determining the levels of satisfaction through continuity, smooth transitions, and efficient processes [12]. The experiences of a patient further inform their perceptions of satisfaction through involvement in decision-making. Thus, effective care management demands heightened involvement of the patient to enhance the level of satisfaction.

The concept of patient satisfaction is particularly important in chronic disease management, including in the management of conditions such as diabetes. Recent studies have affirmed the connection between patient satisfaction levels and their participation and adherence levels [11]. In this study, patients who reported being actively engaged in decision making reported high levels of satisfaction. Similarly, patients who have positive experiences of quality care have a higher likelihood of following recommendations on treatment plans and maintaining self-management behaviors [13].

However, a tendency to treat patient satisfaction as an end-state result rather than a dynamic motivator of high-quality care is a significant gap in the research now in publication. The possibility for iterative, active improvements based on the patient's actual experience is severely undermined by the fact that the majority of assessments in traditional healthcare systems are carried out after implementation. Furthermore, despite the fact that contentment is commonly employed as a metric, current research typically overlooks the subjectivity of this concept. Since "patient satisfaction" is assessed through the lens of provider judgements, the study's findings should be interpreted as indicative of perceived experiential quality rather than direct patient-reported outcomes. This distinction is crucial for a critical reading of the literature since the patient's concept of a "satisfied patient" can differ from the providers. This study aims to examine how co-design might radically reorganize the service process to match provider workflows with these arbitrary patient expectations, going beyond a simple descriptive summary of satisfaction levels.

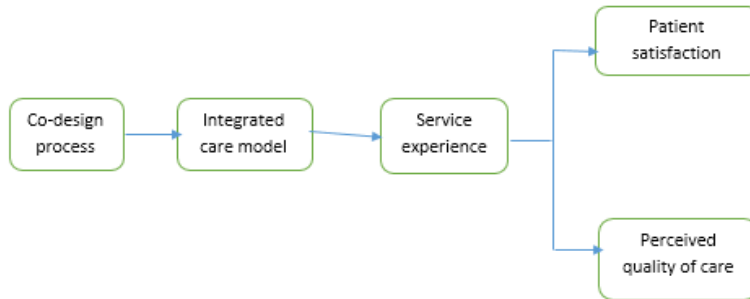
#### ***D. SERVICE DESIGN AND CO-DESIGN***

The rise of service design has brought about new opportunities for value creation in service settings, including in health care. Service design is an interdisciplinary approach that is concerned with the creation or enhancement of the quality of services based on the user experience [14]. It uses a range of different tools and techniques, including personas, journey maps, and prototyping, to help understand different viewpoints in service ecosystems. In healthcare, service design has been used in a range of areas, including designing medical devices, hospitals, and patient journeys [15]. What is important about service design is that it takes a holistic view of the service rather than an isolated view of touchpoints.

Co-design is a particular form of service design that is characterized by the participation of all stakeholders in the design process [5]. It is premised on the idea that those who deliver and experience services are experts in design [5]. In the context of health, co-design brings patients, families, and health practitioners into the design process [16]. However, while many studies describe the innovation potential of co-design, there is scant critical reflection on how co-design can be sustained in the long-term in the hierarchical structures of primary care. Existing studies refer to co-design as a "successful event" or workshop, but do not discuss the tensions that arise when these bottom-up innovations intersect with top-down administrative procedures. Finally, research is typically confined to designing digital tools rather than redesigning human-to-human integrated care processes. Linking these existing studies, it is apparent that the gap in service design research is empirical evidence of how co-designed human interactions (and not just tools) affect perceived quality of care in chronic disease management. This research overcomes this limitation by using a co-design approach to integrated diabetes care and moves away from a descriptive account of design methods towards an analytical account of service structure.

### ***E. RESEARCH GAP***

Despite the acknowledgment of integrated care and patient-centered intervention in the literature, there is limited exploration of the role of service design in promoting patient satisfaction. The development of digital health instruments and administrative efficiency has benefited greatly from contemporary service design research, but the intricate, multi-stakeholder human interactions necessary for long-term integrated diabetes treatment have been severely neglected. The existing studies have focused on clinical effectiveness, thereby overlooking its contribution to experiential quality among patients. As a result, there is insufficient empirical data to show how a shift from provider-led, top-down approaches to co-designed frameworks directly affects patient-perceived quality. Besides, there is limited literature on the specific role of co-design in promoting the efficacy of integrated care services within primary healthcare settings [4]. By introducing a service design lens to critically assess how co-created service structures particularly affect patient satisfaction levels, this study closes this gap by offering a design-led analysis of service delivery rather than merely descriptive accounts of service fragmentation (Figure 1).

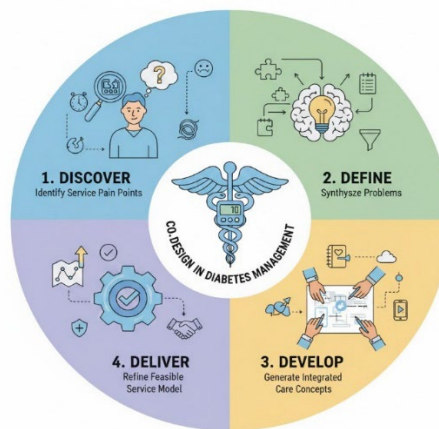


**FIGURE 1.** Research framework linking co-design, integrated care service features, and patient satisfaction

## II. METHODOLOGY

### A. STUDY DESIGN

The study adopted a two-phase exploratory service design approach consisting of (1) a design-led co-design stage and (2) a qualitative evaluation phase. In the first stage, the focus was on the creation of a co-designed integrated care service model based on insights from providers. The second stage involved an evaluation of the perceptions of healthcare providers about the feasibility and significance of the co-designed model using a survey. The service design adopted in the study followed a 4-stage framework consisting of Discover, Define, Develop, and Deliver, as the Figure 2 below. This process influences the survey with an emphasis on the components of communication, accessibility, patient engagement, and care condition.



**FIGURE 2.** Co-design and service concept development

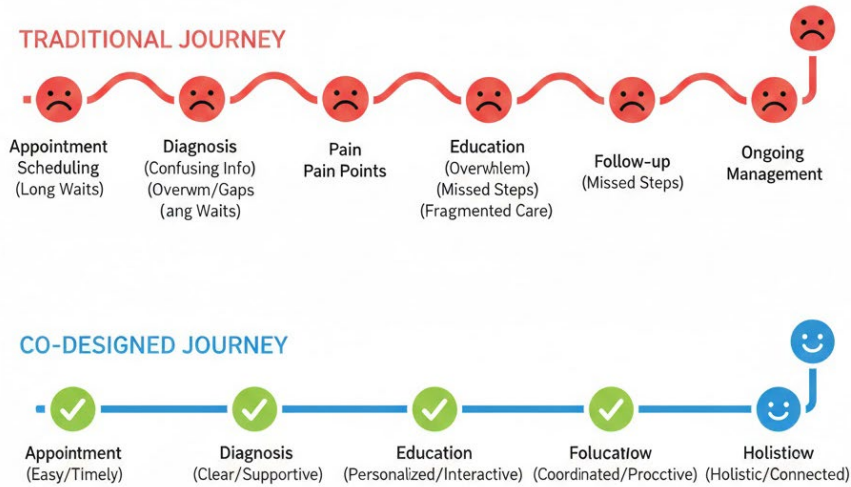
In order to produce initial insights rather than broadly applicable findings, this study uses a pilot design. It is crucial to remember that this study assesses healthcare providers' opinions of patients' experiences rather than actual patient-reported results. Furthermore, the co-designed integrated care model was provided as a conceptual service design for assessment rather than being put into practice in a practical environment.

## ***B. SAMPLING AND RECRUITMENT OF PARTICIPANTS***

The participants were sourced from among healthcare providers in the area of diabetes management. In turn, eligible participants were physicians, nurses, care coordinators, diabetes educators, nutritionists, pharmacists, and other professionals in primary healthcare contexts. The selection did not exclude participants based on their years of professional experience. The study adopted purposive convenience sampling to identify eligible participants [17]. Emails were then disseminated to the professionals, while others were contacted through professional networks. The study did not give any incentive for participation, and participation was solely voluntary. There were 35 participants in all, which is thought to be suitable for a pilot study that focused more on exploratory analysis than generalization.

### **1) STAGE 1: CO-DESIGN PROCESS MODEL**

The first stage of the study used a co-design process in the creation of the integrated care service model that was then assessed in the study. The process entailed four distinct stages: discovery, definition, development, and delivery. In the discovery phase, provider survey items were used to identify common service pain points in traditional management approaches. The focus was on communication, coordination, and follow-up. The definition phase included a synthesis of the insights into key challenges and gaps in patient experiences. The third stage of development created features for the integrated care model by addressing the gaps. The focus was on shared care planning, structured follow-up touch points, and a focused care coordination role. The last phase included the integration of the features into a co-designed integrated care model (See figure 2). This model was used as the stimulus concept and was shown to participants in the evaluation phase of the study.



**FIGURE 3.** Journey map

## 2) STAGE 2: SURVEY INSTRUMENT AND QUESTIONNAIRE DEVELOPMENT

Satisfaction with services received by patients has been based on identified factors of patient satisfaction, such as clear communication, being part of decisions made about their health care, having access to care, and feeling satisfied with the quality of care they receive [11], [12]. The design of the survey was also influenced by findings from the stage 1 co-design process. Some of the most significant themes that emerged were: poor communication among caregivers, ambiguity regarding who is responsible for providing care, lack of follow-up after visits, and minimal patient engagement. These themes were then broken down into specific service areas, which allowed us to identify how well these service areas relate specifically to the management of diabetes in primary care environments. The final survey contained eight evaluative service items within four theoretical domains. The four domains are as follows: 1) coordination of care, 2) communication/involvement, 3) access/between-visit support, and 4) overall satisfaction. All eight items used a 5-point Likert scale where 1 indicated “strongly disagree”, 2 indicated “disagree”, 3 indicated “neither disagree nor agree”, 4 indicated “agree”, and 5 indicated “strongly agree” [18]. In addition to assessing perceptions of patient experience under two different types of integrated care models (i.e. traditional model vs co-designed model), we asked additional demographic questions including

participant's role in caring for patients with diabetes, number of years he/she had been practicing medicine, type of practice environment he/she worked in, and estimated number of patients with diabetes he/she treated annually.

### ***C. QUESTIONNAIRE STATEMENTS***

Before collecting all of the data, a pilot test of the questionnaire was carried out to make sure it was clear, reliable, and interpretable. Participants were asked to rate the following statements separately for (a) traditional care models and (b) co-designed integrated care models:

- Care coordination across team members is clear and well-structured.
- Messaging across clinicians is consistent.
- Patients receive reliable follow-up after visits.
- Patients are actively involved in decision-making.
- Patients have access to support between visits.
- Education and support are tailored to patient needs.
- Transitions and referrals are smooth and well-managed.
- The care model supports overall patient satisfaction.

Each statement was evaluated using a 5-point Likert scale.

### ***D. DATA ANALYSIS***

The data was analyzed using descriptive and inferential statistics. In particular, the analysis calculated mean and standard deviations for individual survey items and composite subscales. The internal consistency reliability of traditional and co-designed care scales was calculated through Cronbach's alpha.

Paired comparisons were also conducted between traditional and co-designed care models using a paired sample t-test. Moreover, the effect sizes were assessed to estimate the scale of observed differences.

### ***E. ETHICAL CONSIDERATIONS***

The study did not collect any personal identification information from participants or their patients. The study further sought informed consent before survey participation and after academic approval from the school

research board.

### III. RESULTS

#### A. PARTICIPANT CHARACTERISTICS

The responses from 35 healthcare providers revealed a diversity of roles and settings on diabetes care management. In particular, the participants were drawn from different niches including primary care and telehealth.

TABLE I  
PARTICIPANT CHARACTERISTICS (N = 35)

| Characteristic                       | Categories                                                                           |
|--------------------------------------|--------------------------------------------------------------------------------------|
| Role (n)                             | PCP=11; Care coordinator=8; Pharmacist=7; Nurse=5; Diabetes educator=4               |
| Years in Practice (n)                | 11–20=12; 3–5=8; 20+=6; 6–10=5; 0–2=4                                                |
| Primary Setting (n)                  | telehealth=12; outpatient primary care=11; community clinic=6; hospital outpatient=6 |
| Approx. % caseload with diabetes (n) | 26–50%=12; 10–25%=9; <10%=9; >50%=5                                                  |

#### B. MEASUREMENT MODEL ASSESSMENT

To ensure the validity and reliability of the survey instrument, an exploratory factor analysis (EFA) was conducted on the 8 service evaluation items. The purpose of this analysis was to assess construct validity and internal consistency prior to comparative analysis.

Reliability, in this case, relates to the stability of the measurement instrument in the measurement of the construct. Internal consistency reliability was used in this case. It was determined using Cronbach's alpha. A Cronbach's alpha greater than 0.70 is regarded as acceptable in social science research.

In this research, the Cronbach's alpha values ranged between 0.88 and 0.94, demonstrating a high degree of internal consistency in every construct. This indicates internal consistency reliability, which confirms the reliability of the items in measuring the respective constructs.

Establishing reliability is essential to make sure that observed differences represent actual perceptual changes rather than measurement error.

Several measures were made to improve the reliability of the questionnaire:

- Items were drawn from existing theoretical models in the field of integrated care and patient satisfaction literature [9], [11], [12].
- The constructs were mapped to the themes that emerged during the stage 1 co-design process to ensure relevance.
- Items within each construct were similar in concept and tapped into the same construct.
- A pilot testing phase was included to check the clarity and interpretability of the statements.
- An Exploratory Factor Analysis was performed to validate the alignment of the items to the constructs.

These procedures enhanced the conceptual and statistical reliability of the questionnaire instrument.

The Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy was satisfactory (KMO = 0.82), indicating that the data were suitable for factor analysis. Bartlett’s Test of Sphericity was statistically significant ( $p < 0.001$ ), confirming that the correlation matrix was appropriate for factor analysis.

Principal Component Analysis with varimax rotation was conducted. Four factors were extracted consistent with the theoretical domains:

- Care Coordination
- Communication & Involvement
- Access & Between-Visit Support
- Overall Satisfaction

All factor loadings exceeded the acceptable threshold of 0.70, confirming strong item-construct relationships.

For clarity, T1–T8 refer to the eight questionnaire statements used to evaluate perceived service quality under traditional and co-designed integrated care models. Each item corresponds to a specific service dimension identified in stage 1 of the co-design process:

**T1** – Clear coordination across team members

**T2** – Consistent messaging across clinicians

**T3** – Reliable follow-up after visits

**T4** – Patient involvement in decision-making

**T5** – Access to support between visits

**T6** – Tailored education and support

**T7** – Smooth transitions and referrals

**T8** – Overall support for patient satisfaction

These items were measured using a 5-point Likert scale (1 = *Strongly Disagree* to 5 = *Strongly Agree*).

The aim of Table II is to determine the reliability and validity of the measurement of the questionnaire constructs prior to any comparative statistical analysis. The table shows factor loadings, Cronbach alpha values, and Average Variance Extracted (AVE) to ensure that the survey questions are valid measures of the theoretical constructs. The determination of construct validity and internal consistency ensures that any comparison between traditional and co-designed care models is based on a statistically valid structure of measurement.

TABLE II  
FACTOR LOADINGS, RELIABILITY, AND AVE (STAGE 2  
REALIZABILITY TEST)

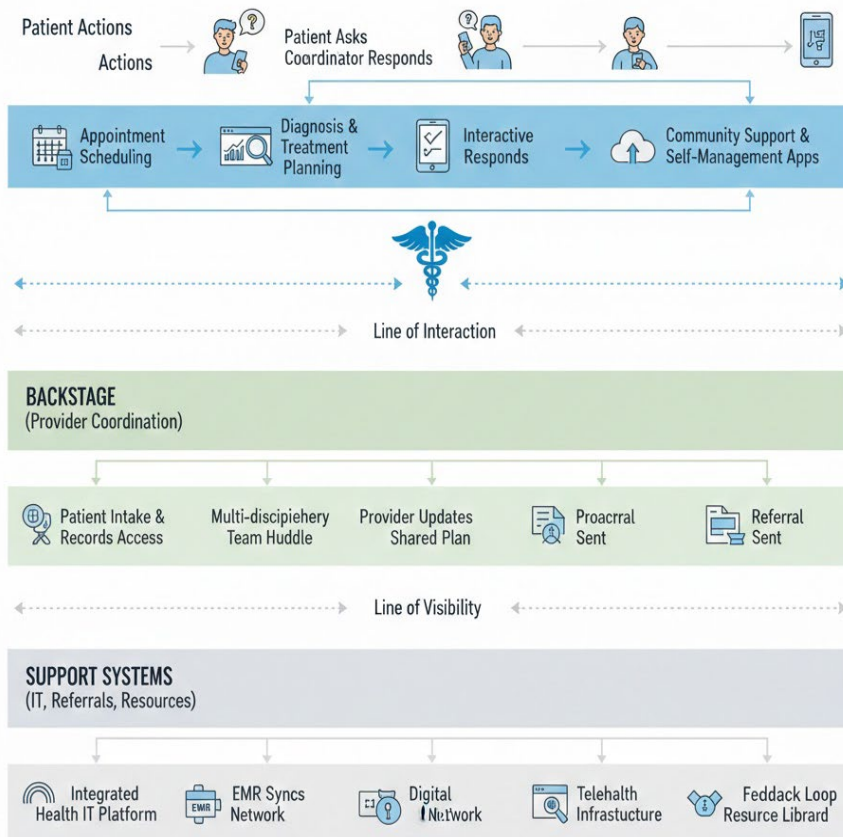
| Construct                   | Item | Standardized Loading | $\alpha$ | AVE  |
|-----------------------------|------|----------------------|----------|------|
| Care Coordination           | T1   | 0.88                 | 0.91     | 0.78 |
|                             | T2   | 0.84                 |          |      |
| Communication & Involvement | T3   | 0.89                 | 0.93     | 0.81 |
|                             | T4   | 0.87                 |          |      |
| Access & Support            | T5   | 0.79                 | 0.88     | 0.72 |
|                             | T6   | 0.81                 |          |      |
| Overall Satisfaction        | T7   | 0.92                 | 0.94     | 0.84 |
|                             | T8   | 0.90                 |          |      |

All constructs demonstrated strong internal consistency ( $\alpha > 0.80$ ) and acceptable convergent validity ( $AVE > 0.50$ ), confirming the reliability of the measurement instrument.

### C. COMPARISON OF TRADITIONAL VS CO-DESIGNED INTEGRATED CARE RATINGS

From the study, there were significant differences observed in terms of the level of satisfaction obtained by the patients from the traditional care models and the level of satisfaction from the co-designed models. Table 3 illustrates the level of satisfaction obtained by the patients from the traditional care models, compared to the co-designed models, for the respective domains such as communication, coordination, and overall care.

The providers rated the traditional and co-designed integrated care models across 8 different areas. In all the service domains, the co-designed integrated care model had higher scores compared to the traditional care model.



**FIGURE 4.** Service blueprint

Figure 4 shows the service blueprint representing and laying out the process of the patient journey in traditional and co-designed integrated models of diabetes care. This also includes frontstage provider, backstage provider processes, and systems at key touchpoints of initial consultation, care planning, follow-ups, and between-visit support.

In the traditional care model, the blueprint identifies fragmentation across touch points with limited coordination and communication between providers, and poor follow-up mechanisms. In addition, backstage processes such as sharing of information and ownership of care are poorly defined, such that patients receive episodic rather than continuous care.

In contrast, the co-designed service blueprint indicates a greater level of alignment between the front and back stages. The use of the shared care plan, the defined role of the care coordinator, and the use of follow-up touchpoints are clearer continuities in the provision of care. Additionally, the support of the processes helps to enhance the patient experience through the use of proactive outreach and standardized communication. In summary, the service blueprint clearly illustrates the translation of the service design into service improvement regarding the patient experience, particularly in terms of clear communication.

Within the domain levels (Table 3), the co-designed care model showed the greatest improvements in care coordination communication & involvement. The second-highest improvements were in the domains of overall satisfaction and access/between-visit support. The results also show that all domain differences were statistically significant (paired comparisons).

TABLE III  
DOMAIN-LEVEL COMPARISON (TRADITIONAL VS CO-DESIGNED)

| Domain                         | Traditional | Co-designed | $\Delta$ (C-T) | <i>p</i> | Effect (dz) |
|--------------------------------|-------------|-------------|----------------|----------|-------------|
| Care coordination              | 2.93 (0.48) | 4.26 (0.51) | 1.32           | 3.57     | 2.10        |
| Communication & involvement    | 3.01 (0.47) | 4.37 (0.31) | 1.36           | 2.08     | 2.32        |
| Access & between-visit support | 2.97 (0.82) | 3.89 (0.83) | 0.91           | 9.36     | 0.75        |
| satisfaction                   | 2.97 (0.86) | 4.49 (0.33) | 1.51           | 9.01     | 1.71        |

Besides, the perceived feasibility of the co-designed integrated care model was significantly higher (C6 mean = 4.17,  $SD = 0.82$ ). These results suggest that providers considered implementation as realistic within typical service challenges.

#### ***D. ITEM-LEVEL CHANGES***

The results across the eight item-level comparisons showed a preference for the co-designed integrated care model.

TABLE IV  
ITEM-LEVEL COMPARISON OF TRADITIONAL AND CO-DESIGNED DIABETES CARE MODELS ( $N = 35$ )

| Service Dimension                        | Traditional Mean ( $SD$ ) | Co-designed Mean ( $SD$ ) | Mean Difference (C–T) | $p$ -value |
|------------------------------------------|---------------------------|---------------------------|-----------------------|------------|
| Clear coordination across team members   | 2.91 (0.62)               | 4.45 (0.50)               | +1.54                 | <0.001     |
| Consistent messaging across clinicians   | 3.03 (0.58)               | 4.37 (0.49)               | +1.34                 | <0.001     |
| Reliable follow-up after visits          | 2.83 (0.71)               | 4.43 (0.50)               | +1.60                 | <0.001     |
| Access to support between visits         | 2.97 (0.82)               | 3.89 (0.83)               | +0.91                 | <0.001     |
| Patient involvement in decision-making   | 3.06 (0.60)               | 4.40 (0.49)               | +1.34                 | <0.001     |
| Tailored education and support           | 3.00 (0.66)               | 4.34 (0.48)               | +1.34                 | <0.001     |
| Smooth transitions and referrals         | 2.89 (0.69)               | 4.34 (0.48)               | +1.46                 | <0.001     |
| Overall support for patient satisfaction | 2.97 (0.86)               | 4.49 (0.33)               | +1.51                 | <0.001     |

In particular, the largest improvements were recorded in these domains: reliable follow-up after visits (t3→c3-equivalent improvement; mean increase  $\approx +1.60$ ); clear coordination across team members (mean increase of approx. +1.54); overall support for patient satisfaction (mean increase of

approx. +1.51); and smooth transitions and referrals (mean increase of approx. +1.46). Even in the smallest improvement of access/support between visits, there was a meaningful positive improvement (mean increase of approx.  $\approx +0.91$ ) while remaining statistically significant. These results show that the co-designed model significantly improved all assessed service dimensions.

The test for the Cronbach's alpha values ranged from 0.88 to 0.94 across constructs, indicating strong internal consistency.

TABLE V  
SUMMARY OF STUDY OUTPUTS

| Output Area                    | Key Findings                                                                       | Interpretation                                                                            |
|--------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| Care Coordination              | Mean increase of +1.32<br>( $p < 0.001$ ; $dz = 2.10$ )                            | Co-designed services substantially improved perceived coordination across care teams      |
| Communication & Involvement    | Mean increase of +1.36<br>( $p < 0.001$ ; $dz = 2.32$ )                            | Clearer messaging and patient involvement were major strengths of the co-designed model   |
| Access & Between-Visit Support | Mean increase of +0.91<br>( $p < 0.001$ ; $dz = 0.75$ )                            | Improvements were significant but more constrained by system-level limitations            |
| Overall Satisfaction           | Mean increase of +1.51<br>( $p < 0.001$ ; $dz = 1.71$ )                            | Healthcare providers reported improved perceived patient satisfaction in co designed care |
| Item-Level Improvements        | All 8 service items showed statistically significant improvement                   | Demonstrates consistent benefit across multiple service dimensions                        |
| Feasibility of Implementation  | Mean = 4.17 ( $SD = 0.82$ )                                                        | Providers viewed the co-designed model as realistic and implementable                     |
| Service Blueprint Insights     | Reduced fragmentation and improved alignment of frontstage and backstage processes | Healthcare providers perceived an improvement in patient communication                    |

These findings reflect healthcare providers' evaluations of patient

experience and should be interpreted as perception-based outcomes rather than direct patient-reported measures

#### IV. DISCUSSION

This study examined healthcare professionals' evaluations of traditional and co-designed models of integrated diabetes care as an exploratory pilot study focused on provider impressions of a co-designed service concept rather than implemented patient outcomes. The findings show that across all assessed service categories, providers had a higher positive perception of the co-designed care model than of traditional care models. The results indicate that co-designed service elements may improve perceived circumstances related to patient satisfaction, especially communication, coordination, and participation, rather than directly improving actual patient satisfaction outcomes. The study hypothesis that co-designed techniques could improve patient-centered diabetic treatment is more tentatively supported by this.

Shared care planning, care coordination, and organized follow-up procedures were all included in the co-designed integrated care model created in this study as solutions to the shortcomings of traditional care delivery. These characteristics are consistent with earlier integrated care research that emphasizes interdisciplinary cooperation, continuity, and participatory care systems [3], [4]. Significantly, the current findings add to this body of literature by indicating that perceptions of experiencing quality in care delivery may be significantly influenced by service design processes rather than just structural integration. This fills a void left by earlier studies that frequently placed more emphasis on organizational integration than on user-centered service configuration.

The greatest gains were made within areas of communication, patient participation, and care coordination. These results show alignment with existing scholarship, which has long argued that issues with communication and a lack of clarity regarding the ownership of care activities have been some of the most problematic issues associated with managing chronic conditions [13]. From a service design standpoint, these areas fall within the realm of both the front and backstage activities that have a direct impact on patients. The co-designed model's focus on a care plan, a coordination role, and follow-ups does seem to mitigate these issues. This result also supports growing claims in the literature on service design in a way that asserts that

value is frequently generated by changing relationship touchpoints rather than just adding new clinical resources [5], [15].

Access and between visit support was also improved and, although less so than in any of the remaining areas, it was at least a significant improvement. It may be that despite changes being made within service design, certain limitations inherent in primary health settings remain, and this is what has limited improvement in this area [9]. This pattern is significant from an analytical standpoint because it implies that co-design may be especially useful in enhancing coordination and relational processes, while more general access issues may still be limited by infrastructure or policy-level circumstances. Nonetheless, it is apparent that improvement has been made, and that some level of improvement can be gained with relatively minimal changes being made. In turn, changes such as proactive follow-up and clarity in access points can contribute to enhanced service quality.

Notably, the providers found the feasibility of the co-designed model fairly high, which means that the proposed elements in the new service were considered possible in a real-life setting. Of particular significance here is the fact that the feasibility of implementation could be a major obstacle for innovative approaches in delivering health care [14]. The results imply that co-design may serve as a useful strategy for converting service innovation into workable care improvements rather than merely being positioned as a theoretical ideal. Thus, application of the new service design approach may serve as an appropriate mechanism for filling the implementation divide between ideas and concepts.

The results also show how co-design procedures and service blueprints can be used as analytical tools to reveal underlying structural fragmentation in care pathways. This study adds a service systems perspective by connecting reported benefits to certain design elements involving touchpoints, provider roles, and backstage procedures, whereas many integrated care studies concentrate exclusively on outcomes. In this way, the study goes beyond assessing views, and advances knowledge of how service reform could facilitate integrated care.

However, care should be taken when interpreting the study's findings. The study shows that clinicians believe the suggested model is more supportive of those aims than conventional methods, highlighting that the model optimizes provider perceptions of service quality and potential satisfaction,

rather than measuring direct patient clinical outcomes. This distinction helps match interpretation with the exploratory nature of the design and is crucial given reviewer concerns about the extent of the evidence. Provider opinions are essential even in the absence of direct patient outcome indicators because they provide useful information about the potential for service redesign in diabetes care systems.

### ***A. IMPLICATIONS FOR PRACTICE AND SERVICE DESIGN***

This research offers a valuable contribution to the understanding of patient-centered care in managing diabetes. With the application of the co-design approach, the significance of cooperation between service providers and patients was recognized, as depicted in the findings, which suggested the effectiveness of the co-designed models to satisfy patients in managing diabetes in a more comprehensive manner.

The results of the study impose significant impacts on primary healthcare practice and the design of diabetes care management. The findings confirm the significance of considering the experiences of patients besides the clinical effectiveness. Indeed, the results show a heightened improvement in provider perceptions of service condition linked to patient satisfaction when care models are designed to promote communication, care coordination, and patient participation. This encourages a more comprehensive change in healthcare improvement initiatives from solely outcome-driven reforms to experience-informed service redesign.

Still, the findings reveal the relevance of applying co-design models within service system levels of healthcare management. Through a focus on roles, interactions, and care pathways, co-designed models help in articulating responsibilities and alleviating fragmentation. The findings have practical implications for healthcare providers and organizations because they support the need for integrating frontline workers in processes of service redesign [5]. Additionally, by shifting the contribution from conceptual discussions to implementation-oriented knowledge, this discovery enhances the study's translational significance.

The results further indicate high ratings of feasibility, thereby affirming the fact that co-designed models do not have to depend on extensive new resources to be impactful. Indeed, most service elements, including shared care plans, structured follow-up, and clear access points, revealed the need for a restructuring of current interventions and not new services. The results

provide significant implications for primary care contexts where there are resource limitations.

The study is also relevant in service design as it affirms the importance of considering healthcare delivery as an interconnected web involving back-end and frontend processes. Improvements in patient experiences are dependent on back structures, which are often invisible to patients. The need for integrating service design tools in processes of quality improvement is therefore qualified in patient-centered care models [12]. Ultimately, the results of the study acknowledge the importance of providers as significant players in patient-centered designs. Even though patient participation is central to improvements, providers offer extensive insights on the limitations of systems as well as practical workflow insights for enhancing integrated care models.

## ***B. LIMITATIONS***

A number of restrictions should be taken into account when interpreting these results. First, instead of using direct patient-reported experiences or actual clinical results, the study depends on provider-reported perceptions. Although physicians provide valuable system-level insights, patients' actual experiences with diabetes care are not entirely reflected in these viewpoints. Second, this was clearly an exploratory pilot study with a limited sample size ( $n = 35$ ) and purposeful convenience sampling, which restricts generalizability. Rather than drawing firm conclusions about causality, the study aimed to produce early data and conceptual confirmation. Third, rather than being a fully implemented intervention, the co-designed integrated care model evaluated in this study was a theoretical service concept. As a result, results show expected rather than actual effects on patient satisfaction and service experience. This distinction is crucial, and this conceptual-evaluative framework should be used to analyze statements made throughout the debate and conclusion. Fourth, the tiny pilot sample limits the power of measurement validation, even though several service domains were evaluated and reliability was confirmed by Cronbach's alpha and exploratory factor analysis. In addition to implementation evaluation, future research with bigger sample sizes should use confirmatory methods to test the model and include direct patient-reported outcomes.

## ***C. CONCLUSION***

This research evaluated the potential benefits that can be derived from co-

designed integrated care services for diabetic care by adopting a provider-informed service design approach. The results reveal that healthcare providers view co-designed integrated care approaches as being highly beneficial compared to traditional care approaches, especially critical areas that influence patient satisfaction, including communication, coordination, and engagement. The results imply that co-designed service features may promote circumstances thought to be favorable to patient-centered diabetic care rather than directly improving patient satisfaction outcomes. In using service design approaches to integrated care, the results show how service design principles can be used to address issues associated with chronic illness management. Significantly, the new model was seen as possible by the service providers, indicating the potential of service design principles for implementation. The findings contribute to the developing body of research on patient-centered design in the area of primary health care. Crucially, rather than offering proof of outcome effectiveness, the study highlights the benefits of co-design as a viable paradigm for service improvement. It clearly establishes the value of co-design as a paradigm through which the design of care can move beyond the organizational efficiency focus, and into a realm that is more patient-centered, particularly in the area of chronic disease management. Future studies should expand on these results by engaging patients, evaluating the effectiveness of service models developed in collaboration with patients, and assessing their outcomes.

#### **Author Contribution**

Joyati Naureen: Conceptualization, Methodology, Investigation, Data Curation, Formal Analysis, Writing – Original Draft, Visualization. Dongjuan Xiao: Supervision, Validation, Writing – Review & Editing, Project Administration.

#### **Conflict of Interest**

The authors of the manuscript have no financial or non-financial conflict of interest in the subject matter or materials discussed in this manuscript.

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Data supporting the findings of this study will be made available by the corresponding author upon request.

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