

QATAR UNIVERSITY

COLLEGE OF PHARMACY

EXPLORING THE IMPACT AND VALUE OF COLLABORATIVE CARE MODEL IN

DIABETES CARE AT A PRIMARY HEALTHCARE SETTING IN QATAR

BY

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## ABSTRACT

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Title: Exploring the Impact and Value of Collaborative Care Model in Diabetes Care at a Primary Healthcare Setting in Qatar

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**Background:** Diabetes mellitus (DM) is one of the top health priorities in Qatar due to its high prevalence and negative health consequences. The current prevalence of DM in Qatar is 15.5%, which is projected to increase to 29.7% by 2035. DM management is still challenging despite healthcare advancement, warranting the need for a comprehensive Collaborative Care Model (CCM). In an effort to deliver comprehensive and integrated patient-centered healthcare services in the community, the government of Qatar focuses on primary care. Therefore, we aim to evaluate the impact and value of CCM in DM care at a primary healthcare (PHC) setting in Qatar.

**Methodology:** Phase I of this project was a multiple-time series, retrospective, observational study with a control group among patients with DM who received care at Qatar Petroleum Diabetes Clinic (QPDC) in Dukhan. The impact of CCM on glycemic control, blood pressure, lipid profile, and anthropometric parameters was evaluated at baseline and up to 17 months of follow-up. Patients were retrospectively categorized as intervention group if they received CCM and appropriate follow-up (n = 168) or usual care if they did not receive CCM and appropriate follow-up (n = 86). Quantitative data were analyzed descriptively and inferentially using the Statistical Package for the Social Sciences software. Phase II was a qualitative exploration of healthcare professionals'

(HCPs') and patients' perspectives on the value of CCM provided at the center. Twelve patients and twelve HCPs participated in semi-structured one-to-one interviews. Qualitative data were analyzed and interpreted using a deductive coding thematic analysis process.

**Results:** Patients in the intervention and control groups had similar baseline sociodemographic and clinical characteristics. The provision of CCM resulted in statistically significant improvements ( $p < 0.05$ ) in mean values (baseline vs. 17 months) of glycated hemoglobin A<sub>1c</sub> (6.9% vs. 6.5%), random blood glucose (194 mg/dL vs. 141 mg/dL), low-density lipoprotein cholesterol (3.7 mmol/L vs. 2.8 mmol/L), total cholesterol (5.4 mmol/L vs. 4.3 mmol/L), weight (78.5 Kg vs. 77.9 Kg), and body mass index (30.4 Kg/m<sup>2</sup> vs. 30.2 Kg/m<sup>2</sup>) over 17-months within the intervention group; whereas, no significant changes occurred within the control group. Similarly, the between group comparisons demonstrated the superiority of CCM over usual care in improving several clinical outcomes. The qualitative phase resulted in 14 different themes under the predefined domains: components of CCM (five themes), the impact of CCM (three themes), facilitators of CCM provision (three themes), and barriers of CCM provision (three themes). The majority of the participants indicated easy access to and communication with HCPs at QPDC. Participants appreciated the extra time spent with HCPs, frequent follow-up visits, and health education, which empowered them to self-manage DM. Generally, participants identified barriers and facilitators related to patients, HCPs, and healthcare system.

**Conclusion:** The implementation of CCM in a PHC setting improved several DM-related clinical outcomes over a 17-month period. The providers and users of CCM had an overall positive perception and appreciation of this model in PHC settings. Barriers to CCM such as unpleasant attitude and undesirable attributes of HCPs and patients, unsupportive hospital system, and high workload must be addressed before implementing the model in other PHC settings.

## DEDICATION

*I dedicate this thesis to the people who encouraged me to push myself to my fullest potentials; those who believed in me the most.*

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## CHAPTER 1: INTRODUCTION

### Background

Diabetes mellitus (DM) is one of the most significant global health issues of the 21<sup>st</sup> century that affects many people worldwide (1). It contributes greatly to the increased prevalence of cardiovascular diseases, working-age blindness, and renal disease (2). The global prevalence of DM in 2019 standardized for the age group 20-79 years was estimated to be 9.3% (463 million people) and predicted to rise to 10.9% (700 million people) by 2045 (3). With the global cultural and societal changes, type 2 DM has become the most prevalent form of DM. There is a direct proportional increase in DM-related complications (e.g. nephropathy, retinopathy, neuropathy, stroke, and cardiovascular diseases) with uncontrolled DM (4,5), resulting in enormous health and economic burden on healthcare systems (6–8). It is estimated that USD 760 billion are spent globally on the management of DM per year (3), having DM complications as the greater contributor to the economic burden rather than DM itself (2). DM and its complications resulted in 4.2 million deaths in 2019 (equivalent to one death every eight seconds), with 46.2% of deaths associated with people under the age of 60 years (working age group) (3). Unfortunately, DM has become the seventh leading cause of death globally, accounting for over 80% of all premature deaths due to non-communicable diseases (NCDs) (9).

The Middle East and North Africa (MENA) region was ranked the second highest region globally in terms of the prevalence of DM, with a current prevalence rate of 12.8% that is projected to increase to 15.7% by 2045 (3). In 2019, DM-related health expenses in the MENA region equaled USD 24.9 billion (3). The MENA region's proportion of all deaths due to DM is 53.3% in 2019 (3). The highest DM prevalence in the MENA region was found within the Gulf Cooperation Council (GCC)



countries. Kuwait had the highest prevalence (22%), followed by Saudi Arabia (18.3%) and Sudan (17.9%) (3). In Qatar, the prevalence of DM was 15.5% in 2019 (3), which is predicted to rise to 29.7% by 2035 (10). The prevalence rates of DM complications among Qataris between 2011 and 2013, particularly nephropathy, retinopathy, and neuropathy were 12.4%, 12.5%, and 9.5%, respectively (11). Within the MENA region, Qatar has the highest annual amount spent per patient (USD 1,751) (3).

Despite the advancement in healthcare services globally, healthcare is still fragmented and complex (12) and DM management is still challenging (13,14). These advances in healthcare, coupled with an increase in complexity of patient illness require a supportive work environment to address patients' needs and improve their health outcomes (15). The conventional care model, where physicians are the sole caregivers who address patients' needs, is challenged to deliver holistic DM care (16,17). Various constraints limit the ability of primary care physicians to meet all the healthcare needs of patients (18). Indeed, physicians experience high workload that affects the efficiency of their interactions with patients, which sometimes forces them to provide suboptimal care to avoid patients' irritation (19). In less than 60% of the time, physicians were able to appropriately educate patients about the frequency and dosing of medications and their adverse effects but not the duration of therapy (20). Studies also reported that in only 18–28% of the consultations, physicians educated patients on DM and the importance of self-management (21).

Healthcare teams involve a variety of healthcare professionals (HCPs) including nurses, physicians, pharmacists, dieticians, and others who share and combine their skills, expertise, and resources to provide comprehensive, patient-centered care to patients with DM instead of an episodic and disjointed form of care (12,22–24). HCPs were globally recognized for their ability to manage up to 47% and

77% of chronic and preventive care, respectively (18). Traditionally, healthcare system organization has not supported a culture of equality among the different healthcare professions and the system was built on a hierarchical philosophy (25). Collaborative Care Model (CCM) comprises multiple HCPs with different professional backgrounds working together in collaboration with patients, families, caregivers, and communities to deliver the highest quality of care (26). A major barrier to collaboration among HCPs is the apparent differences in their educational preparations (27) as well as marked differences in their scope of practice. As the healthcare and educational system recognized the lack of cooperation, HCPs started to focus on effective communication, collaboration, and mutual respect, capitalizing on each member's strengths and emphasizing on the effectiveness of team functioning (28,29). This is achieved through the concept of interprofessional education (IPE) and collaborative practice. Although each member of the healthcare team possesses a unique role, they all share a common mindset of patient-centeredness regardless of their diverse, yet similar, educational and clinical preparations. Despite the unique differences, the team approach aims to provide high quality and safe healthcare (30). No DM management approach, neither a novel oral or injectable agent nor a medical device, is as important as the services of a specialized DM healthcare team.

Several reputable professional DM associations and organizations have recognized the importance of healthcare teamwork in managing DM. The American Diabetes Association (ADA) identified several strategies to improve DM management, including, the provision of chronic care interventions by healthcare teams and coordinating visits using a team-based approach during which patients with DM receive health education (12) and learn how to cope with DM complications (31). The synergy and efficiency of healthcare teams are facilitated by the participation of HCPs, patients,

and their families (32). Accordingly, well-organized multidisciplinary teams reduce HCPs' burnout and increase patient satisfaction (18). Having compassionate HCPs in the DM healthcare teams promotes effective patient guidance, behavioral change, and adherence to medications. Indeed, patients were more likely to disclose nonadherence behavior when dealing with compassionate HCPs (20).

There is a substantial body of evidence highlighting the positive impact of CCM in reducing medical errors and improving patients and health system outcomes (6,12,16,33–36). Education and self-management support provided by nurse practitioners as part of a collaborative team helped 50% of patients to achieve target glycated hemoglobin A<sub>1c</sub> (HbA<sub>1c</sub>), 95.6% to achieve a target systolic and diastolic blood pressure (BP), and 57.8% to achieve target low-density lipoprotein cholesterol (LDL-C) (37,38). Similarly, the addition of pharmacists to the healthcare team reduced HbA<sub>1c</sub>, fasting blood glucose (FBG), body mass index (BMI), weight, BP, hospitalizations, risk of DM-related complications, and mortality (39–42) as well as improved patients' knowledge about DM and its complications, its treatment, self-monitoring (7), and their quality of life (QoL) (33,43,44). Although the value of each healthcare team member is well-recognized globally, multidisciplinary team collaboration in primary healthcare (PHC) settings is still underutilized due to non-referral and lack of perceived need for the service (45).

The priorities of healthcare systems have shifted significantly from a reactive approach to a proactive one in many chronic diseases management in PHC settings to improve population health by preventing emergency department utilization for non-emergent or preventable situations and reducing readmissions after hospital discharge (20). A substantial proportion of preventable emergency department utilization by patients with DM was due to insulin-related decompensations that directly reflects poor

medication self-management and medication nonadherence (20). These preventable emergency and secondary care visits can be appropriately addressed in PHC settings.

The magnitude of the burden of NCDs means that the management of these diseases by specialists or hospitals alone is no longer feasible (46). Individuals with or at risk of developing NCDs require proactive, individualized, and continuous healthcare, which can only be given equitably by PHC providers (47). PHC settings are the most suitable for chronic diseases management as they provide continuity of care and information sharing to aid the coordination of patient care and support in medical decision-making (47). PHC centers offer the greatest potential to detect and screen people at high risk and offer the possibility to prevent the progression of disease (46). The large number of patients with DM may potentially overwhelm referral systems, resulting in high cost for both the individuals and the healthcare system. Hence, PHC is a practical, effective, and equitable option for patients with DM who are in need of healthcare (46).

Qatar has long recognized the importance of DM management in PHC settings. Several national strategies were developed to address this issue. For example, the Qatar National Health Strategy 2018-2022 aims to provide a comprehensive healthcare system through different strategies, including the National Primary Care Strategy 2013-2018 and the Qatar National Diabetes Strategy 2016-2022 (48). The latter two strategies assure DM health promotion, education, and counseling (48) within a comprehensive, integrated, and person-centered PHC services provided in partnership with individuals, families, and communities to advance health and well-being (48).

## Study Rationale

Healthcare has been shown to be delivered in segregation by individual members of the healthcare team rather than collaboratively (21). Promoting a shared healthcare vision is not a new concept, and fostering of a collaborative work environment has been the driving force behind healthcare delivery for decades (21) in acute healthcare settings, but not in PHC settings (49). There is a dearth of literature on the need for a collaborative healthcare practice to address the needs of patients with complex and chronic health conditions (50). Although global evidence supports the positive impact of CCM offered for patients with DM in PHC settings, it is unknown if such interventions would improve patient outcomes in a PHC setting in Qatar. Furthermore, the perspective of HCPs and patients regarding the value of CCM in DM management in PHC settings in Qatar is unknown. To our knowledge, there were no previous studies in Qatar investigating the impact of CCM on DM outcomes and the perspectives of HCPs and patients regarding CCM's value in PHC settings.

## Research Questions

### Phase I:

- What is the impact of CCM on the outcomes of patients with DM followed-up in PHC settings?
- Are there differences between pre- and post-intervention delivered by the collaborative healthcare team on selected outcome measures?

### Phase II:

- What is the perception of HCPs and patients on the value of CCM on DM care in PHC settings?
- What are the facilitators and the barriers to the provision of CCM in PHC settings

and practical solutions to tackle them?

### Study Objectives

The overall objective of this study was to explore the value of CCM and its impact on DM outcomes in PHC settings in Qatar. The project was conducted in two phases: Phase I was a quantitative collection of patient data through electronic medical records, while Phase II focused on the qualitative assessment of the value of CCM.

#### *Specific Objectives for Phase I*

- I. To characterize the clinical profile including DM-related comorbidities and complications of patients with DM attending an ambulatory DM care clinic at a PHC center.
- II. To evaluate the impact of CCM on glycemic control (HbA<sub>1c</sub> and FBG) among these patients.
- III. To evaluate the impact of the CCM on other disease-related outcomes comprising lipid profile, BP, and body mass index (BMI).

#### *Specific Objectives for Phase II*

- I. To explore the perspectives of HCPs and patients regarding the value of CCM in DM management in PHC settings.
- II. To determine the facilitators and the barriers to the optimal application of CCM in DM management in PHC settings.

### Study Significance

In general, there is a lack of data about the benefits of providing CCM to patients with DM in PHC settings in Qatar. This study will describe the components of the CCM

provided by HCPs in Qatar Petroleum Diabetes Clinic (QPDC), which can guide in the implementation of CCM in ambulatory settings if proven to be effective. Managing and controlling DM will help in reducing the complications, risks of hospitalizations, and medication overuse associated with the disease, resulting in cost-savings and better resource utilization.

This study is targeting a national priority in Qatar as per the Qatar National Health Strategy that emphasizes patient-centered care provision (51,52). The study will also promote a research culture in the PHC settings and therefore contribute to evidence-based practice.

Dissemination of the project findings to stakeholders (health-policy makers, primary care HCPs who manage patients, and patients) with recommendations on how to improve CCM provision will draw more attention to the impact of interprofessional collaboration and education and will lead to optimal utilization of this care model.

## CHAPTER 2: LITERATURE REVIEW

### Background

This chapter presents a review of the literature about the impact of CCM on DM outcomes in PHC settings and the perspectives of stakeholders (HCPs and patients) on the value of such care. The chapter starts with an introductory section about the different terminologies used to describe interprofessional collaboration among HCPs, followed by a review of the collaborative care competencies with a particular emphasis on communication, an important competency that is often overlooked in the literature. Furthermore, a thorough presentation of the impact of the involvement of different HCPs to the healthcare team on DM outcomes is presented.

### Definitions and Terminologies Associated with Collaborative Care

The culture and practice of collaborative care begins with IPE, a foundation that starts in HCP education programs. According to World Health Organization (WHO), "Interprofessional education occurs when students from two or more professions learn about, from and with each other to enable effective collaboration and improve health outcomes" (26). Therefore, IPE provides an opportunity for HCP students to learn "about, with, and from each other" to improve collaboration and quality of patient care when they move into practice (53). It is believed that when these students graduate and join clinical practice, they will be able to translate the skills gained from IPE into collaborative practice.

The College of Pharmacy at Qatar University has implemented several IPE initiatives that meet international accreditation requirements (54). HCPs in Qatar had a positive attitude towards these IPE initiatives, which is essential to successful implementation of interprofessional collaboration (55). Although relatively much has been reported about IPE in Qatar, the literature pertaining interprofessional practice in



Qatar is limited.

There are various terms used to represent collaboration among HCPs that indicates a lack of consistency or consensus in their usage in literature (56). These terms include intraprofessional, multidisciplinary, multiprofessional, interdisciplinary, interprofessional, transdisciplinary, and transprofessional collaboration. Some of these terms have a visible distinction and use, while others are usually used interchangeably. Agreement on terminology to describe collaboration among HCPs seems essential to serve as a shared basis for education, research, and practice (56).

Disciplines are described as “individual sciences that study different subjects independently of each other”, while professions are defined as “a service occupation relevant to society” (56). A profession links between theory and practice by applying the scientific knowledge of a particular discipline in actual practice settings (56). The term profession is thus used for practically applied disciplines: medicine is a discipline; a physician represents a profession (56).

The prefixes “multi”, “inter” and “trans” refer to the nature or intensity of the collaboration. The cooperation within a single profession is denoted as intraprofessional collaboration (56). Multidisciplinary collaboration means the involvement of more than one discipline in one activity (57). Multiprofessional collaboration describes the cooperative work of several professions together, but most of the time, they practice independently (56). Interdisciplinary collaboration designates the overlap of scientific fields, whereas interprofessional collaboration represents the sharing of skills, expertise, and diagnostic modalities among different professions to collectively achieve better outcomes (12). The latter two terms are used in the literature frequently and interchangeably, even within a single article, especially in the literature of the collaboration of physicians with other HCPs (56). Transdisciplinary practice is

when students from diverse disciplines utilize their unique knowledge and skills and apply them in a specific setting (58). When HCPs jointly communicate, exchange ideas, and work together from the beginning to address patients' needs, then this form of teamwork is called transprofessional collaboration (56). Other terms like team-based care represent a group of various professionals collaborating regularly about the care of a specific group of patients (e.g. PHC team, operating room team, etc.) (12,59).

### Collaborative Care Competencies

Collaborative care competencies assure the integration of knowledge, skills, values, and attitudes that aid team working within and among professions, and with patients and their families to improve health outcomes (59). Setting competencies is needed to facilitate professionals' lifelong learning, evaluate the difference between interprofessional educational core competencies and practice needs, and inform professional credentialing bodies in defining potential testing content for collaborative practice. There are several types of competencies from an interprofessional perspective (Figure 1). "Common" competencies are those expected of all healthcare professionals. "Complementary" competencies enhance the qualities of other professions in providing overlapped care. "Collaborative" competencies are those needed by each profession in order to work with other professions, patients, families, and communities (60,61). A particular focus on collaborative competencies will be discussed in this chapter.

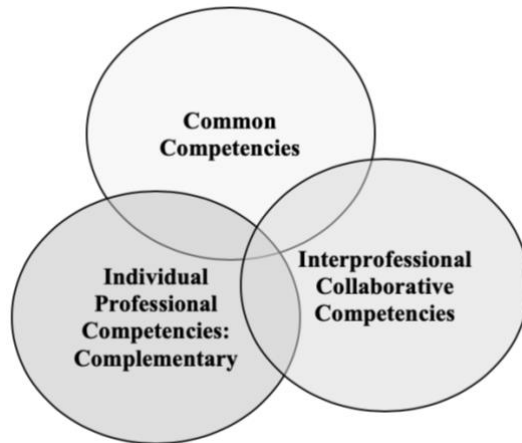


Figure 1. Types of collaborative competencies.

Source: Barr's (1998)

The Institute of Medicine (US) Committee on the Health Professions Education has proposed a set of core competencies that should be possessed by all HCPs to meet the needs of the 21<sup>st</sup> century patients (61). These competencies include providing patient-centered care, working in interdisciplinary teams, employing evidence-based practice, applying quality improvement, and utilizing informatics in effective communication (Figure 2) (61).

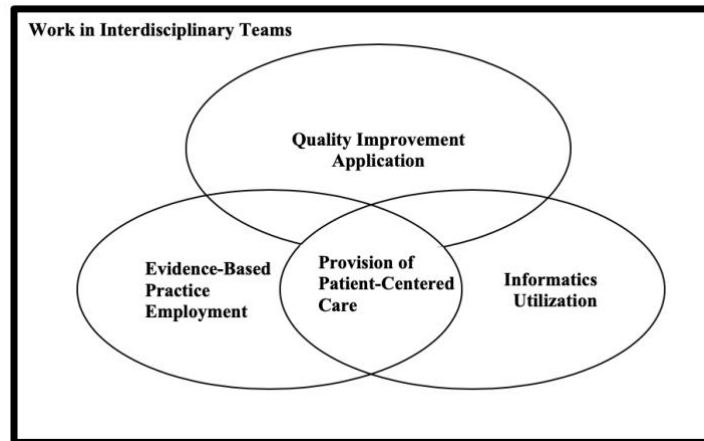


Figure 2. Overlap of care competencies for health professions.

Source: The Institute of Medicine (2003)

Effective communication among HCPs aids in enhancing the clarity within the team, anticipating and avoiding medical errors, improving service provision, and promoting continuity of care (62,63). Owing to the unique communication approach of each profession, accurate decision-making requires the sharing of patients' information at the right time through the appropriate communication with other team members (12). In the absence of face-to-face communication among HCPs, electronic health record (EHR) serves as a tool to ensure appropriate collection and sharing of patients' health data, thus, the provision of patient-focused care (12). Moreover, EHRs enable HCPs to perform an in-depth analysis of the processes by tracking patient outcomes to determine the efficacy of CCM (12,30). Fortunately, patients with poor health outcomes and infrequent follow-up visits can be easily detected through EHRs (20). Despite the benefits of patient records, the patient-provider relationship can be affected by EHRs. Physicians are obliged to enter patient data into EHRs, which may compromise the time allocated for clinical interaction and the quality of patient-centered communication, especially for clinicians with poor communication and computer skills (20). Although communication is a crucial aspect of CCM, the literature rarely discusses means of

communication, as reported by one systematic review (SR) (21).

#### Interprofessional Collaborative Team Composition and Role Clarification

No single professional discipline has the capacity and the ability to efficiently address the complex healthcare needs of all patients with DM. Complex healthcare needs require continuous management that is obtainable from a wide range of HCPs. There are many other healthcare professionals, besides physicians, who have a valuable role in DM management. Nurse practitioners, pharmacists, podiatrists, optometrists, dietitians, certified DM educators, case managers, social workers, mental health professionals, and other professionals' addition to the healthcare team were deemed beneficial (12). Appropriate collaboration between physicians and the above-mentioned professionals who possess varied and unique expertise may significantly improve DM management to not only include treatment provision and counseling, but also address self-care, lifestyle habits, and prevention of complications (12,21). Moreover, a significant reduction in the percentage of patients with no improvement in HbA<sub>1c</sub> was reported in the literature as a result of equal discipline participation without a designated leader (30).

The literature has not specified a fixed number or composition of collaborative healthcare teams, but the goal is to utilize the necessary HCPs for individualized patient cases efficiently. Healthcare team composition typology was comprehensively reported in a SR of 109 articles (64). The types mentioned in the review include, but not limited to, specialized teams of a primary care physician and a specialist, multidisciplinary teams of a physician–nurse duo, and physician–nurse–pharmacist triad (64).

In the same SR, the authors have identified three roles within the healthcare team as the most relevant in primary care: the clinical leader, the case manager, and the

expert consultant (64). Physicians and pharmacists usually fulfill the clinical leader role, especially in cardiovascular-related diseases and medication management, respectively (65,66). The second role aims to improve usual practice by coordinating healthcare teams, monitoring patients' progress (67,68), counseling patients, ensuring adherence to medications (67,69), and empowering patients to self-monitor their condition (70). Nurses have been commonly reported in the literature as case managers for the healthcare team (71,72). The role of the expert consultant is particularly prominent in the care of elderly patients who have a high prevalence of comorbid and psychological conditions, thus, demand for the intervention of geriatricians (73,74) and psychiatrists or psychologists to serve (67,75–77).

#### Profession-Specific Role and Impact on Diabetes Outcomes

One critical component of facilitating a collaborative working relationship among HCPs is to understand the roles and responsibilities of other members of the healthcare team (20). Role clarification was identified as a critical feature for developing strong interprofessional relationships by various collaborative care competency frameworks (78,79). Role clarification means that HCPs recognize and respect other practitioners' roles and scope of practice (80). Confusion about other HCPs overlapping role and their applications can lead to conflict and lack of trust (81). Avoiding the occurrence of such confusion requires the participation of all HCPs in regular team meetings that allow them to negotiate a mutual understanding of their roles and functions in order to build a better working relationship and set common goals (23). In the upcoming sections, the role and impact of selected HCPs will be discussed.

### *Nurse*

Nurses hold a central role in collaborative healthcare teams to provide safe, efficient, and effective patient-centered care to patients with complex health conditions (82). They are recognized as key players in the development of policies, implementation of change, provision and coordination of patient care, and measurement of healthcare improvement (12,23). Certified nurses as diabetes educators have specialized knowledge in DM and offer support and advice between appointments on lifestyle changes and blood glucose (BG) monitoring to patients with DM (12). The literature is supporting the involvement of certified diabetes nurse educator in the primary care teams as they enhance the link among HCPs, participate in the prevention of DM, and guide patients on self-monitoring leading to reduction in DM long-term risks (83), including hospital readmissions (84).

### *Diabetes Case Manager*

Case managers are assigned the authority to oversee, coordinate, and implement care (85). The literature showed that case managers were able to close the physician-identified knowledge gaps between patients diagnosed with DM and their attendance to DM clinics (83). Case managers ensure the adaption of evidence-based practice, promotion of advancement of DM therapy management, and support of patients' self-management practices (83,86), leading to meaningful improvement in glycemic control (87,88).

### *Counselor and Social Worker*

The majority of DM management guidelines overlook the psychological need of patients with DM while focusing exclusively on the medical aspect of the initial

management (89). DM impact the psychological and social wellbeing of individuals living with it, consequently impacting one's ability to manage DM. Therefore, managing the psychological and emotional side of DM is very critical. Counselor and social worker are examples of health workers who can address the psychological needs of patients with DM (90).

Counselors explain various health options to patients and empower them to set achievable goals that will ultimately lead to appropriate action-taking (91). Studies have shown that DM counselors led to significant improvement in patients' postprandial blood glucose levels and a reduction in their lipid profile (91). Social workers help patients overcome social determinants of health including stressful life events, relationship conflicts, disabilities, violence, inadequate housing, and work problems *via* a variety of techniques (e.g. mindfulness and narrative therapy) (92). Patients who meet social workers have greater reductions in HbA<sub>1c</sub> and LDL compared to patients who do not (92).

### *Pharmacist*

Pharmacist's role was traditionally restricted to medication dispensing. However, pharmacists now have the opportunity to participate in direct patient care as part of healthcare teams, particularly in chronic diseases management (93). Pharmacists and DM educator pharmacists are instrumental in the management of patients with DM because of their ability to provide disease education, medication therapy management, and promote patient medication adherence. They can also support physicians and nurses by providing evidence-based drug therapy recommendations and serving as a drug information resource (94). Engaging pharmacists in the healthcare team were shown to significantly improve FBG, HbA<sub>1c</sub>, and BMI and enhance patients' understanding of



diseases, medications, and self-care activities (12,95,96).

*The Impact of Pharmacist Care on Diabetes Outcomes in Primary Care Settings: An Umbrella Review of Published Systematic Reviews*

A comprehensive umbrella review of published systematic reviews (SRs) was conducted to investigate the impact of adding a pharmacist to the healthcare team on DM outcomes in PHC settings (97). PubMed, EMBASE, Scopus, Database of Abstracts of Reviews of Effects, Cochrane Library, Joanna Briggs Institute (JBI) Database, Google Scholar, and PROSPERO were searched using the following terms combined using Boolean connectors (AND/OR): (pharmac\*, multidisciplinary, collaborat\*, interprofessional) AND (care, service, intervention) AND (DM, diabetes mellitus, type 1 DM, type 2 DM) AND (primary care, primary healthcare, ambulatory, outpatients, community) AND (systemati\* review, meta-analysis, summary, narrative, literature, review, overview, rapid review, scoping review, umbrella review).

Reviews were included if they reported one or more of the following outcomes: clinical outcomes (HbA<sub>1c</sub>, FBG, body weight, BMI, BP, lipid profile [LDL-C, high-density lipoprotein cholesterol (HDL-C), triglycerides (TG), total cholesterol (TC)], humanistic outcomes (QoL, satisfaction with pharmacist interventions, perception regarding pharmacist interventions), and economic outcomes (cost-benefit and cost savings resulting from the pharmacist intervention).

The initial search identified 1,134 hits from the electronic databases. Out of the 1,134 articles, 89 duplicates were removed. Of the remaining 1,045 hits, 23 articles were potentially eligible for inclusion based on title and abstract screening. Sixteen articles were excluded for one of the following reasons: service not provided in a PHC setting, not focused on DM, or not focused on pharmacist interventions.

The exact role of the pharmacist in the multidisciplinary team or the nature of the intervention provided to patients with DM in PHC settings, being pharmacist-led or pharmacist-involved interventions, widely varied among the reviews. All of the seven SRs categorized the service as either pharmacist-led or pharmacist-involved DM care in PHC settings, except one review (98) that did not categorize the nature or extent of the service despite the inclusion of pharmacists in the healthcare team. Four SRs (98–101) reported the nature of pharmacist interventions, of which only one (100) conducted and published a meta-analysis of the impact of each intervention on HbA<sub>1c</sub>. Educational and clinical interventions by pharmacists were the most common types of interventions reported across SRs. A framework of the various pharmacist interventions in DM care at PHC settings reported in the included reviews is illustrated in Figure 3.

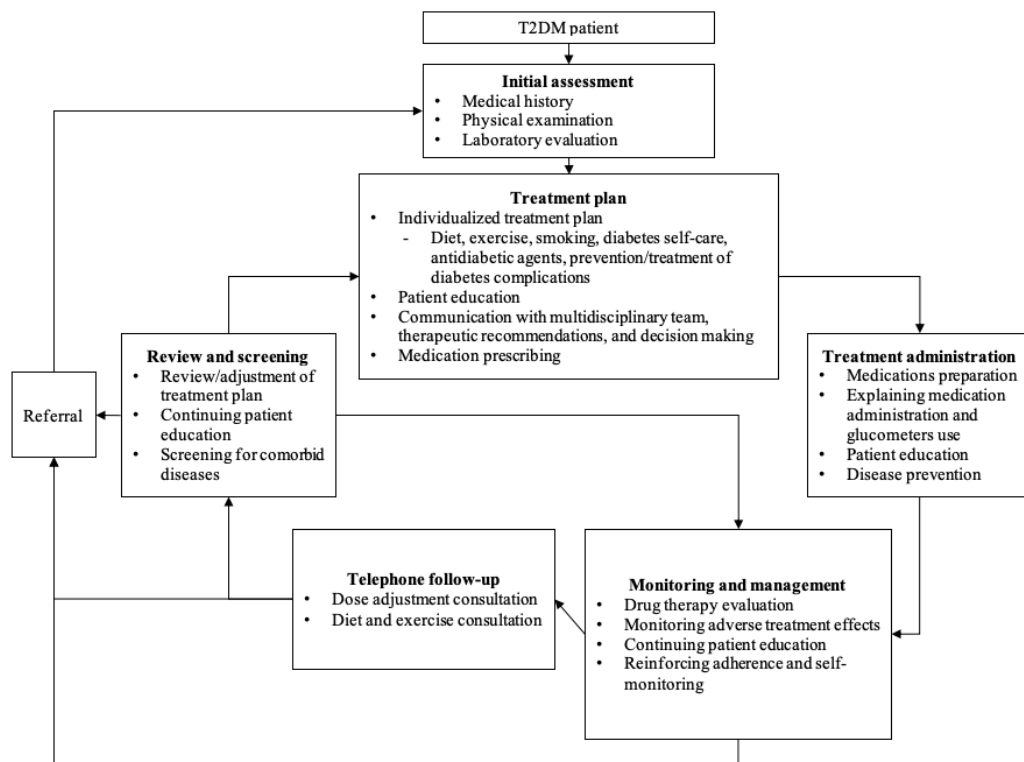


Figure 3. A framework of pharmacist interventions in DM care in primary healthcare settings.

Improvements in HbA<sub>1c</sub> was the most reported clinical outcome of pharmacist intervention in the literature (39,98,100–103). Only one (99) of these reviews did not report HbA<sub>1c</sub> as a clinical outcome, but reported improvements in medication-related problems, morbidity, and mortality instead. Pharmacist interventions also resulted in favorable significant improvements in FBG, BP, BMI, LDL-C, HDL-C, TC, and TG in more than 50% of the SRs.

Humanistic outcomes including QoL were evaluated by three SRs (99,100,103), and patients' attitude towards pharmacy services was assessed by one SR (102). However, one SR (99) reported a lack of benefit of DM care by pharmacists on patients' QoL and satisfaction with the service provided. Due to the variability in the type and nature of humanistic outcomes assessment tools (generic versus disease-specific)

among primary studies, the authors were unable to draw a final conclusion.

Only three SRs (98,99,102) assessed the impact of pharmacist interventions on DM-related economic outcomes. One of these reviews showed that pharmacist interventions resulted in significant cost-saving (ranging from \$8-\$85,000 per person per year) as well as significant service cost beneficence (benefit-to-cost ratio ranging from 1:1 to 8.5:1) according to the 2014 US dollar (98). The other two reviews reported simple cost analyses.

#### Perspectives of Healthcare Providers and Patients on the Value of Collaborative Care in Diabetes Management

The perceptions of CCM providers (i.e. HCPs) and recipients (i.e. patients with DM) have been inadequately investigated and reported in the literature. A qualitative study showed that physicians perceived interprofessional teamwork as an enabling factor for delegating patient education to nurses and DM educators and monitoring DM medications to pharmacists (104). Physicians valued the positive impact of engaging other HCPs in medication management represented in the delegation of medication monitoring and consultations to other HCPs as well as improved patient knowledge and health outcomes (19,105). Nevertheless, pharmacists also expressed that working in a team that includes community health workers had produced positive clinical outcomes in patients with uncontrolled DM (104).

Some patients with DM felt that there is no need to seek further engagement with other HCPs as their healthcare needs were adequately met by one HCP (106). However, patients had a favorable opinion about and high satisfaction with their disease management and collaborative treatment after participating in the CCM (37,106,107). Moreover, patients receiving CCM appreciated the additional time spent with the general practice nurse (37).

As a conclusion to this chapter, DM is a complex chronic disease that cannot be adequately managed by a single healthcare profession. Optimal DM management requires the valuable input of each member of the healthcare team. Healthcare settings requiring multiple practitioners to collaborate and support patient care can benefit from additional evidence showing the benefits of collaboration and collaborative efforts.

## CHAPTER 3: METHODS

### Phase I: The Impact of a Collaborative Care Model in Diabetes Management in a Primary Healthcare Setting

#### *Study Design*

This phase was a multiple-time series, retrospective, observational single-center study with a control group among patients with DM who attended QPDC. EHR clinical data of patients with DM attending QPDC were retrieved retrospectively. The study design is illustrated in Figure 4, where “O” denotes outcome measures, “X” denotes CCM provision, and “~X” denotes usual care (no CCM).

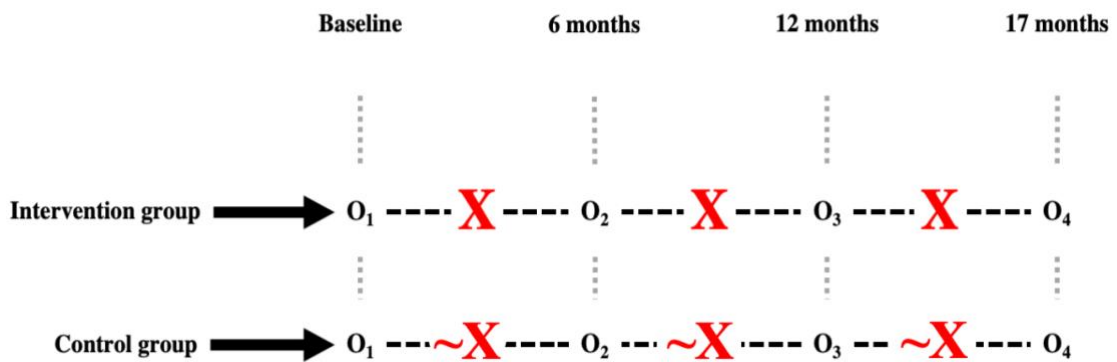


Figure 4. Multiple-time series study design.

#### *Study Setting*

This study was conducted at the QPDC in Dukhan. QPDC was established in 2007 as part of Qatar Petroleum Medical Center (QPMC) in Dukhan. QPMC offers a variety of healthcare services to QP employees and their families, and other members of the community including Qataris and residents. To our knowledge, the QPDC is the only specialized clinic in Qatar where HCPs optimally offer CCM since 2007 for patients with DM. QPDC operates on Mondays and Wednesdays, with an open walk-in policy.

The clinic is staffed by a multidisciplinary team consisting of physicians, nurses, and pharmacists who have an adequate educational background and professional experiences in DM management. The DM team typically provides personalized patient education, develop treatment priorities, and design appropriate action plans in consultation with the patient. Patients attend individualized and regular follow-up visits at least every month. The patients are not allocated a specific time for consultation, but consultations rarely exceed 30-40 minutes compared to inadequate 20 minutes consultations at other PHC centers across the country with minimal interaction with nurses and pharmacists. During these consultations, patients receive comprehensive and standardized management for DM including screening of DM, routine assessment and treatment, and early detection and care of complications such as neuropathy, retinopathy, nephropathy, and cardiovascular diseases. More details about how collaborative care is provided in QPDC Dukhan are provided under “*Description of Collaborative Care Model versus Usual Care at QPDC*”.

#### *Study Population and Eligibility Criteria*

The study included all adult patients (18 years or older) diagnosed with type 2 DM and followed up at QPDC. Patients were included in the study regardless of their DM-related complications, comorbidities, and adherence to the treatment plan to eliminate the influence of external factors on patients’ progress beyond the clinical team’s collaboration patterns.

#### *Sample Size and Sampling Technique*

G-Power® software computed a sample size of 82 patients based on an effect size of 0.4% difference in HbA<sub>1c</sub>, an alpha of 0.05, and a power of 90%. After adding

20% of patients to account for missing or incomplete data, the sample size per group increased to ~100 patients. However, we applied universal sampling approach to include all patients who satisfied the previously stated eligibility criteria. Therefore, there was no specific sampling technique applied in selecting the subjects included in the analysis.

*Description of Collaborative Care Model versus Usual Care at Qatar Petroleum  
Diabetes Clinic*

*Healthcare Professionals' Qualifications*

Physicians at QPDC are well aware of the importance of CCM in DM management. Therefore, they are open to suggestions and discussions with other HCPs for the benefit of the patients. The nurse is a certified DM educator practicing in this clinic since 2007. The pharmacist has at least 10 years of experience practicing in this setting and has relevant credentials in DM education and providing direct patient care functions. HCPs follow QP company's work ethics and policies, serving as a guideline and a reminder to HCPs. A scanned copy of these documents is available in Appendix F.

*Continuous Professional Development*

At QPDC, one-hour long continuous professional development (CPD) sessions are conducted weekly to update the HCPs regarding various health topics. The HCP staff have the autonomy to recommend specific topics as well. HCPs' performance on CPD topics is assessed *via* a pre-post quiz in order for them to receive continuous education and license renewal points. QP CPD sessions are independent of those offered at Hamad Medical Corporation (HMC). However, they are accredited and



approved by Qatar Council for Healthcare Practitioners (QCHP). HCPs at QPDC can also attend CPD events at other institutions such as HMC (108) and Qatar University (QU) (109).

### *Shared Medical Appointments*

Due to the growing demand for high-quality healthcare services, HCPs are pressured to meet more patients per day, which reduces the time allocated per patient to as short as 10-17 minutes (110). Consequently, HCPs briefly consult patients on numerous aspects of DM, up to 17 topics, in 17 minutes (110). The rushed medical services cannot offer sufficient health education and counseling to patients with DM. Shared medical appointments, as practiced in QPDC, addresses the various medical and educational needs of patients with DM in a single appointment instead of scheduling a separate appointment with each HCP (111).

### *Process of Care*

The process of care at QPDC starts with patient's contact with the pharmacist. The patient handles his/her glucometer to the pharmacist to print the BG data stored in the device. The pharmacist gives encouraging phrases like "*perfect readings; excellent; continue the same diet and lifestyle*" to patients who show improvement in their BG reading, and comfort patient who do not, by saying "*we will help you control your BG; you need to improve your lifestyle*". The monthly and weekly glucometer data is saved on the system by the pharmacist for sharing information with other HCPs. Then, patients handle their reports to the specialized nurse educator.

The nurse provides a brief focused consultation on health and lifestyle as well as examinations of anthropometric parameters and laboratory tests. The nurse assists

patients in self-evaluating BG reading by highlighting the above-target, within-target, and below-target readings.

The patient then meets with the physician for further assessment and initiation, refill, or modification of medication therapy, as appropriate. Physicians initiate the collaboration process by referring patients, especially those with uncontrolled DM, back to the pharmacist for DM management and non-didactic health education. Finally, the patient ends with seeing the pharmacist again for thorough medication reconciliation and assessment of the patient's health status and lab results. After reviewing the medication list, BG log, and laboratory values, the pharmacist provides guideline-directed therapeutic recommendations to the provider to add, stop, or change doses of any oral or injectable medications per the current clinical guideline for type 2 DM management. After the discussion, the pharmacist implements a suitable therapeutic plan for the patient. In addition, the pharmacist assesses patients' DM knowledge, level of DM self-care, and lifestyle habits and educate the patient on the treatment plan, lifestyle adjustment, acute management protocols, and self-management of the disease. The self-management advice at QPDC closely aligned with the reported theoretical framework of interventions for patient-self management of type 2 DM in Qatar (112) (Figure 5). The HCPs also address other comorbidities in each visit including hypertension, dyslipidemia, and obesity for comprehensive cardiometabolic management.

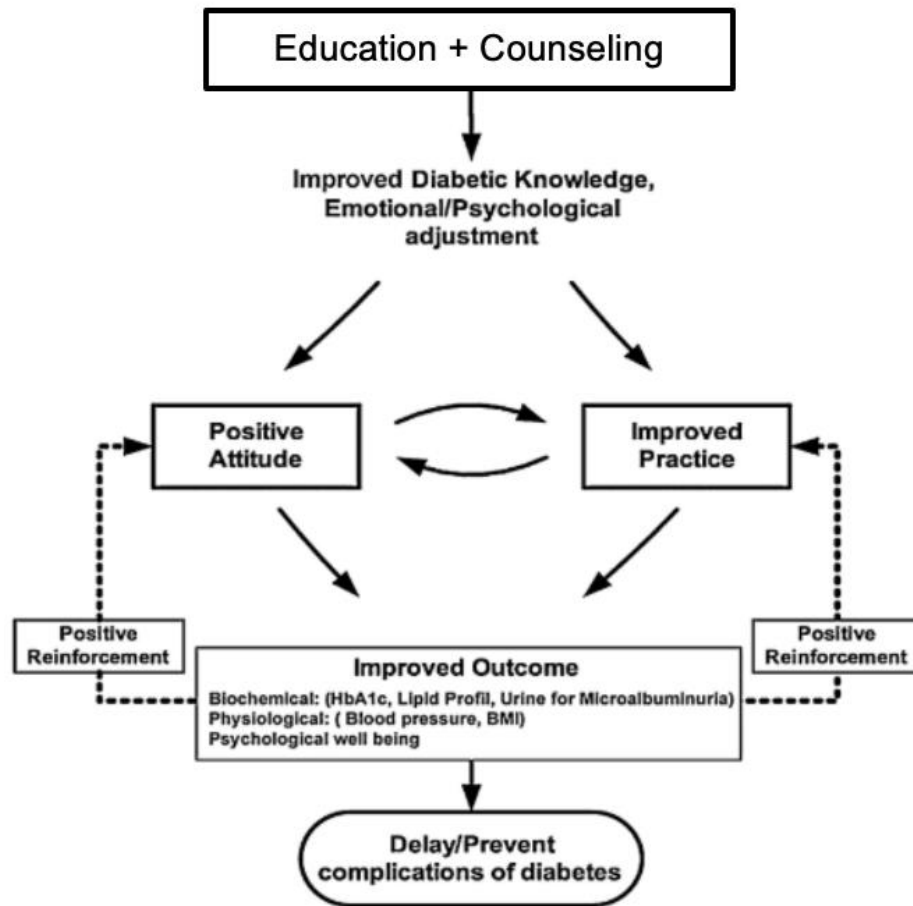


Figure 5. A theoretical framework of interventions for patient-self management of type 2 DM in Doha, Qatar.

Source: Mohamed (2013)

This collaborative practice demonstrated a work-load shift that appropriately utilizes the potentials of nurses and pharmacists without compromising the patient-physician relationship.

### *Family Education*

HCPs in QPDC provide patient and family education on DM, medications, and lifestyle changes using various tools including pictograms and audiovisuals (100-inches high-resolution television monitor). What is unique about this clinic is the use of visuals

including posters on the clinic walls that illustrate all aspects of DM and the negative impact of DM on body systems. Such tools aid in engaging family members in support of the patients.

#### *The Use of Telehealth (Telephone Follow-up) at QPDC*

The 2018 Diabetes Canada Clinical Practice Guidelines recommend the use of telehealth in disease management (113). Telehealth is defined as the delivery of healthcare to patients without an in-person meeting (e.g. a telephone call). Telehealth facilitates patients access to expert DM care (114). At QPDC, the pharmacist provides telephone follow-up 24 hours, all days of the week, for all patients.

#### *Study Groups*

Patients receiving collaborative care in QPDC Dukhan from the physician, pharmacist, and nurse were included in the intervention group. In other words, patients who received the full process of care mentioned under the “process of care” section as described above are included in the intervention group, whereas patients who received the usual care provided by physicians only were included in the control group. The control group patients mainly visit QPDC to receive medication refills and basic instructions on medications use by pharmacists. Regardless of study groups, all patients receive at least an annual DM eye screening, renal function test, and foot examination. In addition, patients are also checked for other aspects of DM care including depression and annual influenza and pneumococcal vaccination status.

### *Outcome Measures*

Thirty-four indicators were utilized in the literature to evaluate DM outcomes: fourteen indicators for glycemic control, two indicators for early detection of glycemic complications, four indicators for treatment of glycemic complications, eleven indicators for cardiovascular diseases, and three indicators of QoL (115). However, HbA<sub>1c</sub> is considered the primary clinical indicator of DM control as per ADA; thus, HbA<sub>1c</sub> was set as the primary outcome measure in this study (95) as it represents the glycemic history of the patient over the preceding 120 days (116). The frequency of the HbA<sub>1c</sub> test depends on the patient's status, the treatment used, and medical judgment (30). Other outcomes that were collected in the study were FBG, random BG (RBG), BP, LDL-C, HDL-C, TG, TC, weight, and BMI. The data were collected starting from the first measurement of each patient (i.e. individualized baseline), meaning that not all patients have the same calendar service start date. The outcomes data were collected for the subsequent 17 months from the baseline, followed by averaging the values of each outcome every 6 months (i.e. 6-months, 12-months, and 17-months) to account for missing data and ease the data analysis process. This corresponds with the averaged values from months 1-6, 7-12, and 13-17, respectively.

### *Data Source*

Retrospective data for this study were directly obtained from the electronic Medical Information Management System (MIMS), the available EHR at QPDC. MIMS is an automated information system that manages all data related to patient care activities (117). Therefore, this study primarily aimed to determine the impact of collaborative care on the clinical outcomes of DM at a PHC center in Qatar, which can be described as a real-world study that involves pragmatic real-world data (RWD).

Real-world studies have become increasingly recognized for their power to provide evidence of treatment effectiveness in clinical practice. While randomized clinical trials (RCTs) are the “gold standard” for evaluating safety and efficacy of new therapeutic interventions, unavoidably strict inclusion and exclusion criteria may result in the selection of non-representative study participants that may considerably differ from the encountered patients in the actual clinical settings or real-world practices (118).

Data sources used in observational studies have expanded to include RWD as it strengthens observational research methodology (119). RWD is defined as “data obtained outside the context of RCTs, generated during routine clinical practice” (120). EHR, claim databases, and prospective or retrospective observations of diverse patient populations can be used to obtain RWD (118). Currently, most regulatory bodies and health organizations use real-world evidence (RWE) derived from analyzing RWD to improve healthcare decision-making. RWD is best suited for studies that evaluate the presence or absence of a pre-specified effect and its magnitude in a specific population. The results might lead to treatment recommendations if the RWE shows similar results to RCT despite the uncontrolled environment (120). Therefore, for phase I of the project, RWD retrieved from patients’ EHRs were used as the data source owing to their representativeness of the actual study population over RCTs.

The joint International Society for Pharmacoeconomics and Outcomes Research (ISPOR) and the International Society for Pharmacoepidemiology (ISPE) Special Task Force have identified seven recommendations to enhance the planning, conduct, and dissemination of studies using RWD (Figure 6) (120). These recommendations reassure the integrity of RWE and enhance the public and policy-makers confidence in RWE (120). The “√” and “X” symbols are used to indicate met and unmet criteria,

respectively. Project publication (recommendation 3) and replication (recommendation 4) as well as addressing methodological criticisms (recommendation 6) will be fulfilled in the future (“🕒” symbol).

- ✓ 1. *A priori*, determine and declare that a study is a Hypothesis Evaluation Treatment Effectiveness (HETE) study or an Exploratory study based on conditions outlined below
- ✗ 2. Post a HETE study protocol and analysis plan on a public study registration site prior to conducting the study analysis.
- 🕒 3. Publish HETE study results with attestation to conformance and/or deviation from the study protocol and original analysis plan. Possible publication sites include a medical journal, or a publicly available web-site.
- 🕒 4. Enable opportunities to replicate HETE studies (i.e., for other researchers to be able to reproduce the same findings using the same data set and analytic approach). The ISPE companion paper lists information that should be reported in order to make the operational and design decisions behind a RWD study transparent enough for other researchers to reproduce the conduct of the study.
- ✓ 5. Perform HETE studies on a different data source and population than the one used to generate the hypotheses to be tested unless it is not feasible (e.g., another data set is not available)
- 🕒 6. Authors of the original study should work to publicly address methodological criticisms of their study once it is published.
- ✓ 7. Include key stakeholders (patients, caregivers, clinicians, clinical administrators, HTA/payers, regulators, manufacturers) in designing, conducting, and disseminating HETE studies.

Figure 6. Recommendations for good procedural practices for the hypothesis evaluating treatment effectiveness studies.

### *Study Instruments*

A comprehensive data extraction/collection sheet was developed to collect the outcomes of interest from the patients' EHR (see Appendix A). The instrument was then validated using the opinion of two thesis supervisors and three HCPs at QPDC and piloted during the data collection phase. Two amendments were applied to the instrument to capture the clinical data from the patients' profiles better.

### *Data Collection Procedures*

Anonymous data collection of patients' socio-demographics (age, gender, type of DM, smoking and alcohol consumption), clinical characteristics (past medical and medication histories), laboratory investigations, and DM-related outcome measures (FBG, HbA<sub>1c</sub>, RBG, BP, lipid profile, and anthropometrics) was ensured. Therefore, all patient identifiers such as names, ID numbers, and date of birth were removed to ensure anonymity. Each subject was assigned a unique research code. The outcomes were retrieved from MIMS using the previously developed data collection form. The data were extracted to and coded on a Microsoft (MS®) Excel sheet and later migrated to IBM Statistical Package for Social Sciences (IBM SPSS®, version 26.0; IBM Corp, Armonk, NY, USA).

### *Statistical Analyses*

Data were analyzed using SPSS® and MS® Excel. Both descriptive and inferential statistics were applied as appropriate. Summary of statistics including frequencies (%), mean  $\pm$  SD, and median (IQR) were used appropriately to describe the demographic and clinical characteristics of the patients in both groups. Chi-square and Fisher's Exact tests were used to compare categorical outcome variables between the



two groups. For normally distributed variables, independent t- and repeated measures analysis of variance (ANOVA) tests were used, while Mann-Whitney *U*- and Friedman tests were used for non-normally distributed variables. Independent t- and Mann-Whitney *U*- tests were used for between-group analyses, whereas repeated measures ANOVA and Friedman tests were used for within-group analyses to determine the impact of the CCM on continuous variables. Comparisons were carried out using a significance level of  $< 0.05$  (two-sided *p*-value).

### *Ethical Considerations*

The QP's Health Department and QU Institutional Review Board (QU-IRB) approved the research proposal and the associated data collection tools (see Appendix B and C). Confidentiality of patients' data was maintained, and there was no disclosure of any identifiers. No patient consent was sought in this phase as in most retrospective studies of data collection.

## Phase II: The Perspectives of Healthcare Professionals and Patients on the Value of a Collaborative Care Model for Diabetes in Primary Healthcare Settings

### *Study Design*

This phase has an exploratory aim. Therefore, a qualitative approach was chosen, and semi-structured interviews were conducted with different HCPs and patients to explore their perspectives on the benefits of CCM in PHC settings. Qualitative research originated from social science disciplines such as sociology, psychology, and anthropology. It allows a deep understanding of human behavior and the underlying reasons, attitudes, and motivations that govern this behavior (121) rather than discretely explaining a phenomenon as in quantitative studies (122). However,

there were concerns about the robustness of this research design, which made it difficult to gain credibility in the health science disciplines (123). Over the past years, qualitative research was increasingly utilized in health literature as it succeeded in enriching the existing literature and led to policy and practice changes (123). Nevertheless, many researchers who utilized qualitative methods fail to report crucial aspects of the methodology (i.e. interpretative framework and philosophical assumptions) (124) and fail to appropriately comprehend methodological aspects of qualitative studies (e.g. describing “interviews” and “focus groups” as approaches to inquiry instead of data collection tools) (125).

In this section, the used interpretative framework, the philosophical assumptions, approaches to inquiry, data collection method, data analysis, and quality measures will be discussed.

#### *Interpretative Framework and Philosophical Assumptions*

Several scholars, researchers, and academics including Creswell and Winit-Watjana, Cohen, Bryman, and Silverman have defined interpretative frameworks and philosophical assumptions differently (126). For consistency and simplicity purposes, the definitions and classifications of Creswell and Winit-Watjana (126,127) will be considered in this study. The research question(s) must be linked to the appropriate interpretative framework and philosophical assumptions that will guide the study before selecting the appropriate approach to inquiry (125).

#### *Interpretative Framework*

Interpretative frameworks are simply the social research strategies that are based on the researcher’s reasoning and views of knowledge (125). According to

Creswell and Winit-Watjana, there are six types of interpretative frameworks as shown in Table 1 (126,127).

Table 1. Creswell and Winit-Watjana's Categorization of Interpretative Frameworks

<b>Interpretative frameworks</b>	<b>Definition</b>
Positivism	Exploration of the objective reality by conducting theory-based research.
Postpositivism	Conduct of research with cause and effect and <i>a priori</i> theories.
Social constructivism	Examination of the meanings of the world in a complex and subjective manner, while recognizing the effect of researchers' values and experiences on the research conduction.
Pragmatism	Acceptance of multiple realities and proposition of practical solutions to the investigated problem.
Transformative, feminist, critical	Focus on developing societies and marginalized clusters to overcome these phenomena.

Social constructivism was the most representative framework of the researcher's knowledge and perceptions and the utmost appropriate one to address the research question. A detailed discussion of this framework will follow in upcoming sections.

### *Philosophical Assumptions*

Philosophical assumptions are defined as different perspectives that underline the interpretative frameworks selected by a qualitative researcher (128). The selection of appropriate philosophical assumptions guides the researchers to the suitable interpretative framework to follow in their qualitative research. Table 2 shows the questions addressed by each assumption per Creswell and Winit-Watjana categorization (126,127).

Table 2. Creswell and Winit-Watjana's Categorization of Philosophical Assumptions

<b>Philosophical assumptions</b>	<b>Questions addressed</b>
Ontological	What is the nature of reality, being, or existence?
Epistemological	What is considered an acceptable knowledge?
Axiological	What is the influence of the researcher on attainable knowledge?
Methodological	What are the approaches to know the reality based on the researcher's reasoning?

Table 3 shows the clear distinction between interpretative frameworks based on their underlying philosophical assumptions (127), with clear illustrations in red under the selected framework (social constructivism) for this phase.

Table 3. Interpretative Frameworks and their Underlying Philosophical Assumptions

Philosophical assumptions	Interpretative frameworks			
	Positivism	Postpositivism	Social constructivism	Pragmatism
Ontological	A single, objective and external reality exists with universal laws used to describe it	A single reality exists beyond ourselves, but it is known only imperfectly and probabilistically	Multiple realities are constructed through experiences and interactions – <b>HCPs and patients had different perspectives about CCM because of variable demographics, education, and experiences.</b>	Reality is what is useful, practical and works well
Epistemological	Reality in the form of facts can be measured using reliable and valid tools	Reality can only be approximated through research and statistics	Reality is constructed between researchers and participants – <b>The researcher negotiated their subjective meanings with those of the participants.</b>	Reality is known through objective and subjective evidence
Axiological	Researchers are independent of the data with an objective stance and distance	Researchers' biases need to be controlled and not expressed	Individuals' values are honored and negotiated – <b>The researcher identified the influence of the diverse participants' values, and identified and evaluated the influence of her own values and experiences on participants.</b>	Values are discussed reflecting knowledge obtained from researchers and participants
Methodological	Quantitative or scientific and predetermined methods, followed by scientific style of writing	Use deductive methods, followed by scientific style of writing	Use inductive methods, followed by literary style of writing – <b>The researcher used inductive and deductive methods, asking participants open-ended questions and addressing emergent knowledge.</b>	Use qualitative and quantitative approaches to data collection and analysis

### *Approach to Inquiry: Methodology*

The selection of the methodology ensures the compatibility of the research questions, objectives, and methods (127). The five approaches to qualitative research inquiry identified by Creswell are (127):

1. Narrative research: Describes participants' stories regarding a phenomenon of interest.
2. Grounded theory research: Generates a theory supported by participants' data.
3. Ethnographic research: Describes the culture of a group with shared values, behaviors, and beliefs.
4. Case study research: Provides an in-depth examination of a particular phenomenon that researchers cannot change over time.
5. Phenomenological research: Describes participants' mutual experiences of a phenomenon.

The aim of this research study is to explore HCPs' and patients' perspectives on the value of CCM in DM management. A phenomenological approach was chosen because it aims to understand the experience of participants by studying several individuals who shared the same experience.

### *Study Setting*

The setting is the same as described under the "*Study Setting*" of Phase I.

### *Study Population and Eligibility Criteria*

Eligible HCPs (e.g. physicians, nurses, pharmacists, and others) were those: (1) practicing in Qatar for at least one year; (2) working at QPDC in Dukhan; (3) involved in DM management within QPDC; (4) able to speak Arabic and/or English. A

snowballing sampling of HCPs continued until saturation was achieved.

Eligible patients were those: (1) 18 years or older; (2) diagnosed with type 2 DM; (3) followed up at QPDC in Dukhan; (4) able to speak Arabic and/or English. A purposeful sampling of patients occurred based on their background, gender, nationality, and willingness to participate.

#### *Data Collection Methods (Semi-Structured Interviews)*

Data collection methods can be categorized into six types: (1) observation, (2) documents, (3) individual interviews, (4) focus groups, (5) audiovisual materials, and (6) emails, chat rooms, weblogs, life journals, and instant messaging (127). For this phase, semi-structured individual interviews were utilized as they offer focused, guided, open-ended, and flexible discussions (125). The topic guide development and interview structure are discussed below.

#### *Topic Guide*

The interview topic guide was developed through a comprehensive literature review and consideration of the research objectives. The guide included open-ended questions with probes that triggered in-depth responses and clarifications (Appendix D). The guide was discussed and approved by the research team, peer-reviewed by three HCPs (head physician, head nurse, and head pharmacist) working at QPDC, and modified accordingly. Then, the interview was piloted on one HCP (pharmacist) to obtain feedback on clarity, inclusiveness, and appropriateness of questions.

### *Interview Structure*

Semi-structured interviews allow researchers to focus on the targeted study phenomena, clarify interviewee responses, discover new explanations of the phenomenon, and collect verbal and non-verbal communication (128). In this phase, semi-structured interviews were the most appropriate data collection methods. The interviews were conducted by the MSc student and took place in the counseling room at the clinic, with an average duration of 30 minutes per interview. All HCPs were interviewed in English, but patients were allowed to choose between Arabic and English.

Recording of interviews allows researchers to obtain verbatim quotations for reporting the results (129). Interviews were recorded using an audio-recorder per participants' consent prior to the interview. Audiotape-recorded interviews were transcribed verbatim; while unrecorded interviews were written as notes. Interviews that were conducted in Arabic were translated into English directly as they were transcribed. Transcribed and hand-written responses were coded into different themes and sub-themes using MS® Excel. Then, the coded data were analyzed systematically and reported.

### *Participants and Sampling*

Semi-structured interviews were conducted with a purposive sample of consenting individuals to further understand their point of view regarding the benefits of CCM. Patients were recruited after they finished their consultation and appointment with the healthcare team, and HCPs were interviewed based on their availability between patients' appointments.



The maximum variation of participants with regards to their demographics and experience was ensured to fully describe different perspectives and enhance the representativeness of the sample. Participants' interviews continued until saturation was achieved and until no new themes were emergent from the responses. Interviews with patients took place at the QPDC counseling room; while interviews with HCPs took place at different locations within the center (e.g. physicians' offices).

### *Data Analysis*

Qualitative data analysis follows several steps including continuous revisions of the transcribed text, arranging and preparing data, coding, categorizing the codes into themes, and presenting the analyzed data as results (127) (Figure 7).

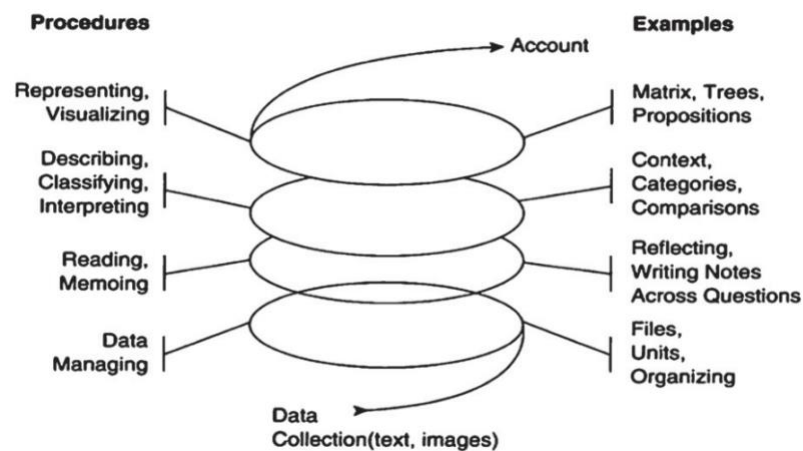


Figure 7. Qualitative data analysis spiral.

Source: Creswell (2018)

The most commonly used qualitative data analysis methods in health science research are summarized below (125):

1. Thematic analysis: Primary data analysis that should be applied due to its flexibility and compatibility with various interpretative frameworks. The data generated through this phase was thematically analyzed.
2. Content analysis: Comprises systematic coding followed by quantification of the analyzed data in a logical and unbiased way.
3. Discourse Analysis: Emphasizes the core format and the structure of texts to examine the assumptions.

### *Thematic Analysis*

Thematic data analysis was applied deductively, meaning that the study domains were determined *a priori*. The advanced features of MS® Word and PowerPoint were utilized to ease the process of manual coding of the verbatim textual transcripts. Textual transcripts of all interviews, including the pilot interview, were organized per participant in a single MS® Word document. The textual transcripts were read several times to gain familiarity with the participants' responses. Using the “Add Comment” feature of MS® Word, codes were added as comments to their corresponding meaningful phrases. It was important to use the same wordings for the same repeated code for tracking purposes. MS® Word was then commanded to only extract meaningful phrases and their codes in a separate table format. As the responses were substantial (i.e. resulted in 11,650 words-transcript), following other manual coding techniques (e.g. codes color-coding *via* MS® Excel (130)) were deemed impractical. Therefore, a novel alternative of MS® Excel was to use the “SmartArt” feature of MS® PowerPoint to create a visual representation of the relations between codes, and grouping of related codes into subthemes, themes, and finally into domains. During the reporting of the results, important quotes were identified and selected from the MS® Word document.

### *Quality Measures*

Similar to quantitative research, quality measures should be carefully considered to ensure the robustness of qualitative research. Quality measures or trustworthiness criteria in qualitative research are given other terms, but they correspond in their meaning to the terms used in quantitative research (125). These measures include credibility, dependability, confirmability, transferability, and reflexivity (125).

- **Credibility** (corresponds to validity in quantitative research) ensures that results are valid and conclusions are credible. Credibility was maintained by having interviewee responses peer-reviewed at the end of the interview by the primary pharmacist at QPDC and by implementing appropriate data analysis methods.
- **Dependability** (corresponds to reliability in quantitative research) indicates that research results are repeatable. A full description of the research methodology, peer review of the interviewee responses, and reservation of all research data in one place (Google drive) will allow other researchers to replicate the work in the future.
- **Confirmability** (objectivity) warrants that the researchers do not influence participants' perspectives. This criterion was maintained by keeping all research activities for future examination by other researchers.
- **Transferability** (corresponds to external validity in quantitative research) identifies the applicability and generalizability of the research results to other settings. In order to achieve this criterion, a detailed description of the research setting and participants, and credible results interpretation was provided.
- **Reflexivity** explains the researcher's influence on the research process. Therefore, an occasional explanation of the researcher's influence on the research process is reported in the thesis.

### *Ethical Considerations*

QP Health Department and QU-IRB approved this phase (see Appendix B and E). The consent form along with the information sheet including the study purpose, interview duration, and anticipated benefits of participation in the study was given to participants before the interview. Participant confidentiality was maintained by giving codes to respondents that were later used in data analysis and reporting. Recordings and transcripts were transferred to password-protected researcher's laptop and will be kept for five years according to QU-IRB requirements to maintain the confidentiality and security of the data.

## CHAPTER 4: RESULTS

This chapter presents the results pertaining to this project, which aimed to (i) identify the impact of CCM on DM outcomes and, (ii) explore the perspectives of HCPs and patients on the value of CCM in primary healthcare settings. The project was split into two phases: Phase I – CCM’s impact on DM outcomes, and Phase II – HCPs’ and patients’ perspectives about the value of CCM. The results of the quantitative data derived from Phase I are presented, followed by those of the qualitative data from Phase II.

### Phase I: The Impact of Collaborative Care Model in Diabetes Management in a Primary Healthcare Setting

#### *Screening of Subjects for Eligibility*

A total of 325 patients’ EHR were screened for eligibility and data of interest were collected *via* the previously developed data collection sheet. Of the 325 patients, 254 fulfilled the study eligibility criteria and were assigned into two comparison groups: intervention versus control groups. Seventy-one patients were excluded for one of the following reasons: having type 1 DM, gestational DM, or prediabetes (n=11), under 18 years old (n=3), irretrievable 17-months data (inadequate follow-up) (n=15), and have enormous missing data (n=42).

Patients who did not receive CCM in the 17-month period were allocated to the control group (n=86), whereas patients who received CCM were allocated to the intervention group (n=168). As per the sample size calculation (see Chapter 3), each group should include a minimum of 82 patients. Figure 8 shows the flowchart of patients’ screening and allocation into the study groups.

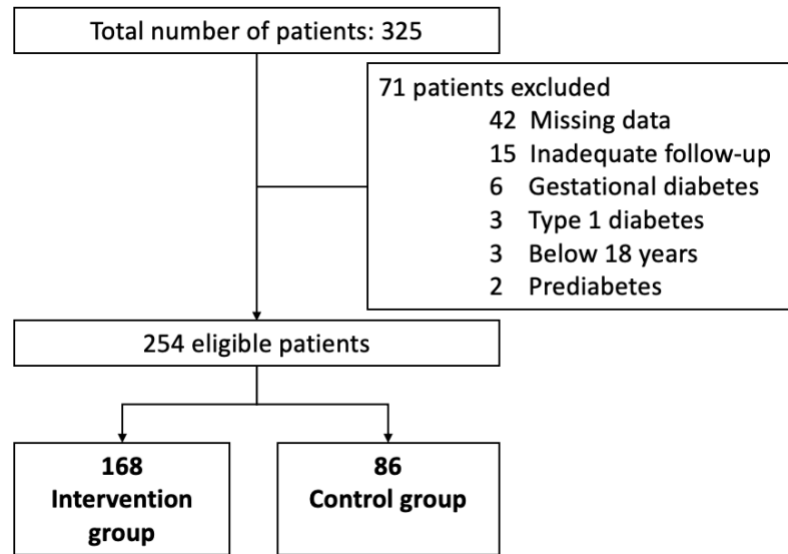


Figure 8. Patients’ screening and enrolment flow chart.

*Sociodemographic Characteristics of Patients who Attended Qatar Petroleum  
Diabetes Clinic*

The sociodemographic characteristics of the included patients are presented in Table 4. Because of the retrospective nature of this phase, there were few differences between the two comparison groups. The control group had significantly more Qataris than the intervention group ( $p=0.006$ ), while the intervention group significantly included more Indian patients compared to the intervention group ( $p=0.008$ ). Apparently, patients in the intervention group were seen more often by HCPs compared to the control group as frequent follow-up visits were a vital component of CCM.

Table 4. Sociodemographic Characteristics of Patients with DM Attending QPDC

<b>Parameter</b>	<b>Total (n=254)</b>	<b>Intervention (n=168)</b>	<b>Control (n=86)</b>	<b>P-value</b>
<b>Gender, n (%)</b>				
Male	171 (67.3)	110 (65.5)	61 (70.9)	0.380 <sub>a</sub>
Female	83 (32.7)	58 (34.5)	25 (29.1)	
<b>Age in years, median (IQR)</b>	52 (12)	51.5 (13)	52 (12)	0.405 <sub>b</sub>

Table 4. Sociodemographic Characteristics of Patients with DM Attending QPDC

<b>Parameter</b>	<b>Total (n=254)</b>	<b>Intervention (n=168)</b>	<b>Control (n=86)</b>	<b>P-value</b>
<b>Nationality, n (%)</b>				
Qatari	86 (33.9)	47 (28.0)	39 (45.3)	0.006 <sub>a</sub>
Non-Qatari				
Indian	71 (28.0)	56 (33.3)	15 (17.4)	0.008 <sub>a</sub>
Filipino	26 (10.2)	21 (12.5)	5 (5.8)	0.096 <sub>a</sub>
Others	71 (28.0)	44 (26.2)	27 (31.4)	0.382 <sub>a</sub>
<b>Number of visits, mean ± SD</b>				
	8.2 ± 3.5	10.1 ± 2.5	4.4 ± 1.3	<0.001 <sub>c</sub>
<b>Medical history outside QP, n (%)</b>				
No	225 (88.6)	152 (90.5)	73 (84.9)	0.261 <sub>a</sub>
Yes	1 (0.4)	1 (0.6)	0 (0)	
Not reported	28 (11.0)	15 (8.9)	13 (15.1)	
<b>Smoking, n (%)</b>				
Non-smoker	215 (84.6)	144 (85.7)	71 (82.6)	0.268 <sub>a</sub>
Ex-smoker	16 (6.3)	12 (7.1)	4 (4.7)	
Smoker	23 (9.1)	12 (7.1)	11 (12.8)	
<b>Alcohol consumption, n (%)</b>				
Yes, regularly	2 (0.8)	1 (0.6)	1 (1.2)	
Yes, occasionally	1 (0.4)	0 (0)	1 (1.2)	0.332 <sub>a</sub>
No	251 (98.8)	167 (99.4)	84 (97.7)	

<sup>a</sup>Pearson Chi-square test, <sup>b</sup>Mann-Whitney U test, and <sup>c</sup>Independent Samples t-test were used to compute the *p*-values

QP: Qatar Petroleum

#### *Baseline Clinical Characteristics of Patients who Attended Qatar Petroleum Diabetes Clinic*

Several of the patients followed-up at the clinic had other comorbidities commonly associated with DM or had DM-related complications (see Table 5). The three most prevalent comorbidities in the study population included: dyslipidemia (94.1%), hypertension (77.2%), and obesity (13.8%). Nephropathy and neuropathy were the most common DM-related complications reported in the study population

(25.2% and 21.7%, respectively). Macrovascular complications including ischemic heart disease, peripheral vascular disease, and cerebrovascular disease were least common in the study cohort (9.8%, 0.4%, and 0.4%, respectively). The comparison between groups showed that the intervention group did not differ from the control group in terms of the prevalence of DM-related comorbidities or complications, except coronary heart disease ( $p=0.046$ ).

Table 5. Baseline Clinical Characteristics of Patients with DM attending QPDC

<b>Parameter</b>	<b>Total (n=254)</b>	<b>Intervention (n=168)</b>	<b>Control (n=86)</b>	<b>P-value</b>
	<b>n (%)</b>			
<b>Comorbidities</b>				
Dyslipidemia	239 (94.1)	161 (95.8)	78 (90.7)	0.100 <sub>a</sub>
Hypertension	196 (77.2)	135 (80.4)	61 (70.9)	0.090 <sub>a</sub>
Obesity	35 (13.8)	24 (14.3)	11 (12.8)	0.744 <sub>a</sub>
Asthma	29 (11.4)	17 (10.1)	12 (14.0)	0.406 <sub>b</sub>
CHD	5 (2.0)	1 (0.6)	4 (4.7)	0.046 <sub>b</sub>
<b>DM complications</b>				
Nephropathy	64 (25.2)	41 (24.4)	23 (26.7)	0.684 <sub>a</sub>
Neuropathy	55 (21.7)	35 (20.8)	20 (23.3)	0.657 <sub>a</sub>
Retinopathy	0 (0)	0 (0)	0 (0)	NA
IHD	25 (9.8)	17 (10.1)	8 (9.3)	0.836 <sub>a</sub>
PVD	1 (0.4)	1 (0.6)	0 (0)	1.000 <sub>b</sub>
Cerebrovascular disease	1 (0.4)	1 (0.6)	0 (0)	1.000 <sub>b</sub>

<sup>a</sup>Pearson Chi-square and <sup>b</sup>Fisher's Exact test were used to calculate the  $p$ -values  
 CHD: Coronary Heart Disease; IHD: Ischemic Heart Disease; NA: Not Applicable  
 PVD: Peripheral Vascular Disease

There were no statistically significant differences at baseline or at 17 months in the medication regimens and types of medications taken by patients in both intervention and control groups (Table 6). The most commonly prescribed medication regimen for DM in the study population was oral monotherapy. More patients in the intervention group received metformin than the control group at baseline (63.7% versus 54.7%) and



at 17-months follow-up (64.9% versus 60.5%). It was apparent that sitagliptin use increased from baseline to the last follow-up visit in the intervention group (9.5% versus 21.0%) compared to a decrease in the control group (12.8% versus 11.6%). Vildagliptin was not prescribed to any patient either at baseline or at 17-months. Similarly, no patients were treated with pioglitazone or liraglutide at baseline or 17-months, respectively. None of the patients in the control group was prescribed glibenclamide at baseline or pioglitazone at 17-months.

Table 6. DM Medication Regimens and Types at Baseline and at 17-Months of Follow Up

	<b>Total (n=254)</b>	<b>Intervention (n=168)</b>	<b>Control (n=86)</b>	<b>P-value</b>
	<b>n (%)</b>			
<b>Medication regimen: Baseline</b>				
Not reported	85 (33.5)	52 (31)	33 (38.4)	0.639 <sub>a</sub>
1 OAA	82 (32.3)	57 (33.9)	25 (29.1)	
2 OAA	54 (21.3)	37 (22.0)	17 (19.8)	
3 OAA	14 (5.5)	10 (6.0)	4 (4.7)	
Insulin alone	6 (2.4)	5 (3.0)	1 (1.2)	
Insulin + 1 OAA	5 (2.0)	2 (1.2)	3 (3.5)	
Insulin + 2 OAA	4 (1.6)	3 (1.8)	1 (1.2)	
Insulin + 3 OAA	3 (1.2)	1 (0.6)	2 (2.3)	
Diet only	1 (0.4)	1 (0.6)	0 (0)	
<b>Medication regimen: At 17-months follow-up</b>				
Not reported	65 (25.6)	36 (21.4)	29 (33.7)	0.150 <sub>a</sub>
1 OAA	88 (34.6)	65 (38.7)	23 (26.7)	
2 OAA	52 (20.5)	32 (19.0)	20 (23.3)	
3 OAA	22 (8.7)	18 (10.7)	4 (4.7)	
Insulin alone	8 (3.1)	5 (3.0)	3 (3.5)	
Insulin + 1 OAA	11 (4.3)	8 (4.8)	3 (3.5)	
Insulin + 2 OAA	6 (2.4)	3 (1.8)	3 (3.5)	
Insulin + 3 OAA	1 (0.4)	1 (0.6)	0 (0)	
Diet only	1 (0.4)	0 (0)	1 (1.2)	
<b>DM Medications*: Baseline</b>				
Metformin	154 (60.6)	107 (63.7)	47 (54.7)	0.163 <sub>a</sub>
Repaglinide	7 (2.8)	3 (1.8)	4 (4.7)	0.231 <sub>b</sub>
Sitagliptin	27 (10.6)	16 (9.5)	11 (12.8)	0.424 <sub>a</sub>

Gliclazide	37 (14.6)	24 (14.3)	13 (15.1)	0.859 <sup>a</sup>
Glimepiride	16 (6.3)	10 (6.0)	6 (7.0)	0.750 <sup>a</sup>
Glibenclamide	3 (1.2)	3 (1.8)	0 (0)	0.553 <sup>b</sup>
Rosiglitazone	9 (3.5)	8 (4.8)	1 (1.2)	0.280 <sup>b</sup>
Insulin	18 (7.1)	11 (6.5)	7 (8.1)	0.640 <sup>a</sup>

#### DM Medications\*: At 17-months follow-up

Metformin	161 (63.4)	109 (64.9)	52 (60.5)	0.489 <sup>a</sup>
Repaglinide	6 (2.4)	2 (1.2)	4 (4.7)	0.184 <sup>b</sup>
Sitagliptin	45 (17.8)	35 (21.0)	10 (11.6)	0.066 <sup>a</sup>
Gliclazide	41 (16.1)	28 (16.7)	13 (15.1)	0.751 <sup>a</sup>
Glimepiride	16 (6.3)	12 (7.1)	4 (4.7)	0.439 <sup>a</sup>
Glibenclamide	3 (1.2)	2 (1.2)	1 (1.2)	1.000 <sup>b</sup>
Rosiglitazone	11 (4.3)	10 (6.0)	1 (1.2)	0.105 <sup>b</sup>
Pioglitazone	2 (0.8)	2 (1.2)	0 (0)	0.550 <sup>b</sup>
Insulin	25 (9.8)	16 (9.5)	9 (10.5)	0.812 <sup>a</sup>

\* Items are not mutually exclusive

*P*-values were calculated using <sup>a</sup>Pearson Chi-square test and <sup>b</sup>Fisher's test

OAA: Oral antidiabetic agent

Although no randomization was required for this retrospective study, no significant differences were found between the two groups for all clinical parameters, except weight (Table 7), which was significantly higher in the control group compared to the intervention group ( $86.4 \pm 19.1$  Kg vs.  $79.6 \pm 16.5$  Kg,  $p=0.042$ ).

Table 7. Baseline Outcome Measures of Patients with DM Attending QPDC

Clinical parameter*	Total (n=254)	Intervention (n=168)	Control (n=86)	<i>P</i> -value
HbA <sub>1c</sub> (%)	6.8 (2.5)	6.9 (2.3)	6.8 (3.4)	0.37 <sup>a</sup>
FBG (mg/dL)	130 (57.1)	130 (54.3)	128 (73.4)	0.992 <sup>a</sup>
RBG (mg/dL)	177 ± 78.7	162 ± 66.2	212 ± 96.8	0.051 <sup>b</sup>
LDL-C (mmol/L)	3.4 ± 1.6	3.4 ± 1.9	3.4 ± 0.9	0.99 <sup>b</sup>
HDL-C (mmol/L)	1.1 ± 0.3	1.1 ± 0.3	1.0 ± 0.3	0.541 <sup>b</sup>
TG (mmol/L)	1.8 ± 1.0	1.8 ± 0.9	1.9 ± 1.3	0.65 <sup>b</sup>
TC (mmol/L)	5.0 ± 1.0	4.9 ± 1.1	5.1 ± 1.0	0.257 <sup>b</sup>
SBP (mmHg)	130 ± 14.9	129 ± 14.7	131 ± 15.5	0.375 <sup>b</sup>
DBP (mmHg)	82 ± 8.5	81 ± 8.3	82 ± 9.1	0.682 <sup>b</sup>
Weight (Kg)	81.5 ± 17.5	79.6 ± 16.5	86.4 ± 19.1	0.042 <sup>b</sup>
BMI (Kg/m <sup>2</sup> )	30.7 ± 6.2	30.5 ± 6.4	31.3 ± 5.8	0.539 <sup>b</sup>

<sup>a</sup>Mann-Whitney U test and <sup>b</sup>Independent samples t-test were used to calculate the *p*-values

\*HbA<sub>1c</sub> and FBG are reported as median (IQR), while all other values are presented as mean ± SD

Table 7. Baseline Outcome Measures of Patients with DM Attending QPDC

<b>Clinical parameter*</b>	<b>Total (n=254)</b>	<b>Intervention (n=168)</b>	<b>Control (n=86)</b>	<b>P-value</b>
BMI: Body Mass Index; DBP: Diastolic Blood Pressure; FBG: Fasting Blood Glucose; HbA <sub>1c</sub> : Hemoglobin A <sub>1c</sub> ; HDL-C: High-Density Lipoprotein Cholesterol; LDL-C: Low-Density Lipoprotein Cholesterol; RBG: Random Blood Glucose; SBP: Systolic Blood Pressure; TC: Total Cholesterol; TG: Triglycerides				

*Clinical Outcomes Between and Within Groups*

Although it was ideal to conduct two-way repeated-measures ANOVA to assess the impact of the service on two levels (i.e. the effect of group, time, and group × time interaction), the test was not computable because of the use of RWD that has a considerable amount of missing data as compared to other study designs in a controlled environment such as RCTs. Alternatively, within-group and between-group analyses were conducted separately to assess changes in outcomes of interest with time in both groups as presented in Table 8. Repeated measures ANOVA and Friedman tests were used to conduct within-group analyses for parametric and non-parametric outcome variables, respectively. Both tests were non-computable for weight and BMI due to missing data in the control group only. For between-group analyses, independent t- and Mann-Whitney U tests were used for parametric and non-parametric outcome variables, respectively (Table 8).

Table 8. Between and Within Group Analyses of Clinical Parameters in the Intervention Group (n=168) and the Control Group (n=86)

<b>Parameter</b>	<b>Baseline</b>	<b>6 months</b>	<b>12 months</b>	<b>17 months</b>	<b>P-value</b>
<b>HbA<sub>1c</sub> (%), median (IQR)</b>					
Intervention	6.9 (2.53)	6.6 (1.34)	6.5 (1.33)	6.5 (1.18)	0.035 <sub>a</sub>
Control	6.5 (1.90)	6.7 (2.90)	6.3 (1.00)	6.7 (2.30)	0.093 <sub>a</sub>
<i>P</i> -value	0.37 <sub>b</sub>	0.034 <sub>c</sub>	0.282 <sub>c</sub>	0.01 <sub>c</sub>	
<b>FBG (mg/dL), median (IQR)</b>					
Intervention	132 (60.41)	134 (34.11)	128 (30.22)	129 (47.41)	0.707 <sub>a</sub>
Control	116 (47.84)	158 (59.96)	161 (85.85)	139 (60.82)	0.356 <sub>a</sub>
<i>P</i> -value	0.992 <sub>b</sub>	0.753 <sub>c</sub>	0.631 <sub>c</sub>	0.287 <sub>c</sub>	
<b>RBG (mg/dL), mean ± SD</b>					
Intervention	194 ± 72.29	158 ± 55.09	164 ± 61.14	141 ± 58.29	0.015 <sub>a</sub>
Control	131 ± 146.53	179 ± 52.89	171 ± 100.14	196 ± 76.22	0.801 <sub>a</sub>
<i>P</i> -value	0.051 <sub>c</sub>	0.520 <sub>c</sub>	0.993 <sub>c</sub>	0.045 <sub>c</sub>	
<b>LDL-C (mmol/L), mean ± SD</b>					
Intervention	3.7 ± 1.07	2.1 ± 0.93	2.9 ± 0.62	2.8 ± 0.83	0.002 <sub>a</sub>
Control	3.2 ± 0.80	2.6 ± 0.61	2.8 ± 1.11	2.7 ± 0.72	0.179 <sub>a</sub>
<i>P</i> -value	0.990 <sub>c</sub>	0.269 <sub>c</sub>	0.087 <sub>c</sub>	0.824 <sub>c</sub>	
<b>HDL-C (mmol/L), mean ± SD</b>					
Intervention	1.0 ± 0.20	1.1 ± 0.54	1.1 ± 0.80	1.2 ± 0.78	0.512 <sub>a</sub>
Control	1.1 ± 0.30	1.1 ± 0.23	1.1 ± 0.30	1.0 ± 0.23	0.317 <sub>a</sub>
<i>P</i> -value	0.541 <sub>c</sub>	0.292 <sub>c</sub>	0.291 <sub>c</sub>	0.097 <sub>c</sub>	

Table 8. Between and Within Group Analyses of Clinical Parameters in the Intervention Group (n=168) and the Control Group (n=86)

<b>Parameter</b>	<b>Baseline</b>	<b>6 months</b>	<b>12 months</b>	<b>17 months</b>	<b>P-value</b>
<b>TG (mmol/L), mean ± SD</b>					
Intervention	2.0 ± 0.94	2.0 ± 1.52	2.0 ± 1.16	1.7 ± 1.03	0.164 <sub>a</sub>
Control	1.5 ± 0.90	1.3 ± 0.65	1.4 ± 0.70	1.3 ± 0.82	0.789 <sub>a</sub>
<i>P</i> -value	0.650 <sub>c</sub>	0.060 <sub>c</sub>	0.883 <sub>c</sub>	0.535 <sub>c</sub>	
<b>TC (mmol/L), mean ± SD</b>					
Intervention	5.4 ± 1.05	4.7 ± 1.30	4.6 ± 0.98	4.3 ± 1.21	<0.0001 <sub>d</sub>
Control	4.5 ± 0.73	4.2 ± 0.86	4.2 ± 0.98	4.1 ± 0.77	0.497 <sub>d</sub>
<i>P</i> -value	0.257 <sub>c</sub>	0.833 <sub>c</sub>	0.102 <sub>c</sub>	0.317 <sub>c</sub>	
<b>SBP (mmHg), mean ± SD</b>					
Intervention	129 ± 14.44	129 ± 12.27	130 ± 12.27	128 ± 12.41	0.324 <sub>a</sub>
Control	133 ± 18.36	133 ± 14.11	136 ± 18.86	136 ± 15.30	0.484 <sub>a</sub>
<i>P</i> -value	0.375 <sub>c</sub>	0.463 <sub>c</sub>	0.188 <sub>c</sub>	0.205 <sub>c</sub>	
<b>DBP (mmHg), mean ± SD</b>					
Intervention	81 ± 7.90	81 ± 7.48	81 ± 8.16	81 ± 9.34	0.864 <sub>a</sub>
Control	82 ± 9.14	81 ± 7.10	83 ± 8.36	81 ± 7.93	0.385 <sub>a</sub>
<i>P</i> -value	0.682 <sub>c</sub>	0.626 <sub>c</sub>	0.734 <sub>c</sub>	0.293 <sub>c</sub>	
<b>Weight (Kg), mean ± SD</b>					
Intervention	79 ± 15.72	78 ± 15.94	78 ± 15.79	78 ± 15.87	0.020 <sub>a</sub>
Control	86 ± 19.09	91 ± 17.17	86 ± 18.74	87 ± 13.10	Non-computable
<i>P</i> -value	0.042 <sub>c</sub>	<0.001 <sub>c</sub>	0.080 <sub>c</sub>	0.079 <sub>c</sub>	

Table 8. Between and Within Group Analyses of Clinical Parameters in the Intervention Group (n=168) and the Control Group (n=86)

<b>Parameter</b>	<b>Baseline</b>	<b>6 months</b>	<b>12 months</b>	<b>17 months</b>	<b>P-value</b>
<b>BMI (Kg/m<sup>2</sup>), mean ± SD</b>					
Intervention	30 ± 6.55	30 ± 6.69	30 ± 6.61	30 ± 6.82	0.010 <sup>a</sup>
Control	31 ± 5.79	32 ± 5.09	31 ± 6.07	31 ± 4.73	Non-computable
<i>P</i> -value	0.539 <sup>c</sup>	0.064 <sup>c</sup>	0.420 <sup>c</sup>	0.481 <sup>c</sup>	

*P*-values were computed by <sup>a</sup>Friedman test, <sup>b</sup>Mann-Whitney U test, <sup>c</sup>Independent t-test, and <sup>d</sup>Repeated measures ANOVA

BMI: Body Mass Index; DBP: Diastolic Blood Pressure; FBG: Fasting Blood Glucose; HbA<sub>1c</sub>: Hemoglobin A<sub>1c</sub>; HDL-C: High-Density Lipoprotein Cholesterol; LDL-C: Low-Density Lipoprotein Cholesterol; RBG: Random Blood Glucose; SBP: Systolic Blood Pressure; TC: Total Cholesterol; TG: Triglycerides

### *Glycemic Control Parameters*

HbA<sub>1c</sub> significantly improved (i.e. reduced) from baseline to 17-months by 0.4% within the intervention group ( $p=0.035$ ). Conversely, the control group had an overall increase in HbA<sub>1c</sub> of 0.2% from baseline to 17-months. At 6-months and 17-months post follow-up, HbA<sub>1c</sub> showed significant improvement in the intervention group compared to the control group (6 months: 6.6% versus 6.7%,  $p=0.034$ ; 17 months: 6.5% versus 6.7%,  $p=0.01$ ) (Table 8). The percentage of patients in the intervention group who reached the target HbA<sub>1c</sub> (<7%) as recommended by the ADA (131) at 17-months was more than double the percentage of those who achieved the target in the control group (46% versus 22%, respectively) as shown in Figure 9. Furthermore, the average monthly HbA<sub>1c</sub> values in the intervention group remained fairly constant over time, while the values showed considerable fluctuations in the control group (Figure 10 [a]).

Although CCM did not result in any statistical significance in reducing FBG either within or between groups, the intervention group had a total reduction of 2.97 mg/dL, while the control group had an increase of 22.77 mg/dL by the end of the 17-months follow-up period (Table 8). The values of FBG showed prominent fluctuations over time in the control group, with a range of 112.14–177.18 mg/dL when compared to 123.20–152.37 mg/dL in the intervention group (see Figure 10 [b]). RBG significantly improved from baseline to 17-months by 53.15 mg/dL within the intervention group ( $p=0.015$ ), while it worsened over time in the control group. At 17-months, the RBG was significantly higher by 54.77 mg/dL ( $p=0.045$ ) in the control group when compared to the intervention group (Table 8). RBG of the control group patients had the most noticeable fluctuations with a greater maximum value compared to the intervention group (range: 120.12–280.30 mg/dL versus 125.31–168.92 mg/dL,

respectively) (Figure 10 [c]).

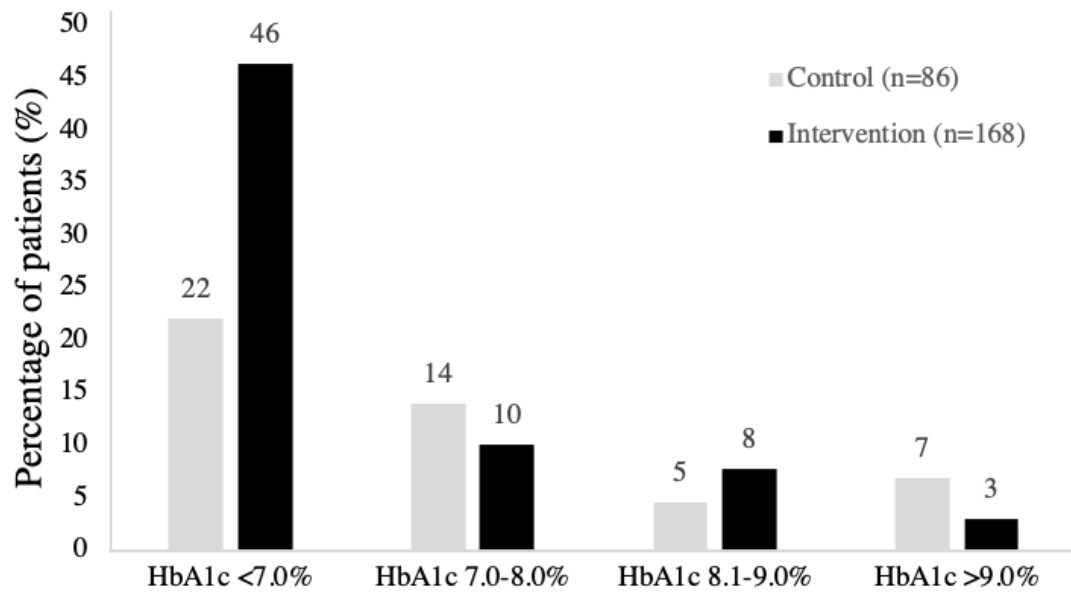


Figure 9. Final mean HbA<sub>1c</sub> distribution at 17 months.



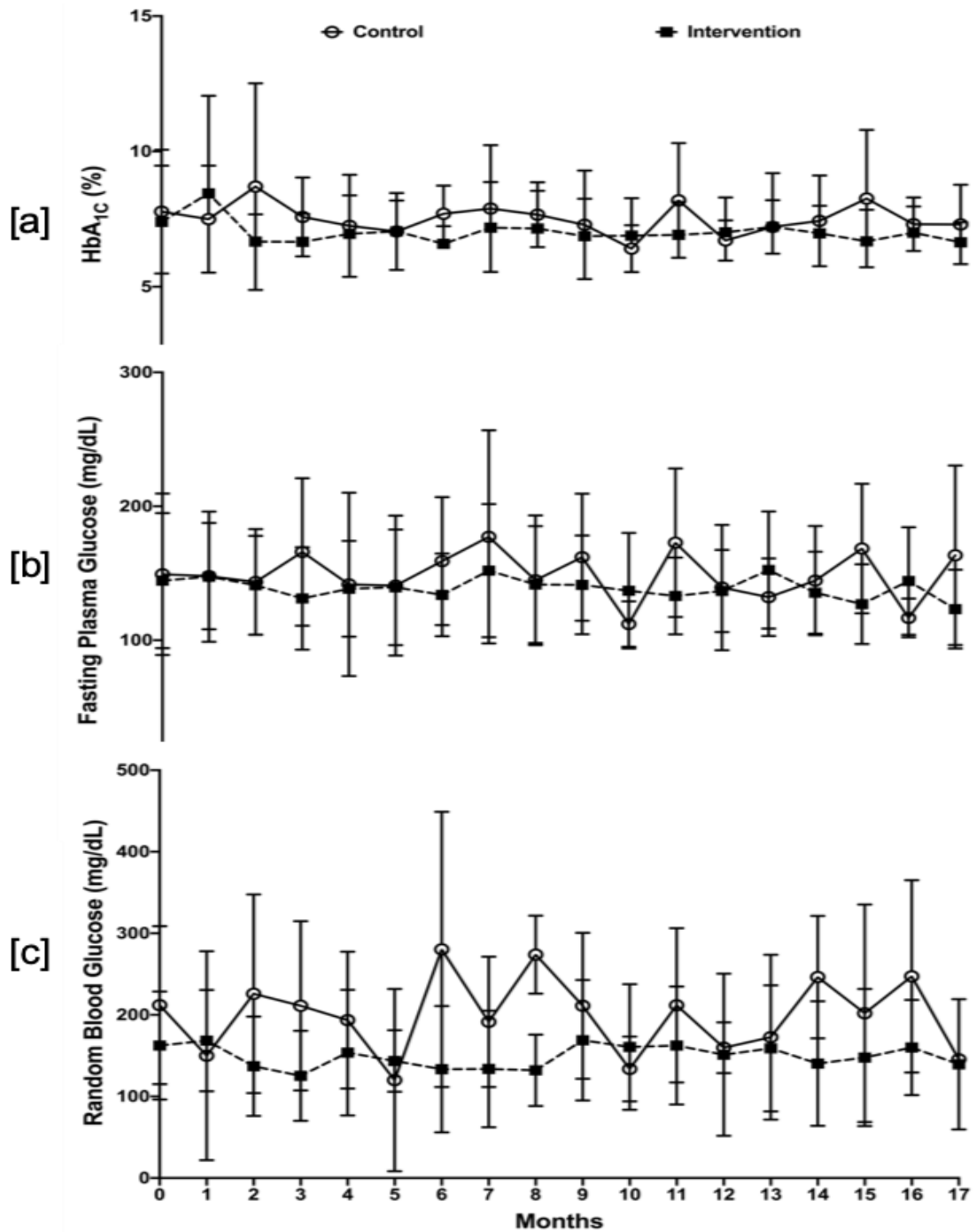


Figure 10. Monthly pattern of glycemic control parameters over 17 months.

### *Lipid Profile Parameters*

The lipid profile parameters did not show significant improvement in the between-group analyses. LDL-C significantly improved (decreased) from baseline to 17-months within the intervention group by 0.9 mmol/L ( $p=0.002$ ) and non-

significantly decreased by 0.5 mmol/L ( $p=0.179$ ) in the control group (Table 8). The range of LDL-C fluctuations in the control group was similar to that of the intervention group at all time points (Figure 11 [a]). Additionally, HDL-C improved (increased) by 0.2 mmol/L in the intervention group, but worsened (decreased) by 0.05 mmol/L in the control group over time (Table 8). Figure 11 [b] shows that HDL-C in both groups was fluctuating over time, with a difference in the range of 0.45 mmol/L in the control group and 0.38 mmol/L in the intervention group.

CCM provision resulted in a two-fold decrease in TG by the end of the follow-up period in the intervention group compared to the control group (0.3 mmol/L versus 0.15 mmol/L) as presented in Table 8. Figure 11 [c] shows the prominent fluctuation in TG in the control group versus the intervention group, with a range of 1.46 mmol/L and 1.12 mmol/L, respectively. Although the intervention group had a higher TC at baseline, TC significantly improved (reduced) within this group by 1.09 mmol/L ( $p<0.0001$ ) over time compared to a non-significant reduction of 0.42 mmol/L in the control group ( $p=0.497$ ) (Table 8). TC values fluctuated in both groups over the 17-months follow-up period, with a range of 1.49 mmol/L versus 0.99 mmol/L in the control and intervention groups, respectively (Figure 11 [d]).

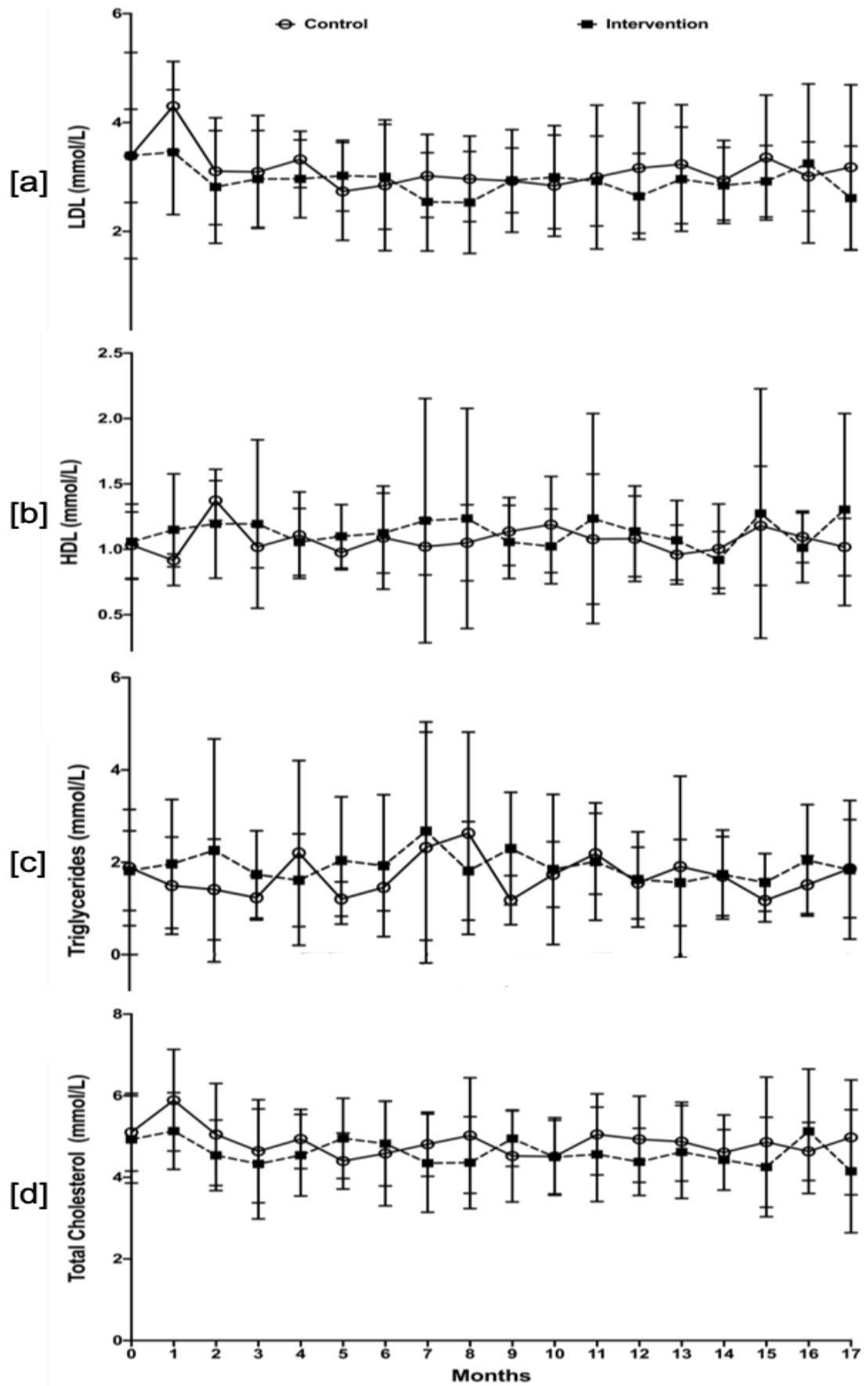


Figure 11. Monthly pattern of lipid profile over 17 months.

### *Blood Pressure*

SBP improved (decreased) in the intervention group by 0.8 mmHg ( $p=0.324$ ), but worsened (increased) by 3.1 mmHg ( $p=0.484$ ) in the control group at the end of 17-months (Table 8). Figure 12 [a] clearly presents the fluctuating pattern of SBP (range: 124.38–135.32 mmHg) in the control group compared to a relatively consistent pattern in the intervention group (range: 125.87–130.83 mmHg). Both groups had an insignificant, slight decrease (improvement) in DBP, but unlike all other parameters, the within-group analyses showed that the control group had a greater reduction in DBP compared to the intervention group (0.77 mmHg,  $p=0.385$ ; 0.31 mmHg,  $p=0.864$ ) (Table 8). Despite the better performance of the control group, DBP values showed greater variability in the control group, especially in the ninth and sixteenth month, compared to the relatively consistent fluctuations in the intervention group (Figure 12 [b]).

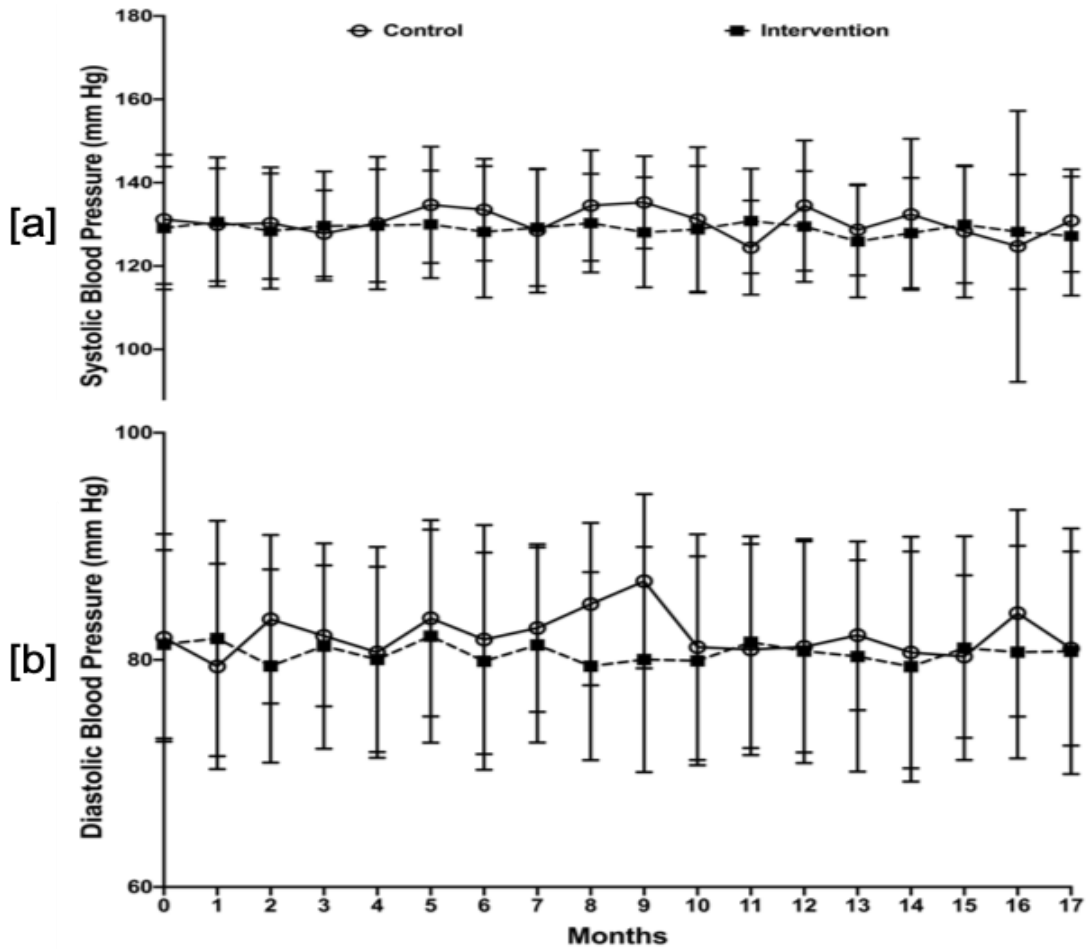


Figure 12. Monthly pattern of blood pressure over 17 months.

### *Anthropometric Parameters*

The weight of subjects in the intervention group was significantly reduced by 0.67 Kg ( $p=0.02$ ), compared to an increase by 0.81 Kg in the control group ( $p=\text{non-computable}$ ). At 6-months follow-up, the control group had a significantly greater weight by 13.01 Kg compared to the intervention group ( $p<0.001$ ). Similarly, CCM resulted in a significant reduction in BMI of 0.25 Kg/m<sup>2</sup> ( $p=0.01$ ) in the intervention group compared to a reduction of 0.15 Kg/m<sup>2</sup> ( $p=\text{non-computable}$ ) in the control group (Table 8). Both weight (Figure 13 [a]) and BMI (Figure 13 [b]) were clearly higher in the control group compared to the intervention group most of the times. The control group had a prominently wider range of weight and BMI values (80.33–112.88 Kg and

29.61–39.37 Kg/m<sup>2</sup>, respectively) as compared to the intervention group (74.56–84.33 Kg and 28.75–32.06 Kg/m<sup>2</sup>, respectively).

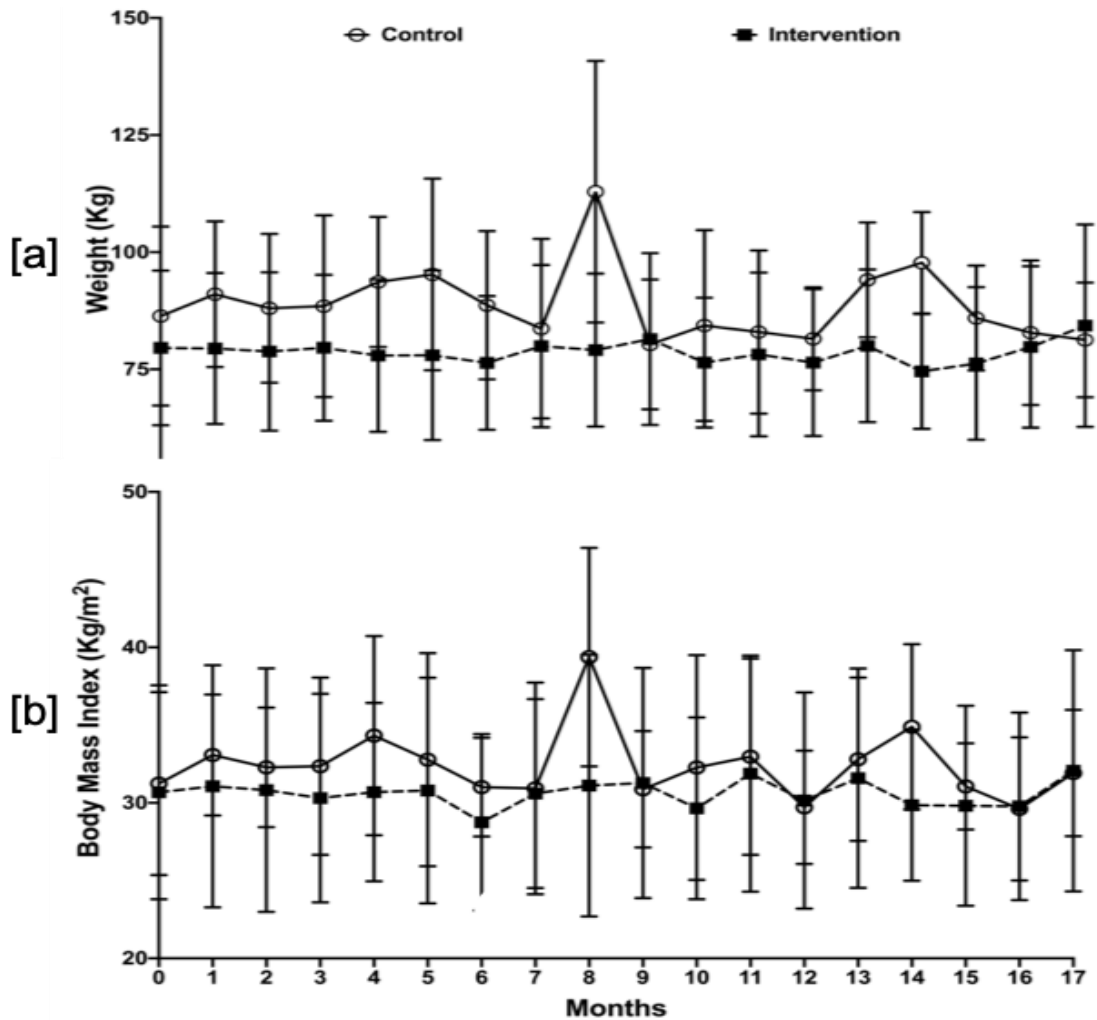


Figure 13. Monthly pattern of anthropometric parameters over 17 months.

## Phase II: The Perspectives of Healthcare Professionals and Patients on the Value of Collaborative Care Model for Diabetes in Primary Healthcare Settings

Semi-structured interviews were conducted with both HCPs and patients to gain an in-depth understanding of the values of CCM for patients with DM. This section will cover the themes that emerged from both perspectives. Although the number of interviewees was limited, the participants had the appropriate competence and practice

experiences to reflect on the explored topics.

Twelve HCPs (two physicians, five pharmacists, and five nurses) were interviewed. Their mean age was  $47 \pm 9$  years, with  $8.9 \pm 5$  years of experience in DM care. The HCP group was multinational, including six Arab and six Asian HCPs (Table 9). All HCPs were attending CPD sessions that keep them well-updated about the management of DM in PHC settings per the regulations of the Ministry of Public Health, as points systems are now a requirement for all HCPs to maintain and renew their license. One of the nurses is a specialized nurse DM educator; the others were responsible for the provision of care for patients with DM and who were frequently available in the clinics.

Table 9. General Characteristics of Healthcare Professionals Who Participated in the Semi-structured Interviews on the Value of CCM in DM Care (n=12)

HCP No.	Nationality	Profession	Years of practice in DM management
HCP 1	Qatari	Pharmacy manager	5
HCP 2	Filipino	Pharmacist	13
HCP 3	Nepalese	General registered nurse	5
HCP 4	Sudanese	Pharmacist	15
HCP 5	Egyptian	Pharmacist	4
HCP 6	Iraqi	Physician	15
HCP 7	Qatari	Diabetes nurse educator	5
HCP 8	Qatari	Physician	11
HCP 9	Indonesian	Ambulance nurse	15
HCP 10	Indian	Senior nurse in charge	10
HCP 11	Indian	Pharmacist	0.6
HCP 12	Indian	Nurse	8

HCP No.: Healthcare provider number

A total of 12 patients with T2DM for an average of  $8.7 \pm 8$  years were interviewed. Their mean age was  $53 \pm 8$  years. Half of the participants were male and employed (Table 10).

Table 10. General Characteristics of Patients with DM Who Participated in the Semi-structured Interviews on the Value of CCM in DM Care (n=12)

<b>Pt No.</b>	<b>Age in years</b>	<b>Nationality</b>	<b>Gender</b>	<b>Employment status</b>	<b>Duration of DM (years)</b>
Pt 1	57	Indian	Male	Employed	6
Pt 2	52	Sudanese	Male	Employed	5
Pt 3	42	Indonesian	Female	Not employed	11
Pt 4	57	Pakistani	Male	Employed	30
Pt 5	61	Qatari	Female	Not employed	15
Pt 6	59	Filipino	Male	Employed	5
Pt 7	54	Qatari	Female	Not employed	11
Pt 8	43	Indian	Female	Not employed	4
Pt 9	41	Qatari	Male	Employed	0.5
Pt 10	64	Qatari	Female	Not employed	13
Pt 11	52	Indian	Male	Employed	0.1
Pt 12	53	Indian	Female	Not employed	4

Pt No.: Patient number

HCPs' and patients' responses indicated that both parties have profound knowledge and appreciation of CCM's positive impact on DM management and outcomes. Fourteen interesting themes emerged from the pre-specified four domains of this phase, as shown in Table 11.



Table 11. Domains, Themes, and Subthemes Associated with the Value of CCM in DM Management in PHC Settings

Domains	Themes	Subthemes	Codes
Components of CCM	Theme 1: Characteristics of the CCM	Service quality indicators	<ul style="list-style-type: none"> <li>• Accreditation</li> <li>• Quality care despite workload</li> <li>• Continuity of care</li> <li>• Equity of care provision</li> <li>• Prompt care provision</li> </ul>
		CCM competency	<ul style="list-style-type: none"> <li>• Blame-free environment</li> <li>• Patient-centered care</li> <li>• Humanistic care</li> <li>• Communication between HCPs and patients</li> <li>• Collaborative patient assessment and shared decision-making</li> </ul>
		Theme 2: Key players in the healthcare team	<p>HCPs' (physicians, nurse diabetes educator, and pharmacists)</p> <p>personal attributes and attitudes</p>

Table 11. Domains, Themes, and Subthemes Associated with the Value of CCM in DM Management in PHC Settings

Domains	Themes	Subthemes	Codes
			<ul style="list-style-type: none"> <li>• Competency of HCPs</li> <li>• Openness and readiness to adopt new technologies and research findings</li> </ul>
		HCPs' availability and professionalism	<ul style="list-style-type: none"> <li>• Fixed clinic staff</li> <li>• Resolution of disagreement</li> <li>• Experience</li> <li>• Commitment and accountability</li> <li>• Trusting and accepting other HCPs</li> <li>• Understanding ones and other HCPs role</li> <li>• HCPs empathy</li> <li>• Assessment of patient's knowledge about DM and its complications</li> </ul>
		Patients' attributes and knowledge	<ul style="list-style-type: none"> <li>• Willingness and interest to receive care</li> <li>• Proactiveness</li> <li>• Adherence to medications</li> <li>• Openness to healthcare team</li> <li>• Patients part of the decision-making</li> <li>• Motivation</li> <li>• Disease self-management knowledge</li> <li>• Patient's awareness of CCM</li> </ul>
		Involvement of family in care	<ul style="list-style-type: none"> <li>• Family education and counseling</li> <li>• Family support and motivation</li> </ul>

Table 11. Domains, Themes, and Subthemes Associated with the Value of CCM in DM Management in PHC Settings

<b>Domains</b>	<b>Themes</b>	<b>Subthemes</b>	<b>Codes</b>
	Theme 3: Coordination and organization of care process	Accessibility	<ul style="list-style-type: none"> <li>• Easy access to care</li> <li>• Flexible appointment system</li> </ul>
		Referral and follow-up	<ul style="list-style-type: none"> <li>• Referral to secondary or tertiary care in emergency cases</li> <li>• Collaboration with the HR department to arrange for follow-up</li> <li>• Regular, frequent, individualized follow-up</li> <li>• Pharmacist-led MUR</li> </ul>
	Theme 4: Education and professional development	Professional development and educational opportunities for HCP	<ul style="list-style-type: none"> <li>• Continuous professional development</li> <li>• Training/workshops on DM management</li> </ul>
		Patient education and counseling	<ul style="list-style-type: none"> <li>• Multi-perspective patient education</li> <li>• Education supported by demonstrative educational tools and aids</li> </ul>
	Theme 5: Managerial	Technology	<ul style="list-style-type: none"> <li>• Computerized system</li> <li>• Glucometer software</li> </ul>

Table 11. Domains, Themes, and Subthemes Associated with the Value of CCM in DM Management in PHC Settings

Domains	Themes	Subthemes	Codes
	support		
		Infrastructure/facilities	<ul style="list-style-type: none"> <li>• Private counseling room with a rounded table</li> <li>• QPDC suitable community/environment</li> <li>• The proximity of QPDC to patients</li> <li>• Free glucometer provision to all patients</li> </ul>
		Financing	<ul style="list-style-type: none"> <li>• Satisfying salary</li> </ul>
<b>Impact of CCM</b>	Theme 1: Improvement in patients' health outcomes	Improved DM control	<ul style="list-style-type: none"> <li>• Controlled/ improved DM outcomes</li> <li>• Modification of drug therapy, diet, and lifestyle</li> <li>• Reduction of medical errors and emergency visits due to uncontrolled DM</li> </ul>
		Addressing patients' psychological well-being	<ul style="list-style-type: none"> <li>• Overcoming patients' panic</li> </ul>
	Theme 2: Satisfaction and appreciation of CCM	Patients' satisfaction with and appreciation of CCM	<ul style="list-style-type: none"> <li>• Patients' appreciation of CCM</li> <li>• Patients' satisfaction with CCM</li> </ul>
		HCPs' satisfaction of the service	<ul style="list-style-type: none"> <li>• Recognition of role</li> <li>• HCPs' satisfaction with patient improvement</li> </ul>

Table 11. Domains, Themes, and Subthemes Associated with the Value of CCM in DM Management in PHC Settings

<b>Domains</b>	<b>Themes</b>	<b>Subthemes</b>	<b>Codes</b>
	Theme 3: Preferred care provider		<ul style="list-style-type: none"> <li>• Service reputation</li> <li>• Preference for QPDC over other clinics</li> <li>• Service expansion to other QP clinics</li> </ul>
<b>Facilitators</b>	Theme 1: Patient-related facilitators	Patients' perceptions and attitude	<ul style="list-style-type: none"> <li>• Patients' creation of a suitable atmosphere for CC</li> <li>• Patients' active cooperation</li> <li>• The pleasant attitude of the patients</li> <li>• Patients' pursuing health and medication education and information</li> <li>• Patients' preference for fixed HCPs for the clinic</li> <li>• Patients' familiarity with HCPs</li> </ul>
	Theme 2: HCPs-related facilitators	HCPs' attributes	<ul style="list-style-type: none"> <li>• Following work ethics and professionalism</li> <li>• Guidelines adherence</li> <li>• HCPs' knowledge/competence and skills</li> </ul>
		HCPs' attitudes and beliefs	<ul style="list-style-type: none"> <li>• Recognition of the importance of one's role in the healthcare team</li> <li>• Importance of building good relations with other HCPs</li> <li>• Teamworking</li> <li>• Acceptance of other team members</li> <li>• HCPs' interest to provide CCM</li> <li>• HCPs' seeking patients preference</li> <li>• Pleasant HCPs attitude</li> </ul>

Table 11. Domains, Themes, and Subthemes Associated with the Value of CCM in DM Management in PHC Settings

<b>Domains</b>	<b>Themes</b>	<b>Subthemes</b>	<b>Codes</b>
			<ul style="list-style-type: none"> <li>• Satisfaction with the performance of other HCPs</li> </ul>
	Theme 3: System-related facilitators	Administration-related factors	<ul style="list-style-type: none"> <li>• QP company’s encouragement and recognition of HCPs</li> <li>• Good managerial support</li> <li>• Supplies provision to uninsured patients</li> <li>• Patient privacy protection</li> <li>• The flexibility of the appointment system</li> <li>• Availability of multinational staff</li> </ul>
		Resources	<ul style="list-style-type: none"> <li>• Printed educational material provided to patients</li> </ul>
<b>Barriers</b>	Theme 1: Patient-related barriers	Patients’ attitudes and attributes	<ul style="list-style-type: none"> <li>• Lack of patients’ time</li> <li>• Communication barrier</li> <li>• Language barrier</li> <li>• Specific patient category not listening to some HCPs’ advice</li> <li>• Patient carelessness</li> <li>• Inadequate patients’ health literacy</li> </ul>
		Financial barriers	<ul style="list-style-type: none"> <li>• Lack of insurance</li> </ul>
	Theme 2: HCPs-related	Workload	<ul style="list-style-type: none"> <li>• Lack of time and patients overload</li> <li>• Patients waiting time</li> </ul>

Table 11. Domains, Themes, and Subthemes Associated with the Value of CCM in DM Management in PHC Settings

<b>Domains</b>	<b>Themes</b>	<b>Subthemes</b>	<b>Codes</b>
	barriers	HCPs' attributes	<ul style="list-style-type: none"> <li>• Lack of staff education</li> <li>• Lack of specialized nurse diabetes educator</li> <li>• Lack of specialized physicians (e.g. diabetologist)</li> </ul>
		HCPs' attitudes and beliefs	<ul style="list-style-type: none"> <li>• Unpleasant HCPs attitude</li> <li>• Attitude of physicians</li> <li>• Lack of HCPs' interest to provide CCM</li> <li>• Underestimation of other HCPs' role</li> <li>• Lack of respect between HCPs and patients</li> <li>• Old physicians perception of sole care provision</li> </ul>
	Theme 3: System-related barriers	Community system	<ul style="list-style-type: none"> <li>• Social barrier</li> </ul>
		Hospital system – Administration-related barriers	<ul style="list-style-type: none"> <li>• Complicated appointment system</li> <li>• Infrequent follow-up</li> <li>• Unsupportive leadership</li> <li>• Lack of adequate human resources</li> <li>• Lack of confidentiality</li> <li>• Substandard medical management</li> </ul>
		Hospital system – Resources	<ul style="list-style-type: none"> <li>• Equipment dysfunction</li> <li>• Electronic healthcare system dysfunction</li> <li>• Lack of global access to glucometer software</li> </ul>

Table 11. Domains, Themes, and Subthemes Associated with the Value of CCM in DM Management in PHC Settings

<b>Domains</b>	<b>Themes</b>	<b>Subthemes</b>	<b>Codes</b>
CCM: Collaborative Care Model; HCP: Health Care Professionals; MUR: Medication Use Review; QPDC: Qatar Petroleum Diabetes Clinic			



## *Domain 1: Components of the Collaborative Care Model*

### *Theme 1: Characteristics of CCM*

*Service quality indicators:* Accreditation of QPDC was considered a crucial element in providing high-quality care. Participants explained that the prompt and continuous provision of equitable, high-quality care was guaranteed even in the presence of high workload.

*“We are following high standards of care that is acknowledged by management. We need to stand out in care for diabetes. It helps me to make people as good as they can be, which motivate us in return to give good service to them. We reached the diamond tier, which is the highest tier in the Canadian accreditation. We have comfortable environment and less patients, unlike Hamad, which help us to do extra work with less complications. We can spend one hour with one patient without compromising another patient. We can handle double the number of patients we are having now as long as the management and human power is more because we have to maintain our quality care” HCP 9.*

*CCM competencies:* HCPs collaboratively assess patients and make decisions after efficiently communicating with other HCPs and with patients. The provision of patient-centered care requires a blame-free, humane environment.

*“Communication between the healthcare members through ISBAR and with the patient directly verbal consultation. Sometimes we can send message from the MIMS that is very short notes that is to do something. But for detailed communication, we go through ISBAR by face, by*

*phone” HCP 3.*

*“I always tell them encouraging statements like excellent and you are doing good. I never blame the patient even if the HbA<sub>1c</sub> is 12%, no problem there is a chance. The next three month we will try again and again. We try changing the medication. So, they appreciate this.. My commitment is to be human with good knowledge. I treat the patients as me and my kids to be treated” HCP 6.*

*“I am living in Doha, but I come to Dukhan for my appointments. They care about me as a human, not as a number” Pt 9.*

### *Theme 2: Key players in the Healthcare Team*

*HCPs’ availability and professionalism:* There was a consensus among all participants that pharmacists and nurses were easily accessible. HCPs should possess several tenets of professionalism in order to deliver DM care.

*“We are available 24 hours; because there is no access to doctor all the time. And sometimes especially DM patients they have problems happening during the daytime, midnight, and early morning. Getting hypo- and hyperglycemia or other symptoms. So, it is difficult for them to reach doctor, but easy for them to find the assigned pharmacist. So, we give them our mobile number they call. Sometimes calling at 2 am, 3 am, we are available 24 hours ” HCP4.*

*“If I need anything, I call the focal pharmacist at any time. I have never seen a good treatment like theirs” Pt 5.*

*“I call the diabetes nurse educator all the time when I need her. She is very friendly. Sometimes I do not feel good, so I come to the clinic to meet the team” Pt 10.*

*“I believe that teamwork is characterized by collaboration and cooperation, respect, support, responsibility, continuity of care, working as a circle with patients centered in it” HCP 7.*

*HCPs personal attributes and attitudes:* In order to provide valuable DM care, HCPs must obtain valid credentials that maintain and improve their competency in DM management. Besides credentials, the pleasant attitude of HCPs towards their colleagues and patients was highly appreciated by patients.

*“HCPs should have educational background, certified certificate from a well-recognized institute (like being a certified DM educator, pharmacist and physicians must have postgraduate training in DM), experience, and CPD. Because if you ask me about DM management 15 years ago it will completely be different from now (all medications, approaches, follow-up, and diagnostic criteria have changed)” HCP 6.*

*“Nurses and pharmacists are very good. That is why I come for diabetes education. The pharmacists are very nice, and they provide*

*individualized follow-up. They are caring more. Pharmacy elsewhere only provides medicines, but here, doctors prescribe, and pharmacists help us in medications” Pt 11.*

*Patients’ knowledge and attributes:* Patients’ knowledge about the disease, medications, and CCM facilitates collaboration in the healthcare environment. Participants expressed that vigilance and proactiveness of patients are essential attributes to better health outcomes. The deliberate negligence of health education by patients contributed negatively to their disease condition and overall health.

*“The patient has to be compliant, adherent to medications and attend follow-up appointments, read a little about his disease, find out what is his/her concerns, fears, worries, because we ask them, and they should know. In Canada, a 10-years-old patient has access to FDA [Food and Drug Administration] and new medications and they discuss with me regarding the new medications. We provide them education, but they have to read something. The patient must have commitment to care for themselves, now the approach is patient-centered” HCP 6.*

*Involvement of family in care:* Active family participation in DM self-care in the form of group meetings with HCPs leads to better health outcomes as the family is considered one of the key players in the management of DM.

*“We have a private consultation room with rounded table, because sometimes we call families not only patients for family meetings to provide special services to them like education because families need*

*our support” HCP 4.*

*“I believe that the family of the patient is the most important key player in the medical team” HCP 8.*

### *Theme 3: Coordination and Organization of the Care Process*

*Easy access to organized care:* Patients have easy access to all HCPs during appointments and walk-in visits. Within a single visit, patients have to see mainly their physician, pharmacist, and nurse for an overall assessment of their status. In addition, the participants generally indicated satisfaction with the organized process of care in the clinic as supported by the below statements.

*“We have easy access and lovely care we are taking. We are familiar with each other. Each one of them know us very well, other places they need to go through cases. They are providing good advices also” Pt 1.*

*“The pharmacist checks my glucometer readings and recommends changes in medicines if needed. The nurse educates me about diet and exercise and checks my vital signs. The doctor makes tests, even if the glucose readings are regular” Pt 8.*

*“It is very easy for patients to reach the doctor and the focal point pharmacist; they can text him or come immediately” HCP 5.*

HCPs encourage patients to visit the clinic or contact them by phone in case of facing difficulties in DM management. Patients of all nationalities frequently contact pharmacists and nurses by phone to inquire about medication dose adjustments (e.g. insulin) after deviating from the meal plan.

*“Usually we tell them if they have any doubts or questions just call at any time and we give them our phone even after office work and weekends. They also can come at any time, especially the newly diagnosed patients, and we tell them if you have any queries come any time just give them the time frame we are open and tell them do not hesitate to call us any time if it is needed” HCP 2.*

*“We have flexibility. We recommend having appointment strictly. If in urgent case, they can walk-in at any time. If you provide good care to patient you will have job satisfaction, we don’t base our work on fast, we base our work on satisfaction and quality care” HCP 3.*

*“We encourage patients to come at any time even if the visits is not scheduled or leave a message” HCP 7.*

*Follow-up and referral:* The clinic receptionist arranges frequent appointments for patients with DM based on their case, but rarely less than four visits a year. The majority of patients are followed up on a monthly basis. In the case of advanced DM complications, HCPs refer patients to secondary or tertiary care as needed.

*“The doctor encourage me to come for follow-up visit once every month and more often at any time if I need more help” Pt 12.*

*“If it an urgent case, we may refer the patient to secondary care for hospitalization in case of severe hypo-/hyperglycemia, concern about DKA [diabetes ketoacidosis] or HHS [hyperosmolar hyperglycemic state], or acute complications of diabetes” HCP 6.*

#### *Theme 4: Education and professional development*

*Professional development and educational opportunities for HCP: DM management is continuously changing with the emergence of new treatment approaches. Effective DM management requires HCPs to remain updated with all new treatments, technologies, and modalities through obtaining credentials or attending educational sessions about DM management.*

*“HCPs should have educational background, certified certificate from a well-recognized institute (like being a certified DM educator, pharmacist and physicians must have postgraduate training in DM), experience, CPD because if you ask me about DM management 15 years ago it will completely different from now.. all medications, approaches, follow-up, and diagnostic criteria changed” HCP 6.*

*Patient education and counseling: Patient education is viewed as a cornerstone of DM management as it empowers patients to appropriately self-manage themselves, which eventually contributes to the improvement of glycemic control, QoL, and*

reduction of long-term implications. All HCPs provide consistent advice to patients about DM and their medications at each visit that reduced patients' confusion till the next appointment.

*“Patient education is the first step for us. After that, we ask for MUR [Medication Use Review], we ask the patient to bring all what he is taking from different location or from his country, even herbal products if he is taking. We ask them to bring and we try to know how he use all these medications and then we check patient file from electronic profile... It is very good for patients health because patient is hearing advices from all collaborative team care. By increasing patient knowledge and patient education, the most important point, patient after that starts to cooperate and build a trust between the healthcare team and the patient” HCP 4.*

*“The team care is very good for patients health specially if they have diabetes because we always need support from them. I feel that I can confidently manage my blood sugar and my health because of the education they provide me with” Pt 12.*

#### *Theme 5: Managerial Support*

*Technology:* HCPs expressed the need for unbiased education by medical representatives about new medications and technologies. The management at QPDC provides HCPs with the required technologies that facilitate care provision to patients



with DM. All patients are provided with the newest glucometers that can be linked to HCPs' computers.

*"They provide us with mobiles, technology, free glucometers for patients" HCP 7.*

*Infrastructure/facilities:* The management also supports the health staff by providing them with a dedicated counseling room used for patients and family meetings and counseling. This counseling room maintains patients' privacy and ensures their comfort throughout the duration of the visit.

*"All infrastructure is evident including this room which gives patients privacy" HCP 2.*

*"They are giving full support. We have a private consultation room with rounded table ... with suitable, comfortable chairs and education tools" HCP 4.*

*Financing:* QP company covers all health expenses of employees. Even non-QP employees who are not insured still receive part of care free of charges like the glucometer and its strips. However, they are charged for other aspects of the service.

*"In QP, some patient are not covered financially for the service and they need the service. We still give them glucometer and strips, because it is difficult for them to purchase" HCP 4.*

## *Domain 2: Impact of Collaborative Care Model on Diabetes Outcomes*

### *Theme 1: Improvement in Patients' Health Outcomes*

*Improved DM control:* Participants indicated that before the launch of the service, the incidence of DM emergency visits due to hypo- and hyper-glycemia at QP Medical Center in Dukhan was high. After the implementation of CCM, HCPs followed-up patients closely (face-to-face and by phone) in order to tailor and modify their drug therapy regimens, diet, and lifestyle based on their glycemetic control. Hence, medical errors and emergency visits due to fluctuations in blood glucose levels were noticeably reduced.

*"I deal with patients with hypo- and hyperglycemia; we give them education. Before the clinic, these incidents were very high. But after patients are followed-up in the clinic, they have less fluctuations in their blood glucose level... Now we rarely have emergency cases because of the good service patients receive at the clinic" HCP 9.*

*"We, the pharmacists, do counselling, MUR, answer questions of patients because doctors sometimes are busy, educate about food and diet. After seeing results of patients, patients are happier and may be discontinued from 2-3 medications because of the improvements" HCP 11.*

*"They gave me good diet and I am almost stopping NoVo rapid and the HCPs team became very happy" Pt 1.*

*Addressing patients' psychological well-being:* A minority of patients expressed their concern when dealing with apathetic physicians in other PHC centers who raise their anxiety levels regarding their health status. Patients with DM, especially if newly diagnosed, need supportive healthcare staff who will calm them down and enhance their self-confidence.

*"A lot of patients who come with HbA<sub>1c</sub> 12%, reach 7% and feel much better. Even their spirit, they feel like they are doing very good job. This is our job to support and promote the patient. I always tell them encouraging statements like excellent and you are doing good. I never blame the patient even if the A<sub>1c</sub> is 12%, no problem there is a chance. Next three month we will try again and again" HCP 6.*

*"Some doctors will make you panic, so I went to the focal pharmacist because of the panic they caused me. The staff is very friendly because they will calm us down and reduce our panic. Here they are very friendly using psychological approach" Pt 11.*

## *Theme 2: Satisfaction and Appreciation of CCM*

*Patients' satisfaction with and appreciation of CCM:* Engaging patients in the decision-making process makes them satisfied with the collaborative care provided. Patients appreciate the useful information about health and medications provided to them by HCPs that are otherwise not provided at other PHC centers or hospitals.

*"When we provide the service for the patient, most of them are feeling happy. When patient starts to work with us and starts to build trust*

*between us, immediately asking why when we go to other healthcare centers or hospitals they are not telling us like that. It is the very first time for us to hear this information. They are saying this to doctors, nurses, and pharmacists” HCP 4.*

*“I feel committed and happy to do my job. The appreciation and “thank you” from patients make us satisfied (not only the salary)” HCP 10.*

*“I cannot see any barrier. We are lucky to have a good service here” Pt 4.*

*HCPs satisfaction:* HCPs, especially pharmacists, were satisfied when their role was recognized by patients and other members of the healthcare team. The improvements in patients’ health after receiving the CCM boosted the satisfaction of HCPs.

*“I feel happy and satisfied when I see progress in their [patients] health and lifestyle” HCP 5.*

*“When I get a good lab result they become very happy and you can see that from their face” Pt 1.*

### *Theme 3: Preferred Care Provider*

Patients showed their preference for the care received at QPDC over other clinics due to the visible health outcomes they experienced. Patients are advising family and friends to follow-up at this clinic, which enhanced its reputation in the city and at

the management level. Therefore, the management of QPDC is interested in expanding the service to other QP health centers in Qatar to reduce the burden of DM on the economic and healthcare system.

*“Some patient are coming from Doha to receive this service. See how many centers and hospital in Doha. Even locals are moving from Doha to here to receive DM care” HCP 4.*

*“I only follow-up with this clinic. Even if they are on vacation, I wait until they come back. I do not go to other clinics. I feel that I can control my disease if I follow their advice. They encourage me to follow their advices every visit. I will be harmed if I follow-up in other clinics because I got used to all the HCPs here as a group” Pt 5.*

*“I don’t go to any other clinic. I was going to QP Doha wellness center until 2008, then I came here” Pt 7.*

### *Domain 3: Facilitators to Collaborative Care Model*

#### *Theme 1: Patient-related facilitators*

*Patients’ perception and attitude:* Patients became familiar with the healthcare team and therefore made the collaboration easier. Patients also indicated that having fixed healthcare staff for their case management was a factor in optimal DM care. HCPs expressed their motivation to collaborate when they deal with patients of pleasant attitude, cooperative manners, and adequate health literacy. Patients believed that it is

their responsibility to create a suitable atmosphere for HCPs to help them collaborate effectively.

*“High knowledge about the disease and medications, bringing their glucometer, and the willingness to receive the care keep us motivated”  
HCP 12.*

*“We have to create the good atmosphere for them. Because they are human beings and they are caring for us. When they spend a lot with a patient we should wait and not get angry because HCPs are not telling stories, they are giving medicines. We should have good attitude towards them” Pt 4.*

#### *Theme 2: HCPs-related facilitators*

*HCPs attributes:* In order to provide the best collaborative care to patients with DM, competent HCPs must first possess adequate knowledge, have a professional set of skills, and have the interest to provide collaborative care. Not to mention, following work ethics that are set by the health management at QP company as well as international practice guidelines can positively influence the provision of CCM.

*“The professions working in the team must be competent, well-educated, and have a desire to help the patient” HCP 1.*

*“Holistic and cooperative approach has criteria that must be met like having a good physician, understanding pharmacist, educated nurse”  
HCP 6.*

*HCPs' attitudes and beliefs:* The recognition of the importance of one's role in the healthcare team and acceptance of other team members' contributions led to greater HCPs' satisfaction and recognition of the importance of building good relations with other HCPs and team work to improve CCM provision. Patients recognized that HCPs who are interested in their work are more likely to be pleasant and seek patients' preferences when making decisions.

*"Knowing that my role is important increases my passion to collaborate and provide education to patients who have gap in knowledge" HCP 11.*

*"The doctor supervise the treatment plan, discuss, hear me, and talk friendly. The pharmacist doesn't refuse anything I ask for, he also discusses with me in a friendly language. The nurses are patient with us and educate us" Pt 5.*

### *Theme 3: System-related facilitators*

*Administration-related factors:* The good managerial support at QP company recognizes the efforts of HCPs and encourages them to collaborate. Having multinational healthcare staff facilitates effective communication with patients of different languages. One of the repeatedly mentioned facilitators by the majority of participants is the flexibility of the appointment system that provides HCPs with close monitoring of patients' cases and quickly addresses patients' healthcare needs. Patients' openness and trust in HCPs was greatly facilitated by their privacy protection. The management also ensures supplies provision even to uninsured patients, representing an universal approach to care delivery.

*“QP company facilitates and encourages us to give our best” HCP 9.*

*“Flexibility in appointment system, lead clinic in this area, cooperation, update staff, shared decision making with HCPs and patients, and privacy” HCP 7.*

*“They have a very flexible appointment system that works well with our duty times” Pt 9.*

*Resources:* The availability of resources, including educational materials and technologies given to patients, facilitates the provision of collaborative care to improve their knowledge and ability to self-manage their condition, respectively.

*“They [the management] provide us with mobiles, technology, free glucometers for patients” HCP 7.*

*“If we request some printed materials (brochures) they [the management] will provide” HCP 5.*

#### *Domain 4: Barriers to Collaborative Care Model*

##### *Theme 1: Patient-related barriers*

*Patients’ attributes and attitudes:* One barrier identified by HCPs is interacting with illiterate patients, especially geriatrics, or foreigners. Patients who are careless about their health and accepting recommendations only from physicians impose a great obstacle to the provision of CCM by HCPs. Dealing with patients who lack time to receive the full process of care compromises some steps of care over the other.



*“If patients are careless, we will not be able to help them. In the meantime, it is up to the patient. We provide them with everything, but if they insist not to care and hurt themselves it is up to them. But we still need to find out why.” HCP 6.*

*“Barriers include [...] lack of patient time, lack of patient education specially geriatrics” HCP 7.*

*Financial barriers:* HCPs have an ethical responsibility to ensure that all patients have access to needed care regardless of their economic background or status. HCPs and QPDC management address patients' financial barriers by discussing insurance issues with patients and justifying patients' needs to the corresponding insurance company.

*“In QP, some patient are not covered financially for the service and they need the service. We still give them glucometer and strips, because it is difficult for them to purchase, we are trying to manage them for one month” HCP 4.*

*“The supply and cost of medication: They have a limited quantity to supply to patients. If they exceed, insurance may object so they have to give an explanation” Pt 1.*

*Theme 2: HCPs-related barriers*

*Workload:* Physicians' desire to collaborate with other HCPs is not always sufficient for providing CCM. There was a consensus that physicians always suffer from patient overload in non-collaborative health environments. High patient load limits the time allocated for patient-provider interaction, hence, proper assessment and treatment. Patient overload also lengthens the wait time for patients to access the needed healthcare.

*“Doctors would like to collaborate, but they have a time pressure. They don’t have the chance to work with a team. They have a lot of patient load. We can make awareness for people regarding this issue” HCP 1.*

*HCPs attributes:* The lack of enthusiastic, interested, and educated healthcare providers hinders the provision of quality care to patients with DM. Having more staff possessing specialized credentials (e.g. specialized diabetes educators) was perceived as necessary for the continuity of care provision, especially in the absence of other specialized co-workers. Moreover, participants indicated that there is a need to have specialized physicians (e.g. diabetologist, ophthalmologists) at PHC settings to eliminate the need for referring patients to other hospitals.

*“Lack of interest. So many times, I ask about the reason but no reply. If talking about overload, sometimes we are two people working here, one covering two windows and the other one covering the diabetes clinic patients. Patients are still satisfied and not complaining. If we go for statistics, every year no one is complaining against pharmacy. So, the workload is not a cause for that” HCP 4.*

*“Some nurses don’t have specialized diabetes courses. If they have, that will be very good in case the other specialized nurse is on leave” HCP 10.*

*HCPs’ attitudes and beliefs:* Some physicians at other clinical settings persistently believe that doctors should be the sole caregivers and decision-makers, which does not guarantee the provision of comprehensive care. Patients expressed frustration with the hierarchical behavior of physicians when receiving care at other healthcare centers or hospitals.

*“Sometimes each HCP have their own mind, but here we hear from others and share new studies done. Even if we disagree, we try to reach one final decision at the end. Sometimes they underestimate other members of the team” HCP 5.*

*“HCPs who think that they are smarter than patients, and not using good terms when communicating with patients and with each other” Pt 6.*

*“Shortage of staff, and having the classic opinion that doctors are the only HCP that should work with patients and make decisions” HCP 8.*

### *Theme 3: System-related barriers*

*Community system:* As strong social relationships positively impact patients' health, the opinion of inexperienced individuals regarding health and medications are

taken seriously by many patients. Patients' obedience to such opinions interferes with professional HCPs' advice they receive, thus leading to adverse health outcomes.

*“We have social problem here, especially in gulf areas, people they trust what their community is telling them not take insulin because some people took it and died or have kidney problems. So, patients trust their acquaintances blindly. Unfortunately, this is the biggest problem we are facing” HCP 4.*

*Hospital system – Administration-related barriers:* The lack of adequate human resources, especially during holiday seasons, may lead to the discontinuity of care provided to patients in need. Substandard and unsupportive leadership was identified by participants as a barrier to healthy collaboration. Complicated appointment systems at healthcare institutions contribute to infrequent follow-up and management of patients with DM. Patients indicated that the lack of confidentiality of their suggestions and discussions in the healthcare environment might harm their career.

*“A bad management system can discourage everyone from healthy collaboration. In governmental health centers, the appointment system is very complicated. But they solved the issue by having a separate department working on arranging appoints. It is a little better now. They will give an appointment every three months and in case of urgency, you will get an appointment after a month” Pt 9.*

*“Healthy discussions between patients and doctors and pharmacists may improve our case. Non-anonymous discussion and suggestion may*

*harm my job” Pt 11.*

*Hospital system – Resources:* HCPs indicated that comprehensive care provision is not possible in the case of dysfunction of electronic healthcare systems and tools (e.g. glucometer). Although QPDC provides patients with glucometers that are linked to the MIMS system, the lack of global access by other healthcare institutions to glucometer software is another identified barrier to CCM provision.

*“There can be economic barriers like equipment. If the equipment is not working properly, improvement will not be distinguished. Even if not calibrated properly, that can also be a barrier to healthcare provision”*

*HCP 3.*

*“Not having a glucometer software that connects with different types of health systems” HCP 8.*

## CHAPTER 5: DISCUSSION AND CONCLUSION

Investigating the impact of collaborative healthcare has become increasingly important for decades in an effort to lessen the burden of chronic diseases including DM. International organizations concerned with the management of DM have reported a high prevalence of DM and its complications despite the advancement in healthcare. To our knowledge, this is the first study conducted in Qatar to investigate the impact and value of CCM in primary care settings. The aim of this project was to address the following research questions: What is the impact of CCM of DM-related outcomes and what are the perspectives of HCPs and patients on the value of CCM in DM care in PHC settings?

This chapter interprets the key findings of the study and discusses the significance of the findings in the context of the existing body of literature. First, the discussions focus on Phase I of the study, and later divulge into Phase II of the study.

### Phase I: The Impact of Collaborative Care Model on Diabetes Outcomes in a Primary Healthcare Setting

This study showed the impact of CCM on 11 DM-related outcomes over a period of 17-months. Given that the literature assessing the impact of CCM on diabetes outcomes took place over different study periods, a similar fashion will be followed in comparing the magnitude of improvement in the outcomes over the follow-up period.

In the present study, reductions in HbA<sub>1c</sub> were both clinically and statistically significant. The CCM provided at QPDC resulted in a significant reduction in HbA<sub>1c</sub> by 0.4% within the intervention group from baseline to 17-months ( $p=0.035$ ). The significant reduction in HbA<sub>1c</sub> after receiving interventions from different healthcare team members in PHC settings reported in several studies ranged from 1.2%–2.1% in shorter periods (minimum 8 months) compared to the current study (17 months), which

could be due to inherent differences in the nature and intensity of the intervention provided or the study design used (94–96,112,132–138). Few studies conducted in the MENA region have shown similar positive clinical improvements in HbA<sub>1c</sub>, FBG, lipid profile, and DM self-care activities after receiving pharmacists interventions as part of a collaborative healthcare team (95,139). Davis et al. (94) found that 23.4% of patients who received the intervention met the goal HbA<sub>1c</sub> of <7% compared to 46% of patients who received CCM in our study. The majority of the cited studies have linked the outcomes improvements to the educational interventions on health, diseases, medications, and lifestyle provided by the healthcare team. Compared with DM management in the hospital setting, PHC centers yielded better clinical outcomes and patients' satisfaction according to an observational cohort study involving 1678 patients with DM conducted in Qatar (140). Provider–patient communication in PHC was shown to be associated with better glycemic control among patients with type 2 DM (141). Moreover, it was found that lower socioeconomic status worsened glycemic control and physical and mental health (142). At QPDC, most patients either have QP insurance or are covered by different types of health insurance, giving them adequate access to healthcare. Interestingly, healthcare services were provided to certain extent for patients without insurance.

Although FBG did not show statistically significant improvements between and within groups in the current study; the FBG improved from baseline to 17 months by 2.97 mg/dL in the intervention group, whereas deterioration occurred in the control group by 22.77 mg/dL. Some studies found a greater reduction in FBG in the intervention group within a shorter follow-up period (95,112,143). An improvement in FBG (reduction of 17.7–53 mg/dL) in patients who received collaborative care compared to usual care over 6 months of follow-up was reported in the literature

(95,143). FBG was significantly improved in another study of a one-year follow-up duration by 16.6 mg/dL in the intervention group (112).

Lipid profile (LDL-C, HDL-C, TG, TC) showed improvements in the intervention group over the study period. This is in line with the results reported in the short-term and long-term Asheville projects, where an improvement in lipid profile was evident at every follow-up but with a small magnitude that did not reach statistical significance (136,137). Usually, lipid profile parameters require a prolonged follow-up period to show significant reductions compared to the baseline. On the other hand, a six-month follow-up study revealed a significant improvement in lipid profile in both the intervention group and the control group, but no significant differences were seen in the between-group analyses (95). In the current study, TC, LDL-C, and HDL-C improved by 0.46 mmol/L, 0.53 mmol/dL, and 0.2 mmol/L, respectively in the intervention group over 17-months. These findings were consistent with a cross-sectional study conducted at QP Messaied Medical Centre that reported a significant improvement in the mean TC, LDL-C, and HDL-C by 0.39 mmol/dL, 0.2 mmol/dL, and 0.04 mmol/dL, respectively in patients attending a special DM clinic versus receiving care at a non-specialized PHC clinic (115).

Although CCM did not result in statistically significant improvement in SBP, there was a clinical improvement (reduction) in the intervention group by 0.8 mmHg, while there was an increase in SBP by 3.1 mmHg in the control group. The control group had a non-significant greater reduction in DBP by 0.77 mmHg compared to 0.31 mmHg in the intervention group during the follow-up period. Previous studies have reported a greater significant improvement in SBP and DBP by 4.9–12.1 mmHg and 2.3–7.2 mmHg, respectively over a shorter follow-up period (94,140). According to ADA, the target SBP and DBP in patients with DM and hypertension should be <130/80



mmHg (144). Patients who received CCM had mean SBP and DBP values at goal during the four time-points (except baseline DBP value), whereas patients in the control group had not. Patients having a more poorly controlled blood pressure might experience greater reductions in blood pressure as a result of receiving collaborative care compared to those having a current blood pressure closer to target. The lack of significance could also result from the high standard deviation of subjects' blood pressure values.

The baseline body weight value was higher in the intervention group than the control group. However, this difference in body weight between the two groups was lost after three months of follow up period ( $p=0.08$ ). At the end of the follow-up period, patients receiving CCM had a significant reduction in their weight by 0.67 Kg ( $p=0.02$ ), while the control group patients had an increase in body weight by 0.81 Kg ( $p$ -value not available). The literature reporting the impact of collaborative care on weight is conflicting due to the different the follow-up periods of each study. For example, one study conducted over four months showed that the intervention resulted in no change in weight reduction within and between groups (145). Another study followed patients for six-months yet reported an increase in weight by 2.7 Kg in the intervention group (143). Furthermore, BMI significantly improved within the intervention group only by 0.25 Kg/m<sup>2</sup> ( $p=0.010$ ) from baseline to 17-months. A greater significant reduction in BMI of 1.7 Kg/m<sup>2</sup> ( $p=0.001$ ) was reported in a study of shorter follow-up period (i.e. 12-months) (112). Other studies have shown that components of CCM including medication management, educational interventions, and patient reminder systems had resulted in statistically significant improvement in BMI by 0.6 Kg/m<sup>2</sup> in the intervention group (96,146).

Although no statistically significant differences were noted in medication

regimens between the two groups, CCM improved medication use and optimized therapy according to guidelines and patients' needs. There was an increase in the addition of insulin to one oral antidiabetic agent (OAA) in the intervention group compared to the control group. Neto *et al* reported no effect of pharmacists interventions as part of the healthcare team on the mean number of medication used per patient in both groups ( $p=0.092$ ) (147). The investigators reported only the mean number of drugs used in the last month of the 36-month study, which might not reflect the differences in the utilization of medications in the intervention group compared to the baseline, and whether the pharmacist helped in switching patients to a more appropriate medication regimen or not.

#### Phase II: The Perspectives of Healthcare Professionals and Patients on the Value of Collaborative Care Model for Diabetes in a Primary Healthcare Setting

To our knowledge, this was the first study in Qatar to investigate the perspectives of patients with DM and HCPs providing care for those patients regarding the value of CCM in DM management in PHC settings. As one previous research suggested, the introduction of new working relationships may not always be successful due to the lack of demonstrable achievements and poor role definitions as well as poor relationships (23). Therefore, it is logical to explore the perspective of key stakeholders regarding the introduction of CCM for DM in a PHC setting. This phase supports the development and implementation of CCM in DM management in PHC settings in Qatar.

Fourteen interesting themes have emerged from participants' responses in this phase classified under four domains: components of CCM, the impact of CCM, facilitators to CCM, and barriers to CCM.

The primary reason why patients prefer QPDC is the availability of unique characteristics exclusive to this clinic. Patients perceived the easy access to qualified HCPs, the easy arrangement of follow-up visits, and receiving special health education as important determinants to manage their condition. Participants in one study were also aware that knowledge and education alone is not sufficient to manage DM safely and effectively (148,149). Moreover, the participants indicated that having fixed HCPs at QPDC enhanced their familiarity with HCPs and strengthened patient-provider relationships on a personal level. A qualitative study reported that patients usually meet different HCPs when visiting DM clinics and that they perceived staff alternation as a barrier to continuity of care (115). Patients who did not have a fixed DM healthcare team were frustrated and more likely to have lower medication adherence and worse health outcomes (20,150–152). One study highlighted that patients from racial and ethnic minority groups were less likely to have a consistent provider, and were more likely to experience problematic communication with HCPs (20,153,154), which was not evident among patients attending QPDC. A study reported that both patients and PHC providers preferred to have the same diabetes team as this promoted familiarity between both parties and contributed to consistency in care provision (23). Patients preferred to develop a relationship with educators and appreciated being cared for by a familiar team of HCPs (23) who are like a “family member” to them (20). Patients’ satisfaction, confidence, trust toward the HCPs, and adherence to medications were evident when patients had a familiar healthcare team (115).

Both patient and HCP participants expressed the importance and value of collaboration in the healthcare environment, which ultimately reflects the harmony in the provision of care to patients with DM. Clinical interactions among HCPs created

new knowledge and understanding of the patient, thereby enabling the provision of individualized patient care (23).

Formal and informal communication was frequently valued as a crucial component of CCM by both patient and HCP participants as it reflects on the quality of the care delivery and patients' familiarity with the healthcare provider. Communication between HCPs and patients in-person and through technology-facilitated medium helps in creating strong professional and personal relationships between them. Studies have shown that familiarity and informal interactions (e.g. personal interactions during lunch, providing corridor consultations, etc) have promoted personal exchange, encouraged intergroup relations, enhanced the understanding of each profession's approaches, and clearly defined different professional priorities of different HCPs (155,156). Furthermore, HCPs recognized that face-to-face meetings facilitated the provision of better patient-centered care and facilitated timely responses during patients' follow-up while patients were still on site (23). Conversely, the lack of informal relationships was shown to disconnect HCPs from their healthcare team (23), and that is why interpersonal communication was referred to as the 'glue' of multidisciplinary collaboration (157).

Both patients and HCP participants indicated that effective and continuous communication between HCPs and patients enabled close monitoring of patient's condition and adherence to personalized treatment plans, leading to the detection of any alarming health issues. Communication is an effective tool to close the gap between the patient's healthcare needs and the HCPs' expectations, thereby facilitating the provision of patient-centered care in DM management that is tailored to patients' cultural values, beliefs, knowledge, and expectations (19,20,158,159). Similarly, HCPs should avoid giving instructions to patients, but instead encourage healthy discussions

and respect patients' concerns, as this would be a more useful way to correct the patients' understanding of DM and gain their cooperation (19).

The study participants have identified other modes of communication in the healthcare environment including the use of MIMS, emails, and administrative staff. As indicated by HCPs, especially nurses, the MIMS system allowed them to share patient information instantly. Accordingly, a few DM educators indicated that EHR notes were one way to share patients' information and care recommendations such as lifestyle or BG monitoring with other HCPs (23). The participants clearly expressed the importance of different means of communication that facilitate CCM, which was opposed by one study that showed that participants considered these means of communication less effective for team functioning (80). Pharmacists at QPDC were proud of utilizing the best technologies including audiovisuals in patient and family education. Providing health education to patients and their families, rather than individually, using audiovisuals and printed educational material were considered as important tools in improving patients' knowledge and understanding about DM (19).

Another component of CCM is the recognition of each healthcare team member's role by patients and HCPs. HCPs, especially pharmacists, expressed their enthusiasm and satisfaction in their job when they felt that their role is appreciated by other team members and by patients. Certified diabetes educator pharmacists practicing in Canada expressed that the greatest personal benefit resulted from the increased job satisfaction and sense of workplace (160). Patients were extremely confident in the knowledge, ability, and role of the pharmacist to educate them on insulin therapy adjustment based on self- monitoring of BG (161).

Additionally, participants recognized the importance of relevant HCPs' education, clinical experience, and attitude. The inclusion of DM nurse educators

within the DM healthcare team was perceived as crucial for the continuity of care to patients with DM. Considerable evidence showed that the involvement of specialized nurses in DM care led to better health outcomes compared to traditional physician-led care (19,162). In fact, having several certified DM educators was suggested as a solution to the shortage of DM nurse educators at QPDC particularly during vacations. Nurses have been trained to sustain the management of DM elsewhere especially in the absence of healthcare teams (23). Another HCPs' attribute is their interest in DM. Many HCPs indicated that their interest in managing DM is their main motivation to effectively collaborate with other HCPs and to provide optimal care to patients with DM. Physicians participating in one qualitative study also indicated that HCPs should have 'a personal interest' in DM care and show this interest to patients (19).

Participants indicated that the pleasant and flexible attitude of HCPs facilitates communication and collaboration with patients and other HCPs. Our findings were similar to the literature reporting that HCPs being 'flexible', 'easy-going', and 'confident' are necessary characteristics to consider the HCP as a valuable team player (23). Participants also indicated that there is a great need for a strong relationship building with other healthcare team members through regular meetings and discussions to provide better DM care to patients. The literature showed that a crucial component to enhancing working relationships is to build trust and rapport among HCPs through regular meetings and on-site discussion when the care is being provided to patients (23). Regularly scheduled meetings and case discussions were shown to optimize the efficiency of healthcare teams in meeting patients' needs and addressing operational challenges (80,163).

Patients' attributes and attitudes were other identified component of CCM. Patients tend to focus on their experience of illness, while HCPs focus on the

physiological aspects of illness and its management (20). Although both aspects are important to patients' health and well-being, differences in views can result in communication misalignment (20,153). In the present study, participants indicated that there is a need for efficient communication and education to reach a common ground. Therefore, HCPs must include patients in the decision-making process to facilitate shared goals, better adherence, and potentially better health outcomes (20). In our qualitative study, all participants appreciated the inclusion and engagement of patients in shared decision-making in DM management, which made them feel that they are "treated humanely". In several studies, patients expressed a desire to be "perceived as individuals, not illnesses" and indicated that they felt "reduced to their disease" when HCPs exclusively focus on solving medical problems (164). HCPs in the current study felt that the provision of engaging, respectful, and humane healthcare was their responsibility.

Regarding the impact of CCM, it was recognized that there was a perceived increase in patients' satisfaction and QoL as well as an improvement in patient health after receiving CCM. Other studies have reported similar results, but quantitatively (143,161,165). For example, Mast *et al* reported a significant improvement in patients' satisfaction with their current DM treatment ( $p=0.006$ ), the amount of time taken to manage their DM ( $p=0.043$ ), and the frequency of feeling physically ill ( $p=0.025$ ) on the QoL questionnaire administered to patients who received baseline usual care (pre-test) then received collaborative care (post-test) (143). Another impact of CCM reported by the participants is the reduction of emergency department visits due to DM-complications. HCPs have observed that the initiation of the service had resulted in a reduction in emergency visits at QPMC, which was similar to the findings of a cross-sectional study conducted in the United States (161).

Both HCPs and patients were able to recognize that the outcomes of DM management can be influenced by several factors related to patients, HCPs, and the healthcare system. Participants have identified a lack of patient's time, carelessness, inadequate patients' health literacy, communication barrier, language barrier, and lack of insurance as barriers to CCM provision to patients with DM at PHC settings. Several barriers to the provision of CCM for patients with DM have been identified in the literature as well. For example, HCPs who participated in one study were frustrated with patients' poor adherence to a healthy lifestyle and medications recommended by the healthcare team, especially older and uneducated patients (19). They used expressions such as 'the patients are not listening', 'not understanding' or 'not following the instructions' (19). Similar to our findings, the participants of the former study indicated that older and uneducated patients with DM were not willing to follow physicians' recommendations or attend health education (19). Physicians and nurses in the same study also expressed a higher probability of medication misuse and non-adherence by patients who fear harm or damage to their body organs (19), a finding that was contrast to our findings, where patients showed no concern for DM consequences as they felt adequately educated and managed at QPDC. Most of the HCPs in our setting emphasized the importance of having a multi-national healthcare team to be able to understand and interact with patients of all ethnic/racial backgrounds. Non-Arabic speaking physicians participating in one study expressed language barriers with patients who could not speak English, which forced them to communicate with family members or asked for the assistance of other HCPs for translation and interpretation (19).

One of the HCPs-related barriers recognized by patients is lack of allocating sufficient time for consultation by HCPs, resulting in a lack of adequate patient education and counseling on self-management. Other studies showed that patients also



frequently complained that providers “go too quickly” (150) and do not have time to get to know them and their concerns (19,20,164).

HCPs recognized lack of trust and appreciation of other team members’ roles as a barrier to the provision of CCM in other PHC settings. This could be more prominent among new team members because their professional competency and ability had yet to be demonstrated (19,23,166). Another study showed that new educators felt like “outsiders” and tentatively build rapport while simultaneously avoid hindering the daily routine at the practice settings (23). However, mutual respect and understanding of others’ role were the most important factors for promoting effective service integration among all HCPs involved in caring for patients with DM (23). The increase in familiarity among HCPs suppresses professional boundaries and hierarchies and encourages collaboration, thus enhance trust (23). Some physician have related the lack of collaboration in the healthcare environment to mistrust of the competences of the other HCPs, knowing that the complexity of DM care necessitates a sharing of responsibility between HCPs (167). The cause of this mistrust could be the lack of appropriate IPE to HCPs during their university years. IPE is considered an important component in building capacity and developing collaborative practice-ready health professionals who are competent in delivering CCM (168).

Despite the increasing prevalence of DM, inadequate reimbursement of comprehensive DM care is frequently reported in the literature (169–171). HCPs perceived that most of the services needed by patients with DM are inadequately reimbursed, which limits their ability to perform all the tasks necessary to deliver comprehensive DM care (169). Even in a fee-for-service environment that rewards volume over quality, HCPs indicated that they cannot afford to provide collaborative DM care to all patients with DM, despite their willingness and interest to do so (20,115).

At QPDC, reimbursement was not perceived as a concern, probably because of the adequate financial support. HCPs working at QPDC had an interest in and ability to provide CCM regardless of financial return.

The lack of teamwork approach and shortage of human resources were recognized by HCPs as system-related barriers to CCM in PHC settings. Previous researchers found that physicians indicated that they had to do everything for the patients due to lack of DM specialist nurses, shortage in the number of dieticians and health educators, and no podiatrists for foot care (19,115).

The participants in this study (HCPs and patients alike) recommended some solutions to improve the provision of CCM to patients with DM. They believed that there should be a flexible and proactive appointment call center that arranges frequent follow-up visits, hence reduce patients' overload. Patients' overload may place HCPs under undue pressure to shorten duration of consultations, resulting in suboptimal DM control and increased risk of DM-related complications (19). Physicians indicated that it is very important to see a reasonable number of patients such as 10 – 15 in order to provide optimal DM care (172,173). Reducing the workload and number of visits of patients positively affected HCPs' performance and attitudes according to a study conducted in DM clinics in Oman (19).

#### Strengths and Limitations of the Study

There are several strengths as well as limitations in this study that are noteworthy; therefore, the findings should be interpreted in light of these. This study is the first of its kind to robustly investigate the impact of CCM on DM-related outcomes and the perspectives of HCPs and patients on the value of CCM in a PHC setting in Qatar. Although an RCT is the preferred study design to investigate the cause and effect

of interventions or treatments, the use of RWD in Phase I of this study reflected a more naturalistic, non-controlled environment that is more representative of the target population. Interestingly, the RWE generated from this project showed similar results to numerous published RCTs, despite the potentials for lower medication adherence and other factors that were expected to lower the effects of the intervention. Furthermore, Phase I of the study had a relatively large sample size that ensured adequate power to detect a difference in DM-related outcomes. Despite having an unequal number of patients in each group, the variances between groups were equal in ten out of eleven parameters. This study also included a comparison group and evaluated multiple outcomes related to DM and other comorbidities. Finally, this study supports the initiative to implement CCM in DM management in PHC settings in Qatar that is aimed to reduce the disease burden.

Although health literature is heavily reliant on quantitative data, human's unique experiences and different perspectives cannot be neglected. The coalition of HCPs' and patients' perspectives in Phase II allowed the generation of in-depth understanding and authentic conclusions regarding the value of CCM in DM management. Key guidelines on qualitative research conduct were thoroughly reviewed and considered to ensure the proper implementation of this phase. The qualitative data obtained from the participants provided more detailed, powerful, and compelling results based on stakeholders' experiences and observations, and revealed the value of CCM that cannot be investigated quantitatively. All HCP participants were familiar with the researcher and were consistent in the information being provided, obviating the concern of data manipulation by the researcher. Moreover, choosing interviews over other data collection methods (e.g. focus groups) was more suitable to the sensitive setting at QPDC. Quotes identification and reporting were revised several times by the

supervisors to ensure transparency and eliminate any emergent bias that could be introduced by the researchers. We have strengthened the credibility of this study by interviewing participants of diverse sociodemographic characteristics to introduce variability to the study sample and answer the research questions from different perspectives. Although qualitative data extrapolation from the study group to the general population may not be always feasible, there is still an opportunity to create generalizations from the data reported in this study due to the various purposive sampling technique used. Through in-depth interviews, we identified facilitators and barriers to CCM provision in PHC settings for patients with DM, which can guide health policymakers to consider both factors when implementing CCM.

This study has certain limitations, some of which are inherent to the respective types of the study designs utilized. First, Phase I was a study of a retrospective design, which is susceptible to a lack of adequate documentation of essential information/data such as medications, diagnoses, and complications. Second, incomplete and inconsistent data was one of the major limitations of this phase. This resulted in inapplicability of analyzing the data using two-way repeated-measures ANOVA test. Third, patients with type 1 DM were excluded from the study due to their insufficient number (n=3). Fourth, blind assignment of participants to groups was not applicable due to the retrospective nature of the study; however, this was not considered a concern as patients' natural assignment in the real-world has circumvented the potential bias associated with the lack of blinding. Fifth, other relevant data such as patients' medication adherence that may affect the studied clinical outcomes were not available; hence, those moderating and confounding variables were not accounted for in this study. Finally, the dates of diabetic foot examinations, comprehensive eye examinations, and influenza immunization status were not collected due to inconsistent

documentation among patients, and the performance of these tests elsewhere (e.g. nearby governmental hospitals that use different electronic health systems).

Likewise, Phase II of the study had some other limitations to be considered. First, the presence of the researcher during the interviews might have created some anxiety in a minority of the participants. Participants' anxiety was addressed by allocating adequate time to establish rapport before the interview. Second, there was an issue of anonymity and confidentiality while presenting the findings as the sample size is relatively small and participants could be identified by others through their demographics. This drawback was unavoidable since the patient population and human resources for health (i.e. the numerical strength of HCPs) at the QPDC are very limited. Third, the purposive sample was determined based on HCPs' recommendations, which could introduce bias beyond the researcher's awareness. Fourth, the researcher's perspective and observation were not extensively tracked, yet all supervisors had access to all transcripts and were actively engaged in data interpretation and reporting process to enhance transparency. Finally, the study is limited to one geographical location (i.e. Dukhan); nevertheless, the findings can be transferable to other similar settings.

#### Future Directions and Recommendations

The current study provides a basis for future research studies. Further research is warranted to evaluate the level of involvement of different HCPs that produces the greatest improvement in the health outcomes of patients with DM in PHC settings. Future work should be conducted to address how cultural competencies and diversities among HCPs and patients impact interprofessional team care. There is also a need to investigate the effect of CCM on patient-reported outcomes including, but not limited to, QoL, satisfaction, preference, perceived treatment burden, and others. Furthermore,

economic evaluations (e.g. cost-benefit analysis, cost-effectiveness analysis, and cost-utility analysis) of the impact of CCM on DM-related outcomes in PHC settings are also warranted. Predictions of the impact of CCM on future disease prevalence can add value to the available literature. Given the magnitude of the impact of CCM on DM outcomes in PHC settings, it is reasonable to utilize the approach in managing patients with type 1 DM as well as other chronic diseases and other settings (e.g. secondary and tertiary healthcare settings). Continuous education of HCPs and patients will narrow the gap between current practice and the optimal implementation of CCM, therefore improve and sustain health outcomes. Knowing that poor glycemic control is the most determinant of diabetes-related complications and death (174), further evaluation on the impact of improved glycemic control by CCM on DM-related complications is demanded. Finally, health policymakers and administrators in the PHC sector should explore the potentials of applying this practice based on the generated evidence that may result in improving healthcare outcomes and decreasing the burden associated with DM.

### Conclusions

Inefficiencies in delivering DM care in PHC settings can be circumvented by the integration of CCM. Phase I of the present study evaluated the impact of CCM on several DM-related outcomes in PHC settings, and has demonstrated several significant improvements in DM-related outcomes including HbA<sub>1c</sub>, RBG, LDL-C, TC, weight, and BMI when patients with DM received collaborative care. The findings of Phase I support the important role of the PHC setting in DM management and highlight the positive impact of the integration of different HCPs into the healthcare team in PHC settings on tangible health outcomes. Successful implementation of CCM could lead to

a decrease in the workload, reduction in the frequency of emergency department visits, improvement in DM-related outcomes, hence a decrease in morbidity and mortality associated with DM complications. To the best of our knowledge, Phase II of this project is the first study conducted in Qatar to investigate and report the positive perspectives of patients and HCPs on the value of CCM for managing DM in PHC settings. Important components of CCM such as HCPs' and patients' attributes and attitudes, family involvement in the care process, availability of technology, and utilization of facilities were recognized by the participants. The provision of CCM may promote patients' health, level of patients and HCPs satisfaction, and preference of the service over other forms of care. To facilitate collaborative practice in similar settings, pleasant attitudes of patients and HCPs besides administrative support through tangible resources must be considered. However, unpleasant attitude and undesirable attributes of HCPs and patients, unsupportive hospital system, and high workload were some of the identified barriers to CCM provision to patients with DM in PHC settings. Understanding of the complexity of factors that influence CCM provision for patients with DM in PHC settings provides HCPs and health policymakers with future directions.

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## APPENDIX

### Appendix A: Data Extraction Sheet



الكلية الصيدلانية  
College of Pharmacy  
Qatar University



العيادة المتكاملة  
Qatar Polyclinic

Date: \_\_\_\_\_ Start date: \_\_\_\_\_ Patient's research ID #:

**A. Patient's Sociodemographic Information**

Age	years	Gender	<input type="checkbox"/> Male <input type="checkbox"/> Female	Nationality	
Type of diabetes	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> Others:	Medication history outside QP	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not mentioned	Medical history outside QP	<input type="checkbox"/> Yes <input type="checkbox"/> No
Smoking	<input type="checkbox"/> Never smoke <input type="checkbox"/> Ex-smoker <input type="checkbox"/> Current smoker	Alcohol intake	<input type="checkbox"/> Yes, regularly <input type="checkbox"/> Occasionally <input type="checkbox"/> No	Date of diabetes diagnosis	/ /

**B. Clinical data**

+	Comorbidities (if any)	<input type="checkbox"/> Hypertension <input type="checkbox"/> Coronary heart disease <input type="checkbox"/> Dyslipidemia <input type="checkbox"/> Obesity <input type="checkbox"/> Asthma <input type="checkbox"/> Others	Date of comorbidity diagnosis (if any)	<input type="checkbox"/> Hypertension: <input type="checkbox"/> CHD:   <input type="checkbox"/> Dyslipidemia: <input type="checkbox"/> Obesity: <input type="checkbox"/> Asthma: <input type="checkbox"/> Others:
	MICROvascular Complications	<input type="checkbox"/> Diabetic nephropathy <input type="checkbox"/> Diabetic neuropathy <input type="checkbox"/> Diabetic retinopathy <input type="checkbox"/> Others	MACROvascular Complications	<input type="checkbox"/> Ischemic heart disease (e.g. MI) <input type="checkbox"/> Peripheral vascular disease <input type="checkbox"/> Cerebrovascular disease (eg: stroke) <input type="checkbox"/> Others
	Medications at Baseline (before service provision)	<input type="checkbox"/> 1 OAA <input type="checkbox"/> 2 OAA <input type="checkbox"/> 3 OAA <input type="checkbox"/> Insulin alone <input type="checkbox"/> Insulin + 1 OAA <input type="checkbox"/> Insulin + 2 OAA <input type="checkbox"/> Insulin + 3 OAA <input type="checkbox"/> Diet only	Medications at 18 months	<input type="checkbox"/> 1 OAA <input type="checkbox"/> 2 OAA <input type="checkbox"/> 3 OAA <input type="checkbox"/> Insulin alone <input type="checkbox"/> Insulin + 1 OAA <input type="checkbox"/> Insulin + 2 OAA <input type="checkbox"/> Insulin + 3 OAA <input type="checkbox"/> Diet only

Notes:

Date:

Start date:

Patient's research ID #:




**C. Primary Outcomes**

Parameter	0 baseline	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
HbA1c (%)																			
FBG (mg/dL)																			
TC (mmol/L)																			
HDL (mmol/L)																			
LDL (mmol/L)																			
TG (mmol/L)																			
SBP (mmHg)																			
DBP (mmHg)																			
Weight (Kg)																			
Random BG (mg/dL)																			
Height (cm)																			
BMI (Kg/m <sup>2</sup> )																			

## Appendix B: QP Ethical Approval for Phase I and II

### Ahmed Awaisu

---

**From:** Sithy Sansera Umma Mohamed Fairouz <fairouz@qp.com.qa> on behalf of Mahmood Abdul Rahman Al-Jaidah <m\_aljaidah@qp.com.qa>  
**Sent:** Sunday, February 25, 2018 9:02 AM  
**To:** Dean - College of Pharmacy  
**Cc:** Ahmed Awaisu; m\_aljaidah@qp.com.qa; Mohammad Issam Diab; Mohammed Thahir Ismail; Alshaymaa Mohammed A M Al-Motawa  
**Subject:** RE: Meeting Request

Dear Dean,

Greetings from QP - Healthcare.

We have no objection to allow your students for research unless there is breach of patient confidentiality.

Regards,



**Mahmood Abdulrahman Mahmood Al-Jaidah**

Manager, Healthcare

P.O. Box 47 | Doha, Qatar | T: +974 40134154 | F: +974 40139470 | E-mail: [m\\_aljaidah@qp.com.qa](mailto:m_aljaidah@qp.com.qa)

---

**From:** Dean - College of Pharmacy <Dean.cph@qu.edu.qa>  
**To:** "m\_aljaidah@qp.com.qa" <m\_aljaidah@qp.com.qa>  
**Cc:** "fairouz@qp.com.qa" <fairouz@qp.com.qa>, Mohammad Issam Diab <mohamed.diab@qu.edu.qa>, Ahmed Awaisu <aawaisu@qu.edu.qa>  
**Date:** 21/02/2018 10:10 AM  
**Subject:** RE: Meeting Request

Dear Dr. Mahmoud Al-Jaidah,

I am pleased to write to you again to sincerely thank you for your help last year and for your continuous support to our College of Pharmacy at Qatar University. Since we signed an MoU about 7 years ago, several undergraduate and postgraduate pharmacy students had undertaken experiential training and research at QP healthcare clinics in Qatar. Our experience with QP has been tremendous in terms of educating and training our students.

Certainly, we consider primary healthcare as a priority for Qatar and we aim to collaborate in all possible ways for fruitful outcomes and human capital development. As an extension of last year's undergraduate research project, I would like to inform you that Dr. Ahmed Awaisu in collaboration with colleagues at Dukhan Healthcare Center has proposed to continue the project on collaborative care model in patients with diabetes. The study will comprise of a survey and a retrospective chart review of existing records at the Dukhan Healthcare Center for a duration of about 6 months.

The proposed study is to serve as an MSc student research project for our MSc Pharm. student (Sara Hamdi Abdulrhim). The study is non-interventional and requires only questionnaire surveys and interviews of healthcare providers and patients (Phase 1), and a chart review of an existing data (Phase 2). In view of this, Dr. Ahmed Awaisu in collaboration with the colleagues at Dukhan Healthcare Center has written a protocol/proposal and filled the required ethics application forms (enclosed herewith). We will appreciate your kind support to the team, please.

I would like to kindly request your kind indulgence and support to grant approval for this project. Our faculty will abide by

## Appendix C: QU Ethical Approval for Phase I



### Qatar University Institutional Review Board QU-IRB

April 25, 2019

Dr. Ahmed Awaisu  
Graduate Student Supervisor  
College of Pharmacy  
Qatar University  
Tel.: 4403-5596  
Email: [aawaisu@qu.edu.qa](mailto:aawaisu@qu.edu.qa)

Dear Dr. Ahmed Awaisu,

**Sub.: Research Ethics Review Exemption / CPH Graduate Student Project**  
**Ref.: Student, Sara Abdulrhim / Email: [sa1206904@student.qu.edu.qa](mailto:sa1206904@student.qu.edu.qa)**  
**Project Title: "The Impact of Collaborative Care Model on the Outcomes of Diabetes Management in Primary Care Settings in Qatar (COMPRISE-D Project I)"**

We would like to inform you that your application along with the supporting documents provided for the above graduate student project, has been reviewed by the QU-IRB, and having met all the requirements, has been granted research ethics **Exemption** based on the following category(ies) listed in the Policies, Regulations and Guideline provided by MoPH for Research Involving Human Subjects:

**Category 3:** Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified

**Documents reviewed:** QU-IRB Checklist (S1), QU-IRB Application (FS), Data Collection Form, Approval Study QP Health Center Dukhan, IRB review form, responses to IRB queries and updated documents.

Please note that exempted projects do not require renewals however, any changes/modifications to the original submitted protocol should be reported to the committee to seek approval prior to continuation.

Your Research Ethics Approval No. is: **QU-IRB 1067-E/19**. Kindly refer to this number in all your future correspondence pertaining to this project. In addition, please submit a closure report to QU-IRB upon completion of the project.

Best wishes,

A handwritten signature in black ink, appearing to read 'Mohamed'.

Dr. Mohamed Elrayess  
pp, Chairperson, QU-IRB



Qatar University-Institutional Review Board (QU-IRB), P.O. Box 2713 Doha, Qatar  
Tel +974 4403-5307 (GMT +3hrs) email: [QU-IRB@qu.edu.qa](mailto:QU-IRB@qu.edu.qa)



## Participant Information and Consent Form

### Dear participant,

You are invited to participate in a study titled: "The perspectives of healthcare professionals and patients on the benefits of collaborative care model for diabetes mellitus in primary care settings". The study aims to explore the views of healthcare providers about the benefits of collaborative/team-based care model for diabetes care in primary care in Qatar.

### **PROCEDURE:**

You will be asked to undergo a semi-structured interview by a master of pharmacy student from Qatar University College of Pharmacy to assess your views and opinions about the benefits of collaborative care model.

### **POSSIBLE BENEFIT TO YOU:**

This research will be beneficial for you since it aims at exploring the value of collaborative/team-based care and will be the starting point for future changes in the care provided for patients with diabetes.

### **RISKS AND HARMS EXPECTED:**

No risks or harms are associated with your participation in this study. The only inconvenience might be the time of interview that will last for about 30 – 45 minutes.

### **BENEFIT TO OTHERS:**

The master student involved in the research will develop skills such as leadership, problem solving, communication, organization, critical thinking, and adaptability. Students also will understand the perspective of patients/healthcare professionals about the value of collaborative care. The result will raise awareness about the value of teamwork in diabetes care, which can help in the development of guidelines and protocols advocating for collaborative diabetes care at other primary healthcare centers in Qatar.

### **PARTICIPATION:**

Your participation in this study is completely voluntary. You have the right to agree to undergo the interview, skip any question or decline to participate in the study; however, your participation is highly appreciated. If you proceed to the interview, you are indicating that you have agreed to participate and thus are providing consent. If you consent to participate and during the process of completing the interview you wish to withdraw or not to answer a question you have the right to do so. The interview will be audiotaped using digital recorder to make sure that all the information you provide is accurately recorded. You may still participate in the interview if you do not want to be audio-taped.

**PRVACY and CONFIDENTIALITY:**

All the information given by you will be kept confidential and will only be reported as a group data with no personal identity (i.e. we will deal with aggregated data and no name or identity will be given). The information collected will not be revealed to any third party without your explicit permission. All the information will be kept confidential under locked compartments at the College of Pharmacy, or in Qatar University computers which are password protected to which only the research team will have access to. All data will be destroyed once the results are analyzed and published.

**ACCESS TO RESULTS:**

Once a summary of the results becomes available, you may ask a copy from the Principal Investigator.

If you have any questions or need clarifications on the study, do not hesitate to contact the researchers through the principal investigator whose contact information is stated below:

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**APPROVAL:**

The study is approved by the Qatar University Institutional Review Board with the approval number QU-IRB 1112-EA/19; If you have any question related to ethical compliance of the study you may contact them at QU-IRB@qu.edu.qa

**CONSENT:**

I have read, or someone has read to me, and I understand the information provided above. I have been given an opportunity to ask questions and all of my questions have been answered to my satisfaction. I have been given a copy of this form and I freely give my consent to participate in this research project.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

## نموذج المعلومات والموافقة للمشاركين في البحث

### عزيزي المشترك،

أنت مدعو للمشاركة في دراسة بعنوان: "وجهات نظر مقدمي الرعاية الصحية والمرضى حول فوائد الرعاية الطبية التعاونية لمرضى السكري في مراكز الرعاية الأولية"، والتي ستستكشف وجهات نظر المرضى حول فوائد نموذج الرعاية التعاونية لرعاية مرضى السكري في قطر.

### الإجراءات:

سيُطلب منك إجراء مقابلة من قبل طالب ماجستير صيدلة في جامعة قطر لتقييم وجهة نظرك وآرائك حول فوائد نموذج الرعاية التعاونية.

### الفوائد الممكنة لك:

سيكون هذا البحث مفيداً لك لأنه يهدف إلى استكشاف قيمة الرعاية التعاونية وسيكون نقطة البداية للتغييرات المستقبلية في الرعاية المقدمة للمرضى المصابين بالسكري.

### المخاطر والأضرار المتوقعة:

لا توجد مخاطر أو أضرار مرتبطة بمشاركةك في هذه الدراسة. الإزعاج الوحيد الذي قد يواجهك هو وقت المقابلة الذي سيستغرق 30 - 45 دقيقة على الأقل.

### الفوائد العائدة على الآخرين:

سيقوم طالب الماجستير المشارك في البحث بتطوير مهارات متعددة مثل القيادة وحل المشكلات والتواصل والتنظيم والتفكير النقدي والقدرة على التكيف. سوف يفهم الطالب أيضاً وجهة نظر المرضى بخصوص قيمة الرعاية الطبية التعاونية. نتائج البحث ستؤدي إلى زيادة الوعي بقيمة العمل الجماعي على مرضى السكري، والتي يمكن أن تساعد في تطوير البروتوكولات الداعمة للرعاية التعاونية لمرضى السكري في مراكز الرعاية الصحية الأولية الأخرى في قطر. كما ستوفر هذه الدراسة نتائج تهيئية وأساساً للأبحاث المستقبلية في قطر.

### المشاركة:

مشاركته في هذه الدراسة هي طوعية تماماً. لديك الحق في الموافقة على إجراء المقابلة، أو تخطي أي سؤال أو رفض المشاركة في الدراسة؛ ومع ذلك، فإن مشاركتك لها تقديرٌ عالياً. إذا وافقت على المقابلة، فأنت تشير إلى أنك وافقت على المشاركة وبالتالي تقدم موافقتك. إذا وافقت على المشاركة وأردت الإنسحاب أو عدم الإجابة عن أي سؤال أثناء المقابلة فلك الحق في القيام بذلك. سيتم تسجيل المقابلة باستخدام مسجل رقمي للتأكد من تسجيل جميع المعلومات التي تقدمها بدقة. لا يزال بإمكانك المشاركة في المقابلة إذا كنت لا تريد أن يتم تسجيلها.

### الخصوصية والسرية:

سيتم الحفاظ على سرية جميع المعلومات التي قدمتها، وسيتم الإبلاغ عنها فقط كبيانات مجموعة بدون هوية شخصية (بمعنى أننا سنتعامل مع البيانات المجمعة ولن يتم إعطاء أي اسم أو هوية). لن يتم الكشف عن المعلومات التي تم جمعها إلى أي طرف ثالث دون إذن صريح منك. سيتم الحفاظ على سرية جميع المعلومات في غرف مقفلة في كلية الصيدلة ، أو في أجهزة الكمبيوتر التابعة لجامعة قطر المحمية بكلمة مرور والتي لن يتمكن من الوصول إليها سوى فريق البحث. سيتم تمييز جميع البيانات بمجرد تحليل النتائج ونشرها.

### الوصول إلى النتائج:

بمجرد أن تصبح نتائج البحث متاحة، يمكنك أن تطلب نسخة من الباحث الرئيسي. إذا كان لديك أي أسئلة أو تحتاج إلى توضيحات إضافية حول الدراسة، فلا تتردد في الاتصال بالباحث الرئيسي ادناه:

د/ احمد عويسو

كلية الصيدلة

جامعة قطر ، ص.ب. 2713 ، النوحة ، قطر

هاتف 4403 5596 فاكس 4403 5551

[www.qu.edu.qa/qu/colleges/pharmacy](http://www.qu.edu.qa/qu/colleges/pharmacy)

أ/ سارة عبدالرحيم

كلية الصيدلة

جامعة قطر ، ص.ب. 2713 ، النوحة ، قطر

هاتف 70047602

[www.qu.edu.qa/qu/colleges/pharmacy](http://www.qu.edu.qa/qu/colleges/pharmacy)

لقد تمت الموافقة على هذه الدراسة من قبل مجلس المراجعة المؤسسية لجامعة قطر برقم QU-IRB 1112-EA/19؛ إذا كان لديك أي سؤال يتعلق بالامتثال الأخلاقي للدراسة، فيمكنك التواصل بهم على [QU-IRB@qu.edu.qa](mailto:QU-IRB@qu.edu.qa)

### موافقة:

لقد قرأت، أو قرأ لي شخص ما، وفهمت المعلومات المقدمة أعلاه. لقد أتحت لي الفرصة لطرح الأسئلة وتمت الإجابة على جميع أسئلتي بشكل مرضي. لقد تم إعطائي نسخة من هذا النموذج وأوافق بكامل إرادتي على المشاركة في هذا المشروع البحثي.

التاريخ

التوقيع

## Participant Information and Consent Form

### Dear participant,

You are invited to participate in a study titled: "The perspectives of healthcare professionals and patients on the benefits of collaborative care model for diabetes mellitus in primary care settings". The study aims to explore the views of patients about the benefits of collaborative/team-based care model for diabetes care in primary care in Qatar.

### **PROCEDURE:**

You will be asked to undergo a semi-structured interview by a master of pharmacy student from Qatar University College of Pharmacy to assess your views and opinions about the benefits of collaborative care model.

### **POSSIBLE BENEFIT TO YOU:**

This research will be beneficial for you since it aims at exploring the value of collaborative/team-based care and will be the starting point for future changes in the care provided for patients with diabetes.

### **RISKS AND HARMS EXPECTED:**

No risks or harms are associated with your participation in this study. The only inconvenience might be the time of interview that will last for about 30 – 45 minutes.

### **BENEFIT TO OTHERS:**

The master student involved in the research will develop skills such as leadership, problem solving, communication, organization, critical thinking, and adaptability. Students also will understand the perspective of patients/healthcare professionals about the value of collaborative care. The result will raise awareness about the value of teamwork in diabetes care, which can help in the development of guidelines and protocols advocating for collaborative diabetes care at other primary healthcare centers in Qatar.

### **PARTICIPATION:**

Your participation in this study is completely voluntary. You have the right to agree to undergo the interview, skip any question or decline to participate in the study; however, your participation is highly appreciated. If you proceed to the interview, you are indicating that you have agreed to participate and thus are providing consent. If you consent to participate and during the process of completing the interview you wish to withdraw or not to answer a question you have the right to do so. The interview will be audiotaped using digital recorder to make sure that all the information you provide is accurately recorded. You may still participate in the interview if you do not want to be audio-taped.

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**ACCESS TO RESULTS:**

Once a summary of the results becomes available, you may ask a copy from the Principal Investigator.

If you have any questions or need clarifications on the study, do not hesitate to contact the researchers through the principal investigator whose contact information is stated below:

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**APPROVAL:**

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I have read, or someone has read to me, and I understand the information provided above. I have been given an opportunity to ask questions and all of my questions have been answered to my satisfaction. I have been given a copy of this form and I freely give my consent to participate in this research project.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date



## The perspectives of healthcare professionals and patients on the value of collaborative care model for diabetes mellitus in primary care settings

### Semi-structured Interview Guide – Healthcare Professionals (Dukhan)

<b>Introduction</b>
<p>Hello. Thank you for coming today. I am (facilitator's name) from Qatar University. I will be conducting today's interview with you. Also, here is my colleague (notetaker's name), who will help take notes.</p> <p>Today's interview is part of a study that evaluates the value of collaborative healthcare for patients with diabetes. Today, you will be asked to share your perspective on the value of collaborative diabetes care at the Diabetes Clinic of Dukhan Healthcare Center to highlight the importance of applying such care for patients with diabetes in primary settings.</p>
<b>Initial neutral question and demographics</b>
<p>Ask interviewee to introduce themselves, their age, nationality, health care profession/professional role, year of graduation (first professional degree to practice), and years in practice in diabetes management.</p>
<b>General introductory questions</b>
<ol style="list-style-type: none"> <li>1. When you think about health care being provided by a team, what does that mean to you?             <ol style="list-style-type: none"> <li>a. I will define collaborative healthcare if the participant fails to correctly define or describe <b>World Health Organization definition of interprofessional collaborative practice: "Multiple health workers from different professional backgrounds working together with patients, families, caregivers and communities to deliver the highest quality of care"</b> (WHO, 2010).</li> <li>b. Did you also come across the term "collaborative care model (CCM)"? <b>A measurement- guided care based on evidence-based practice guidelines that focusses particular attention on patients not meeting their clinical goal</b> (American Psychiatric Association)</li> </ol> </li> <li>2. In your opinion, what are the criteria/characteristics of collaborative care and teamwork? (Hint: E.g. Communication)</li> </ol>
<b>A. Description of the service at the clinic</b>
<ol style="list-style-type: none"> <li>1. Who are the key players (i.e. main members of the healthcare team involved) in providing diabetes care at the clinic?</li> <li>2. How do you work with other healthcare professionals in your team to provide care for patients with diabetes? Who does what?</li> <li>3. How do you work together as a team to come up with a plan for patients (i.e. process of care provision)?</li> <li>4. How do the team members communicate with each other and with the patients?</li> <li>5. How do you also provide collaborative care outside routine appointments? Can patients communicate with you between appointments? What is your commitment to providing patients with needed information?</li> <li>6. What support do you receive from the management of the center in terms of infrastructure, facilities, and human resources?</li> </ol>
<b>B. Patient's involvement in decision-making</b>
<ol style="list-style-type: none"> <li>1. What is the role of patient in CCM and team-based care? Is the patient's role helpful in addressing his/her needs?             <ol style="list-style-type: none"> <li>a. IF NO: To what extent do you intend to make the patient part of the healthcare team?</li> <li>b. IF YES: What needs are being met now? How is that happening?</li> <li>c. How does engaging the patient in the healthcare team and partnership in decision-making help/discourage the patient and you?</li> </ol> </li> </ol>
<b>C. Impact of CCM</b>
<ol style="list-style-type: none"> <li>1. How is team-based health care good or bad for patients' health?             <ol style="list-style-type: none"> <li>a. What might be good for patients about team-based care? How does it benefit the patients? (Hint: self-care and self-management)</li> <li>b. What, if anything, might be bad for patients about team-based care? How might it harm or fail to help patients?</li> </ol> </li> <li>2. Describe for me how you feel about the efforts you invest in providing CCM to patients with diabetes? Do you believe it is more convenient for you to deliver usual care model compared to CCM?</li> <li>3. In your opinion, what are the harms of not providing CCM to patients with diabetes?</li> <li>4. What is the patients' impression about CCM in Dukhan? To what extent do they appreciate the service?</li> </ol>
<b>D. Benchmarking</b>
<ol style="list-style-type: none"> <li>1. What characteristics are unique to the Diabetes Clinic at Dukhan Healthcare Center compared with similar clinics in other primary healthcare centers in Qatar? (Hint: environment, location, shared decision-making, etc)</li> <li>2. Why other primary healthcare centers do not provide CCM?</li> </ol>
<b>E. Barriers and influencers</b>
<ol style="list-style-type: none"> <li>1. What factors do you believe are barriers for the provision of CCM in diabetes?</li> <li>2. What factors do you believe are enablers/facilitators for the provision of CCM in diabetes?</li> </ol>
<b>Concluding</b>
<ol style="list-style-type: none"> <li>1. What do you suggest could improve the provision of CCM in diabetes management (if it needs improvement) or maintain it?</li> <li>2. Would you like to share any additional information related to this topic?</li> </ol>
<p><b>Thank you very much for your time today and for your honest opinion and fruitful discussions. We greatly appreciate your participation in this study.</b></p>

## ما هي وجهات نظر المرضى حول فوائد نموذج الرعاية التعاوني لمرضى السكري في مراكز الرعاية الأولية؟ أداة المقابلة للمرضى

المقدمة
مرحباً شكراً لحضوركم اليوم، أنا (اسم الميسر) من جامعة قطر. سأجري مقابلة اليوم معك. أيضاً، هنا زميلي، (مدون الملاحظات)، الذي سوف يساعد في تدوين الملاحظات. تعد مقابلة اليوم جزءاً من دراسة تقييم قيمة الرعاية الصحية التعاونية لمرضى السكري. سيُطلب منك اليوم مشاركة وجهة نظرك حول فوائد عيادة السكري في عيادة السكري في دخان لتسليط الضوء على فوائد توفير الرعاية الأولية لمرضى السكري.
السؤال للمعيد والديمغرافيات
اطلب من الشخص الذي يجري مقابلته تعريف نفسه، وعمره، وجنسيته، وأعلى مستوى تعليمي، وحالة التوظيف، ونوع مرض السكري، ومدة إصابته بمرض السكري، ومدة إقامته في قطر.
أسئلة تمهيدية عامة حول مرض السكري والرعاية التعاونية
1. هل يمكنك أن توضح لي ما هو مرض السكري؟
أ. تحديد ووصف نموذج الرعاية التعاونية
1. عندما تفكر في الرعاية الصحية المقدمة من قبل فريق طبي، ماذا يعني هذا بالنسبة لك؟ أ. سأعرف الرعاية الصحية التعاونية إذا فشل المشارك في الإجابة أو إذا كانت إجابته غير كاملة (انظر للأسفل) <b>تعريف منظمة الصحة العالمية (WHO) للممارسة التعاونية بين المهنيين: "العديد من العاملين في مجال الصحة من خلفيات مهنية مختلفة يعملون مع المرضى والأسر ومقدمي الرعاية والمجتمعات لتقديم أعلى جودة من الرعاية" (منظمة الرعاية الصحية، 2010)</b>
2. ما هي العوامل التي تضمن أن الرعاية الصحية مقدمة لك من قبل فريق طبي؟ أ. من هم الأعضاء الرئيسيين في فريق الرعاية الصحية الخاص بك في العيادة؟ ب. ما هي خدمات الرعاية الصحية المختلفة التي تتلقاها من كل من أعضاء الفريق الطبي؟ من يفعل ماذا؟ ج. كيف يقوم فريق الرعاية الصحية بتنسيق أو إدارة احتياجات الرعاية الصحية الخاصة بك؟ (عملية توفير الرعاية) د. هل يعمل الفريق سوياً لوضع خطة لرعايتك؟ هـ. كيف يتواصل الفريق الطبي مع بعضهم البعض ومعك؟
3. كم مرة تزور العيادة لمتابعة مرض السكري؟
4. في الشهر الماضي، تقريباً كم عدد المتخصصين في مجالات الرعاية الصحية المختلفة الذين قابلتهم (مثل الأطباء، الممرضات، والصيدلة، إلخ...) في العيادة وأماكن أخرى؟
5. إلى من تذهب للحصول على المشورة بشأن مرض السكري و/أو مضاعفاته بين المواعيد؟
ب. المشاركة في اتخاذ القرارات
1. هل تعتقد بأنه يتم إشراكك في العلاج بطريقة تراعي وتلبي احتياجاتك المتعلقة بمرض السكري؟ أ. لا، كيف يمكن تحسينه؟ ب. نعم، ما هي الاحتياجات التي يلبها الفريق الطبي لك حالياً؟ كيف يتم ذلك؟ ج. إلى أي مدى تشعر أنك جزء من عملية أخذ القرار لفريق الرعاية الصحية الخاص بك؟ هل هو شيء جيد أم شيء سيء؟
ت. تأثير الرعاية القائمة على الفريق
1. هل تشعر بأن الرعاية الصحية المقدمة من قبل فريق طبي مفيدة أو مضرّة لصحة مرضى السكري؟ أ. كيف أفادتك تلك الرعاية؟ كيف تحسن رعايتك وتجربتك كمرضى؟ (تلميح: الرعاية الذاتية والإدارة الذاتية) ب. برأيك، ما هي المسائل المصاحبة للرعاية التعاونية القائمة على الفريق؟ كيف من الممكن أن تضرك أو تفشل هذه الخدمة في مساعدتك؟
2. كيف تشعر بعد انتهاء المواعيد مع مقدمي الرعاية الصحية لمرضى السكري؟ هل النصائح المقدمة لك تمكنك من إدارة مرض السكري حتى الزيارة القادمة؟
ث. المقارنة لمعيارية
1. ما الذي جذبك لتلقي الرعاية الأولية لمرضى السكري في هذه العيادة مقارنة بالعيادات الأخرى؟ أ. ما الميزة التي تجدها في المواعيد؟ (تلميح: البيئة، والموقع، وصنع القرار المشترك، وما إلى ذلك) ب. لماذا لا تجذبك الخدمات (إن وجدت) التي تقدمها مراكز الرعاية الصحية الأولية الأخرى؟
ج. الحاجز والعوامل المساعدة
1. ما هي العقبات في رأيك التي تحول دون تقديم هذا النوع من الرعاية التعاونية لك؟
2. ما هي العوامل التي تعتقد أنها تساعد/تيسر توفير هذه الرعاية لك؟
الخاتمة
1. هل لديك أي اقتراحات/تعليقات/أسئلة إضافية حول الرعاية التعاونية المقدمة لمرضى السكري؟ هل تود إضافة شيء؟ شكراً جزيلاً على وقتك اليوم وعلى رأيك الصادق والمنقشة المثمرة. نحن نقدر مشاركتك.



## The perspectives of healthcare professionals and patients on the benefits of collaborative care model for diabetes mellitus in primary care settings

### Semi-structured Interview Guide – Patients (Dukhan)

<b>Introduction</b>
<p>Hello. Thank you for coming today. I am (facilitator's name) from Qatar University. I will be conducting today's interview with you. Also, here is my colleague, (notetaker's name), who will help with taking notes.</p> <p>Today's interview is part of a study that evaluates the value of collaborative healthcare for patients with diabetes. Today, you will be asked to share your perspective on the benefits of collaborative care at the Diabetes Clinic in Dukhan Healthcare Center to highlight the benefits of applying such care for patients with diabetes in primary healthcare settings.</p>
<b>Initial neutral questions and demographics</b>
<p>Ask interviewee to mention their age, nationality, highest level of education obtained, employment status, type of diabetes and for how long they had diabetes, and how long they have been in Qatar.</p>
<b>General introductory questions about diabetes and collaborative care</b>
<p>1. Please help me understand what diabetes is?</p>
<b>A. Defining and describing Collaborative Care Model (CCM)</b>
<p>1. When you think about health care being provided by a team, what does that mean to you?</p> <p>a. I will define collaborative healthcare, if the participant fails to correctly define or describe (<b>see below</b>).</p> <p><b>The World Health Organization (WHO) definition of interprofessional collaborative practice: "Multiple health workers from different professional backgrounds working together with patients, families, caregivers and communities to deliver the highest quality of care" (WHO, 2010).</b></p> <p>2. When you think about healthcare provided by a "team" at the clinic, what indicates to you that you are being cared by a team?</p> <p>a. What are the different health care services you receive from the different team members?</p> <p>b. How does your health care team coordinate or manage your health care needs for diabetes? (process of care provision)</p> <p>c. Does the team members work together to come up with a plan for your care?</p> <p>d. How do the team members communicate with each other and with you?</p> <p>3. How often do you visit the clinic for your diabetes follow-up?</p> <p>4. In the last month, approximately how many different health care professionals have you seen (e.g. doctors, pharmacists, nurses, physical therapists, etc) at the clinic and elsewhere?</p> <p>5. Who do you seek for advice regarding diabetes or diabetes complications between appointments?</p>
<b>B. Patient's involvement in decision-making</b>
<p>1. Do you feel that you are involved in your health care in a way that meets your needs for diabetes?</p> <p>a. IF NO: What would make it better?</p> <p>b. IF YES: What needs are being met now? How is that happening?</p> <p>c. To what extent do you feel that you are part of decision making of your health care team? Is it a good thing or a bad thing?</p>
<b>C. Impact of team-based care</b>
<p>1. How is team-based health care good or bad for patients' health?</p> <p>a. How has it benefited you? How does it improve your care and your experiences as a patient? (Hint: self-care and self-management)</p> <p>b. What, if anything, might be bad for patients about team-based care? How might it harm or fail to help you?</p> <p>2. How do you feel after appointments with diabetes educators? Does the advice provided to you improve your ability to manage diabetes till the next visit?</p>
<b>D. Benchmarking</b>
<p>1. What qualities attract you to seek diabetes care at this center over other primary healthcare centers?</p> <p>a. What do you find helpful in appointments? (Hint: environment, location, shared decision-making, etc)</p> <p>b. Why do the services (if any) by other primary healthcare centers do not attract you?</p>
<b>E. Barriers and enablers/facilitators</b>
<p>1. What factors do you believe are barriers for the provision of team-based care in diabetes?</p> <p>2. What factors do you believe are facilitators for the provision of team-based care in diabetes?</p>
<b>Concluding</b>
<p>1. Do you have any additional suggestions/comments/questions about team-based care for diabetes? Have we missed something you think is important?</p> <p>Thank you very much for your time today and for your honest opinion and fruitful discussions. We greatly appreciate your support.</p>

## Appendix E: QU Ethical Approval for Phase II



### Qatar University Institutional Review Board QU-IRB

June 16, 2019

Dr. Ahmed Awaisu  
Graduate Student Supervisor  
College of Pharmacy, Qatar University  
Tel.: 4403 5596  
Email: [aawaisu@qu.edu.qa](mailto:aawaisu@qu.edu.qa)

Dear Dr. Ahmed Awaisu,

**Sub.: Research Ethics Expedited Approval / CPH Graduate Student Project**

**Ref.: Student, Sara Hamdi M. Abdulrhim / Email [sa1206904@student.qu.edu.qa](mailto:sa1206904@student.qu.edu.qa)**

**Project Title: "The perspectives of healthcare professionals and patients on the benefits of collaborative care model for diabetes mellitus in primary care settings (COMPRISE-D Project II)"**

We would like to inform you that your application along with the supporting documents provided for the above undergraduate student project, has been reviewed by the QU-IRB, and having met all the requirements, has been granted research ethics **Expedited Approval** based on the following category(ies) listed in the Policies, Regulations and Guidelines provided by MOPH for Research Involving Human Subjects. Your approval is for one year effective from June 16<sup>th</sup> 2019 till June 15<sup>th</sup> 2020.

- 1) present no more than minimal risk to human subject, and  
2) involve only procedures listed in the following category(ies).**

**Category 6:** Collection of data from voice, video, digital, or image recordings made for research purposes

**Category 7:** Research on individual or group characteristics or behavior (including but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies

**Documents Reviewed:** QU-IRB Checklist, Application\_QP Phase 2\_v1(FS), MSc Proposal\_v6, Study Approval QP Health Center Dukhan, Info Sheet & Consent for Patients (FS\_Arabic & English\_v2), Info Sheet & Consent for HCPs (FS\_English\_v2), Interview Guide for Patients (FS\_Arabic & English\_v4), Interview Guide for HCPs (FS\_English\_v4), QU-IRB Review Form, responses to IRB queries and updated documents

Please note that all approvals are valid for a period of **one year** and renewal should be sought one month prior to the expiry date to ensure timely processing and continuity. Moreover, any changes/modifications to the original submitted protocol should be reported to the committee to seek approval prior to continuation.

Your Research Ethics Expedited Approval No. is: **QU-IRB 1112-EA/19**

Kindly state this number in all your future correspondence to us pertaining to this project. In addition, please submit a closure report to the QU-IRB upon completion of the project.

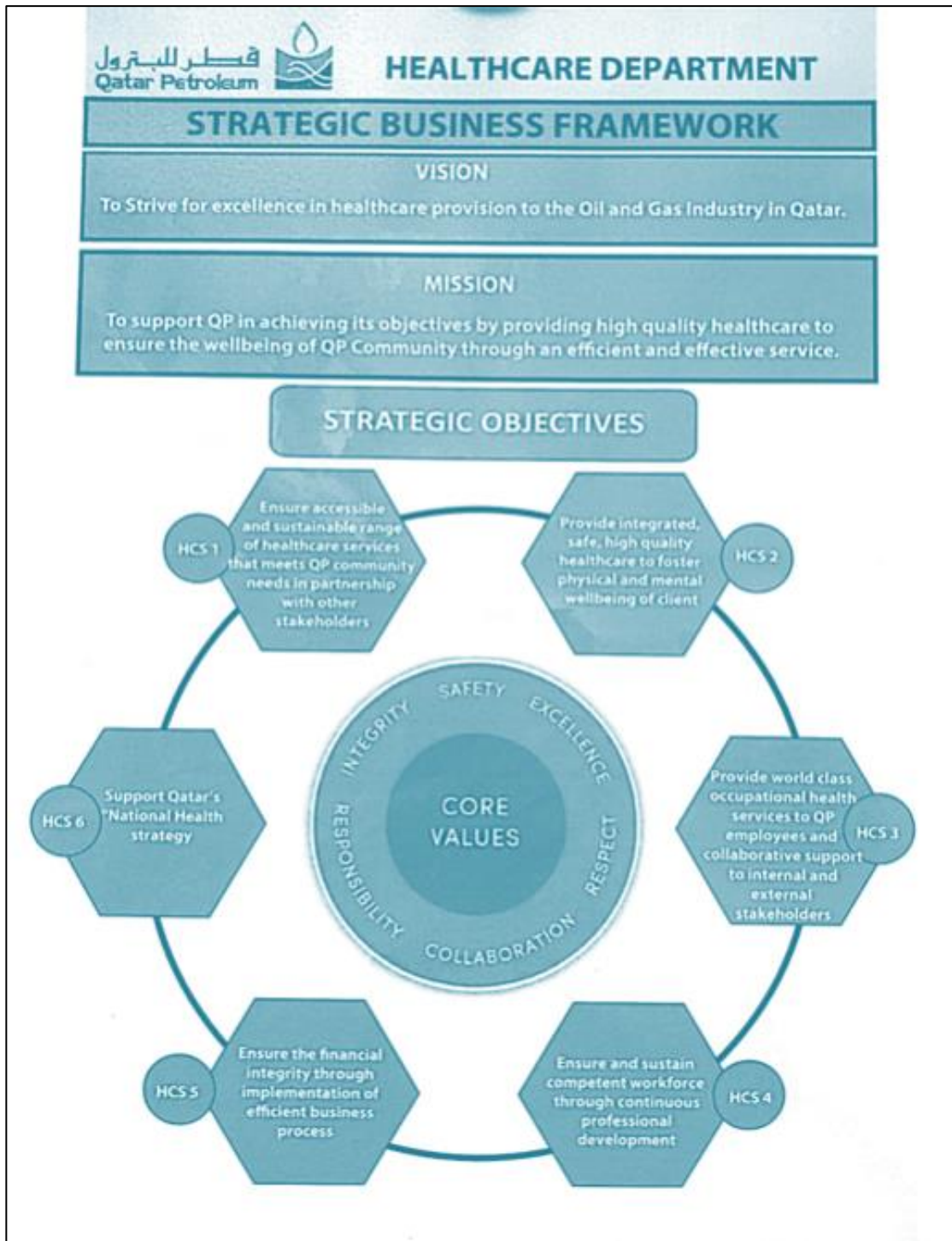
Best wishes,

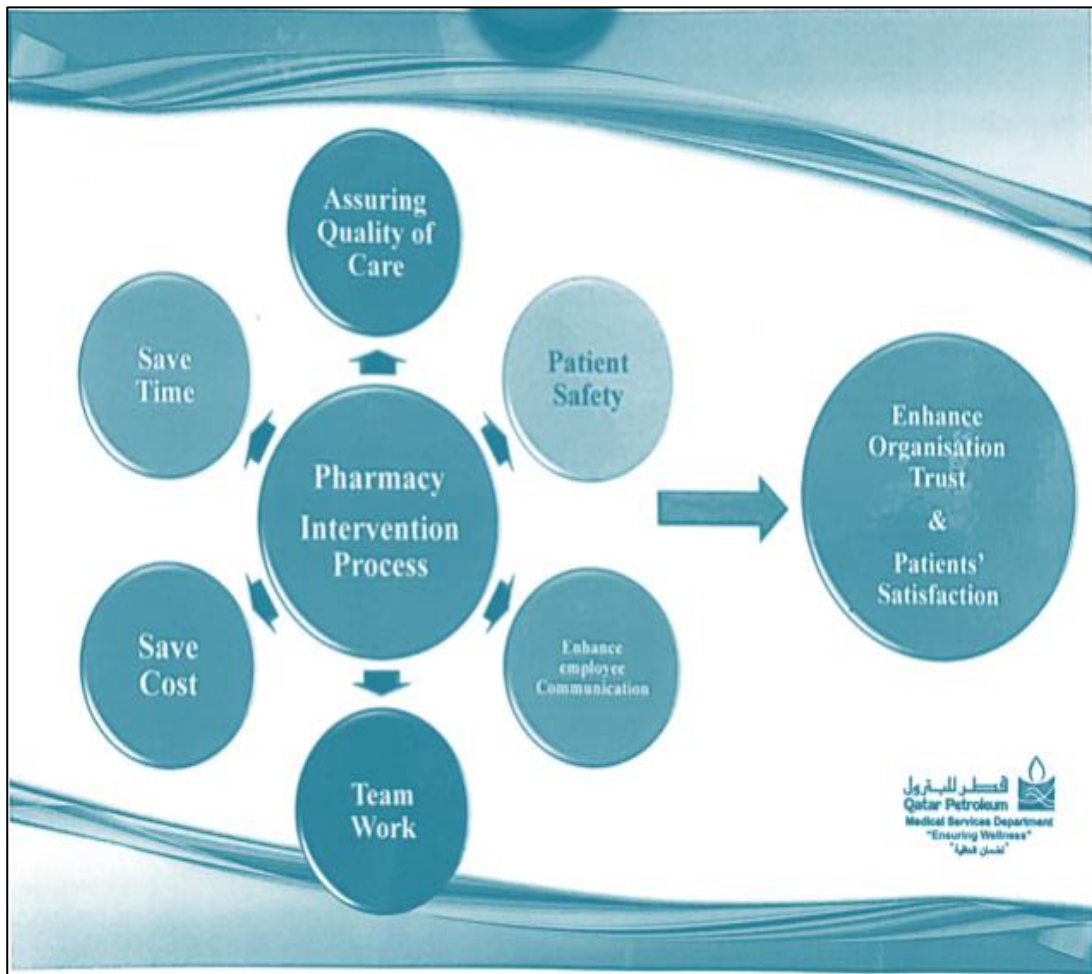
Dr. Noora Lari  
pp/ Chairperson, QU-IRB



Qatar University-Institutional Review Board (QU-IRB), P.O. Box 2713 Doha, Qatar  
Tel +974 4403-5307 (GMT +3hrs) email: [QU-IRB@qu.edu.qa](mailto:QU-IRB@qu.edu.qa)

## Appendix F: Qatar Petroleum's Work Ethics





## Appendix G: MSc Thesis-Related Scholarly Output

- Abdulrhim S, Sankaralingam S, Ibrahim MIM, Awaisu, The impact of pharmacist care on diabetes outcomes in primary care settings: An umbrella review of published systematic reviews, *Prim. Care Diab.* (2019), <https://doi.org/10.1016/j.pcd.2019.12.007>