School of Nursing and Midwifery

Factors Affecting the Self-Management Practices of People with Type 2 Diabetes in Almadinah, Saudi Arabia

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DECLARATION

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university or other institution and affirms that to the best of my knowledge, the thesis contains no material previously published or written by another person, except where due reference is made in the text of thesis.

Khalid Abdullah Aljohani
October 3, 2011

ABSTRACT

In the Middle Eastern Gulf Cooperation Countries, the prevalence of type 2 diabetes mellitus (T2DM) is increasing steadily. It has recently been estimated that up to 23% of the Saudi Arabian population meet the diagnostic criteria. Due to the potential for serious micro and macro-vascular complications such as peripheral vascular disease and nephropathy, T2DM places a significant burden on the individuals concerned and their families. In addition, T2DM is having catastrophic consequences for the health-care systems of many countries that are unable to cope with the increased demand for services. Furthermore, the prevalence is expected to increase and the burden of the disease is expected to worsen. As a consequence the Saudi government is implementing a number of strategies to address the issue, such as the National Plan to Combat Diabetes. The major problem is that T2DM is largely a lifestyle disease caused by an affluent diet and inactivity, and the goal of effective glycaemic control is impossible without competent patient self-management.

This study identified factors affecting self-management practices among people who have T2DM in Almadinah, Saudi Arabia. The study had three phases. The first phase involved the development of a valid questionnaire instrument to measure diabetes self-management practices in Arabic speaking populations. The Summary of Diabetes Self-care Activities (SDSCA) instrument was translated into Arabic and validated according to the World Health Organisation's Steps of Translation and Adaptation of Instruments. Two samples of T2DM participants were purposively recruited in this phase. The first sample consists of 33 while the second was 210 participants. Translation indicators showed satisfactory outcomes for each

stage of the process. The Arabic Summary of Diabetes Self-care Activities (A-SDSCA) instrument proved to have very acceptable psychometric properties: split-half reliability (.90); test-retest (.912, p = <.001); and Cronbach's alpha (.76). The internal consistency of the instrument's sub-scales was good for diet (.89), exercise (.83), blood glucose testing (.92), and foot care (.77). Factor analysis revealed the presence of four components explaining 34.4%, 16%, 15.4%, and 11.2% of the variance of daily self-management practices for these items respectively (accumulated total of 77.1%). Based on these outcomes, the A-SDSCA was utilised in the second phase of the study.

The second phase of the study measured diabetes self-management practices and identified socio-demographic factors affecting these practices. The sample of 210 T2DM participants purposively recruited from three primary health-care centres completed the A-SDCA (N=1,477). HbA1c scores indicated that only 30 (14.7%) participants had controlled blood glucose level (≤ 7%). Bivariate analyses showed that blood glucose testing (85% ≤ four days/week) and exercise (47% ≤ two days/week) were the least practiced self-management activities. In contrast, self-management levels were greatest for medication (75% 7days/week), diet (71% ≥ three days/week), and foot-care (56% ≥ three days/week). A regression model showed that high blood glucose level (-.122, p = .050) and smoking (-.192, p = .004) were negatively associated with self-management practices. On the other hand, being female (.321, p = .000) and having a good income (.129, p = .050) were positive factors. Overall, these factors accounted for 25% of the variability in everyday self-care practices (R^2 = .251).

The third phase further explored factors affecting self-management practices, not identified by the questionnaire alone. Using semi-structured interviews, qualitative data were collected from 24 T2DM participants and 12 health-care providers. Raw data were analysed by means of quantitative thematic analyses using the Chronic Care Model (CCM) as the conceptual framework. The result identified 30 sub-themes under the six CCM domains (themes). In total, 365 related statements were extracted. Major inputs were derived from health-care providers' interviews (132 statements) followed by female (118 statements) and then male (115 statements) T2DM participants. Community domain was the most frequently identified theme (100 statements; 27%) while health system was the least frequently identified (38 statements; 10%). Factors relating to delivery system; decision making; clinical information system; and self-management represented 20%, 11%, 14% and 17% of the total identified statements, respectively.

In conclusion, the fact that only 15% of participants had controlled glycaemic level despite a high level of dependence on medications is very good evidence that medication alone, is not the complete answer to the effective management of T2DM in the study context. The fact that the study participants demonstrated low levels of compliance with most other self-management practices indicates that they were facing difficulties and obstacles to practice optimal self-management activities. Furthermore, these findings reflect serious limitations in the way T2DM self-management is promoted and enhanced in the various study locations. The A-SDSCA could be utilized by health-care researchers to measure self-management practices among T2DM people. Furthermore, the instrument might be used to measure improvements in self-management practices before and after self-management programs application.

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LIST OF ABBREVIATIONS

ACIC	The Assessment of Chronic Illness Care
A-SDSCA	Arabic Summary of Diabetes Self-Care Activities
CCM	Chronic Care Model
FBG	Fasting blood glucose
GCC	Gulf Cooperation Countries
HbA1c	Glycosylated Haemoglobin
ICCC	Innovative Care for Chronic Conditions
IDF	International Diabetes Federation
MOH	Ministry of Health, Saudi Arabia
NDIC	National Diabetes Information Clearinghouse
RBS	Random blood glucose
SDSCA	Summary of Diabetes Self-Care Activities
T1DM	Type 1 diabetes mellitus
T2DM	Type 2 diabetes mellitus
WHO	World Health Organisation

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CHAPTER 1 : INTRODUCTION AND BACKGROUND

Introduction

According to the World Health Organisation (WHO) (2011c, p. 1), "A diabetes epidemic is underway". The International Diabetes Federation (IDF) estimated that worldwide there were 284.6 million people with diabetes in 2010 (IDF, 2009a). The distribution of the disease is far from even and likely to become more uneven by 2030. For example, the IDF estimates that the number of Europeans with diabetes will increase by 20% between 2010 and 2030; however, the increase for the population in the Middle East and North Africa will be 94% (IDF, 2009b). Of particular concern is type 2 diabetes mellitus (T2DM) because it constitutes 90% of all diabetes cases and is considered to be preventable type of diabetes (Ballard, 2009).

As previously stated, the Middle Eastern and North African countries are likely to see the incidence of T2DM double during the next 20 years. Although this incidence places a substantial burden on the individuals concerned and their families, and is looming as catastrophic for the national health-care systems in these countries, there is a paucity of research on diabetes in this region of the world. Of particular interest in this thesis is the research on self-management. It is important because of the health benefits for individuals associated with reducing the incidence of micro and macro-vascular complications such as peripheral vascular disease and nephropathy. Self-management is the appropriate approach to take in the management of diabetes because it is demonstrated to enhance the health and quality

of life of patients and substantially reduce the great economic burden on families and health-care systems. However, establishing the infrastructure to support self-management activities is complex.

Middle Eastern and North African countries cannot simply clone programs established in Europe or North America because of numerous cultural and economic differences. For example, the literacy rate of older populations of Saudi Arabia, Syria, and Yemen is relatively low; therefore, printed instructions would not be appropriate. Also, Middle Eastern cultural norms relating to male and female behaviours vary considerably from those in the West. For example, in Saudi Arabia females do not drive nor engage in outdoor sports activities. This has ramifications for accessing health services (e.g. scheduling trips to a chemist) and engaging in physical activity such as walking. In general, few studies have investigated diabetes health-care interventions within Saudi Arabia (Al-Ahmadi & Roland, 2005). The studies that have been published have focused on medical interventions (Khoja, 2010). Searching the literature during the preparation of this study showed an absence of Saudi studies examining patients' and health-care providers' perspectives about the control and treatment of the disease. The current study is an initial attempt to fill that void.

Significance of the study

First, the study translates the Summary of Diabetes Self-Care Activities (SDSCA) (Appendix A) and established the validity of the instrument using a purposeful sample of 210 males and females participants who have T2DM and are receiving treatment at three primary health-care centres in Almadinah, Saudi Arabia.

The SDSCA questionnaire consists of two parts. The first part contains essential questions about self-management practices such as diet, exercise, blood glucose testing, and foot-care. The second part includes additional questions, which were designed to get more information about patient's health-care context.

Based on a review of current literature, this was the first Arabic language version of the SDSCA to be undertaken. Furthermore, it was the first diabetes self-care instrument of any sort to be undertaken in Arabic. The Arabic SDSCA instrument will enable researchers in diabetes self-management to conduct future studies in Arabic speaking populations and it provides an exemplar for interested researchers to translate other diabetes care instruments using the same approach.

Second, the study examines factors affecting self-management. The focus on Saudi patients reaching their optimal self-management practices is of particular importance. The study's findings may serve to enhance capacity building for patients and primary health-care providers and may facilitate future interventions to improve patient outcomes.

Third, despite the fact that the study was undertaken in Almadinah, Saudi Arabia, it is relevant to interested groups (patients, providers and decision makers) within Saudi Arabia and other Gulf Cooperation Countries (GCC). It investigates factors that affect patients' self-management such as health providers' and patients' contributions to health-care interventions that could provide insight into new areas of research. It is anticipated that the measurement of patients' self-management activities in this study may serve as a base-line for future studies. In addition, utilising the Chronic Care Model (CCM) developed by Wagner in 1996 as a guiding

framework to classify factors affecting T2DM self-management may facilitate future adaptation of this international model to organise diabetes primary health-care services in Arabic speaking countries (Bodenheimer, Wagner, & Grumbach, 2002a).

Research questions

Primary question. What factors affect the self-management practices of people with T2DM diabetes in Almadinah, Saudi Arabia?

Subsidiary questions. 1) Does the Arabic version of the SDSCA have acceptable reliability and validity? 2) What self-management activities do people with T2DM diabetes perform, and are these activities consistent with the American Diabetes Association (2008) standards of medical care in diabetes? 3) What support and interventions do primary health-care centres provide to people with T2DM to assist in their diabetes self-management, and how do the supports and interventions compare with the American Diabetes Association (2008) guidelines? 4) What factors do T2DM patients identify as affecting their diabetes self-management outcomes? 5) What factors do health-care providers identify as affecting the self-management of people with T2DM?

Expected outcomes

This study had three phases, with specific expected outcomes for each phase. Phase I of the study translated and validated the SDSCA. This is the first attempt to apply the instrument to an Arabic speaking population. The successful completion of this phase entailed producing an instrument with accepted psychometric properties that allowed the researcher to use it to collect data regarding the self-management of diabetes with Arabic speaking population.

In Phase II the Arabic translated instrument was applied to a wider study sample for the purpose of measuring diabetes self-management activities for T2DM patients. The outcome of this phase is the first estimation of the frequency of self-management activities in Saudi Arabia that relies on international criteria identified by the study instrument subscales. Taking into account the fact that males and females are represented equally in this study, the outcome of this phase offers insight into gender-specific factors affecting self-management.

Phase III involved the recruitment of T2DM participants and front line diabetes healthcare providers for the purpose of exploring their views on factors that affect self-management outcomes. Outcomes from this phase include an increased understanding of other factors not identified by the study instrument. Implementing the Chronic Care Model as a coding framework for individual interviews, given, for the first time, systemic details concerning factors affecting self-management for Saudi people who have T2DM presented under each domain of the model. Publishing the results of Phase III of the project could help to draw attention of primary healthcare management to the limitations of the current health delivery approach.

Background

In 2006, diabetes was identified by United Nations Resolution 61/225 as one of the most serious diseases that impacts individuals and countries worldwide (Silink, 2007). Internationally diabetes affects 6.6% of the 4.3 billion people aged between 20-79 years (IDF, 2010). Further, due to continuing dietary and other lifestyle changes, it has been estimated that the percentage may increase to 7.8% by 2030 (estimated adult population is 5.6 billion). In the Middle Eastern and North African region, the estimated prevalence of the disease is considerably higher than the international average. Compared with the 2010 estimation of 26.6 million diabetes cases (7.7% of adult population) the IDF expects the prevalence to double in the next 20 years. The Gulf Cooperation Countries are included among the highest diabetes prevalence countries worldwide (IDF, 2009a) (see Figure 1.1).

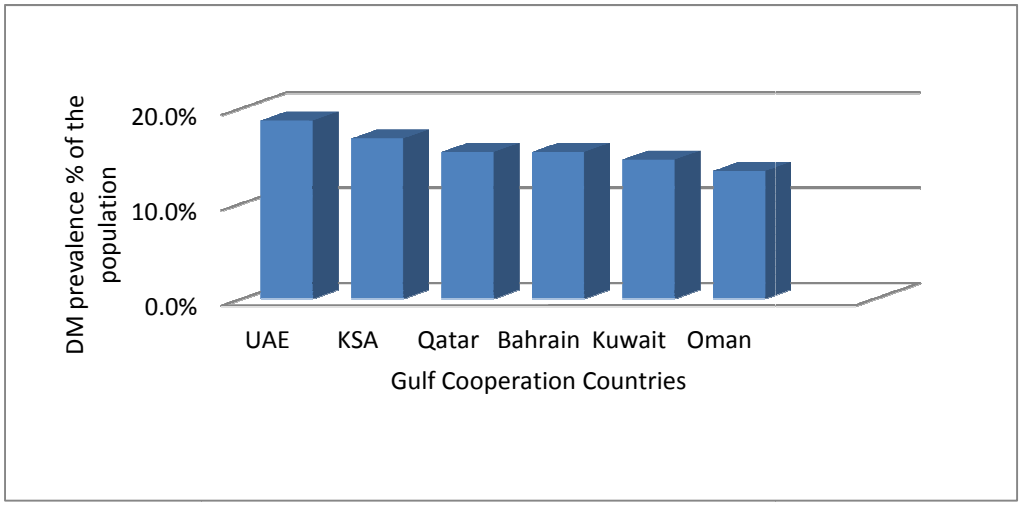

Figure 1.1. Predictive diabetes prevalence among Gulf Cooperation Countries (2010). Source of data (IDF, 2009a)

The World Health Organisation has estimated the overall prevalence of diabetes in the Saudi population to be 15% (WHO, 2006). The extremely high prevalence of the disease reflects the transition of the Saudi citizens' life style. Following the discovery of oil in 1973, life changed for many Saudis. Many people moved from desert areas to the cities where more government services are provided. Urban migration allowed greater access to education, health and other services for many people. Among the negative consequences has been a radical change in diet. The traditional Saudi diet, which was high in complex carbohydrates such as grains and lentils, has been replaced by a diet which is very high in simple sugars and fats such as cakes and pastries. In essence, the Saudi people have developed a taste for Western style food very rapidly as evidenced by the profusion of Western fast food restaurants in the country.

Furthermore, with increased affluence, Saudi people have been able to afford to buy more meat. This has enabled them to prepare and eat traditional dishes such as the favourite lamb with rice cooked in fat, more often. These dietary changes coupled with a sedentary lifestyle have led to a substantial increase in the prevalence of overweight and obesity and many chronic diseases, particularly diabetes mellitus.

Saudi Arabia profile

Saudi Arabia is geographically one of the largest countries in the Middle-East (2,240,000 km²). However, desert covers approximately 95% of the Saudi land, including *Alrub' Alkhali*, the largest sand mass in the world (WorldAtlas, 2010). It is bordered by Jordan, Syria, Iraq and Kuwait in the north, Yemen and Oman to the south, and shares its eastern border with the United Arab Emirates, Bahrain, Qatar

and the Persian Gulf. The western border is entirely composed of the Red Sea (see figure 1.2).

Saudi Arabia is a member of the Gulf Cooperation Council, along with Kuwait, Bahrain, Qatar, United Arab Emirates and Oman. Recently, Yemen has gradually become involved in this council through education and health cooperation.

Figure 1.2. Map of Saudi Arabia (Einstein, 2007)

The Kingdom of Saudi Arabia was unified by King Abdul-Aziz Bin Saud in 1932. Currently, Abdullah Bin Abdul-Aziz is the King of Saudi Arabia and the custodian of the two holy mosques. The Saudi Arabian political structure is dependent on the royal government wherein the King is the head of state, the prime minister, and commander-in-chief of armed forces. The King is advised by the council of ministers, his advisors, and the Majlis Al-Shoura (consultative council). The council of ministers and the King's advisors are appointed by the King for the

purpose of assisting him to formulate and execute the government policies (Mufti, 2000). Majlis Al-Shoura members are appointed by the King, but based on recommendation of the head of Majlis Al-Shoura. Al-Shoura consists of 13 committees such as health and environment affairs and human rights affairs.

In general, the King's advisors' role is not clear to the public. However, the council of ministers and Majlis Al-Shoura play a major role in restructuring and operating the Kingdom. For example, any national project must be approved by Majlis Al-Shoura first, then by the council of ministers and finally by the King. Citizens who have a complaint about government services have the right to contact the minister concerned or go directly to the King who has open meetings at regular intervals.

The country consists of thirteen regions. The Makkah and Almadinah regions are named after two of the most holy cities in Islam, the *Albait Alharam* in Makkah and the *Almasjed Alnabawi* in Almadinah. Muslims all around the world visit these cities which in turn increases the load on the health-care system. More information about Hajj is provided later in this chapter.

In 2010 the estimated population of Saudi Arabia was 23,980,834, with 65% of the population was aged between 15-64 years of age. Population to gender classification indicates that the male population was 13,301,169 (55.5%), and the female population was 10,679,665 (45.5%). Of the total population, 675,915 people (3%) were aged 65 or older (52% male and 48% female). From a literacy standpoint, 1,787,841 people (7.5% of the population) were illiterate (females constituted 73% of those unable to read or write) (Ministry of Economy and Planning, 2010).

The study location

This study was undertaken in Almadinah, a city located in the north-west of Saudi Arabia. The estimated population of Almadinah is 1,614,644 (Ministry of Economy and Planning, 2010). Almadinah was chosen as the study site because it has typical Saudi health services in terms of primary health-care and health-care structure. There are 55 primary health-care centres in Almadinah region. Thirty-five centres are located in the city of Almadinah. These centres are distinct from the acute-care hospital facilities that are designed to meet in-patient medical needs. The primary health-care centres provide services similar to those provided by their namesakes in Western countries such as Australia.

Saudi health-care system

According to Mufti (2000), organised Saudi health-care services were established in 1951. The Ministry of Health (MOH) is the government agency responsible for health-care policies, supervision and planning in the Kingdom. In addition to the MOH, there are several governmental bodies that provide health services including the Ministry of Defence and Aviation (second-largest health services provider), the Ministry of Interior, and the National Guards. Government bodies, especially the MOH, provide 80% of health services in the Kingdom (Mufti, 2000). Although the per capita gross domestic product in Saudi Arabia is US$14,550, the reported MOH expenditure per capita is only US$ 310 (MOH, 2009b, p. 31). Regardless of the accuracy of the estimation, this number is significantly lower than other Gulf Cooperation Countries' health expenditures per capita such as Qatar and the Emirates, which were US$1,426 and US$673, respectively (WHO, 2011a).

Since its establishment in 1951, the MOH has gone through three stages of development (Regional Health Systems Observatory, 2004). In the first stage, between 1970 and 1980, acute care services provided by hospital and tertiary health centres were more supported than primary health-care. In the second stage, in the 1980s, the World Health Organisation encouraged the adoption of a 'Health for All' movement, which increased attention on and recognition of the importance of primary health-care in managing health on a national basis. Therefore, early attention toward primary health services, including diabetes care, was derived from international recommendations rather than Saudi health planners' beliefs in primary care as an essential role in improving health outcome. In the third stage, a royal decree was issued in 2002 emphasising that health services should be provided in an equitable and affordable manner for all persons. Currently, however, the public health system does not provide free services (except for emergency services) for expatriates who work in the private sector.

The Saudi health system is supervised and managed by the Council of Health Services, a body composed of both private and government health organisations, and headed by the Minister of Health, who is appointed by the King every four years. There are 231 government hospitals and 1986 health-care centres in the Kingdom. There were an estimated 47.5 million primary health-care visits in 2008. The private sector operates 215 private hospitals and 217 clinics with a bed capacity of 11,362. However, according to an MOH (2009b) report, only 123 private hospitals operated of their optimal capacity.

Primary health-care recently received more support from the government, which led to the expansion of primary health-care centres throughout the Kingdom.

The number of primary health-care centres increased from 1858 in 2005 to 1986 in 2008. These centres are classified into hierarchical classes: A, B, C, and D health-care centres (MOH, 2010). In brief, class A centres are designed to serve catchments with a population of more than 25,000, with in-patient services (10 beds), emergency, maternity, X-ray, pharmacy, and laboratory services. Class B centres are similar to class A, but the target population number for class B is between 3,000 and 25,000. Class C centres serve between 3,000 and 7,000 people and have in-patient services. Class D centres are the smallest primary health service organisations that are operated by one general practitioner and a small health-care team to serve populations of less than 3,000 people. Primary health-care centres are staffed by approximately 5,481 physicians, 11,873 nurses, 1,036 dentists and 5,316 other health professionals, including psychologists, pharmacists, dieticians, and podiatrists (MOH, 2009b).

Since the introduction of the new Saudi health system in 2002 (the third stage of the health system development), cost containment strategies have been implemented at several levels of the system. Similarly, the privatisation of health-care services started in 2006, perhaps because the MOH's budget was increasing annually. The number of people with health insurance has also increased steadily due to the government requirement not to recruit expatriate workers without valid health insurance that is paid for by the recruiting body. These cost containment strategies could reduce the pressure on MOH expenditure.

Chronic diseases, led by diabetes, pose a significant challenge to the MOH's efforts to improve health outcomes (Khoja, 2006). Additional pressure is brought about by Hajj and Umrah services that provide for Pilgrims who visit Makkah. Hajj

activities include five days of religious activity, conducted in Allah's Inviolable House, Mina, Arafat and Mozdalifa areas in Makkah while Umrah is a visit to Allah's Inviolable House. According to Al-Ahmadi and Roland (2005), health-care decision-makers are under pressure to create a health-care delivery system that responsibly addresses current health challenges.

Diabetes health-care services. In Saudi Arabia, diabetes care is mostly integrated into the public health system most through primary health-care. Usually, people with diabetes are referred from primary health-care centres to specialist diabetes centres. There are two reasons for this. First, health-care interventions to manage diabetes cases starts with the registration of the patient in a primary health-care centre and the issuing of diabetes card (Appendix B). Medical diagnosis includes a physical examination and laboratory studies. In addition to medical treatment, management includes patient education using the Diabetes Patient's Education Checklist (Appendix C) as a guide. The aims of these steps are to diagnose diabetes and prevent complication. Second, when diabetes complications occur, the role of diabetes centres is to manage as well as refer patients to specialist care, such as those in cardiology or surgical departments. In addition, people with diabetes are referred for annual medical examinations.

Based on the latest MOH (2008) report, there were 1,803,435 registered people who have diabetes (7.5% of the population) in Saudi Arabia. Diabetes prevalence reaches a peak in the 45-60 age group (see

Table 1.1). The second highest prevalence rate is for age group between 15 and 44 and the third for age group over sixty.

Table 1.1

Registered DM patients according to their age group.

Age group/years	Number	Cumulative
<1	1,549	
1-4	6,536	8085
5-14	41,741	49826
15-44	485,338	535164
45-60	829,776	1364940
>60	438,495	1,803,435

From the standpoint of health services utilisation, Table 1.2 shows that male patients have more visits to primary health-care centres and emergency departments (54%) compared to female patients (45%). Generally, non-Saudi patients who have diabetes have fewer visits than Saudi patients. The low number of visits of non-Saudi patients is because they usually do not receive medical services in the public system unless they are working in a government organisation. For those who work in the private sector, medical services are provided through the private health-care sector.

Table 1.2

Diabetes patients' visits to different health-care organisations (MOH, 2008)

Visits locations	Saudi	Non-Saudi	Male	Female	Total
Hospitals	NA	NA	NA	NA	99,769
Diabetes centres	40,236 (96.7%)	1,370 (3.2%)	18,541 (44.5%)	23,065 (55.5%)	41,606
Emergency	408,764 (93.1%)	30,017 (6.8%)	238,243 (54.2%)	200,538 (45.8%)	438,781
Primary Health Care Centre	174,7497 (96.8)	55,938 (3.2%)	989,617 (54.8%)	813,818 (45.2%)	1,803,435

Diabetes specialist preparation programs. Due to the difficulty experienced in obtaining written information about health professionals' preparation programs, the researcher contacted a number of diabetes care leaders directly. The information obtained indicated there were three major categories of programs, one for nurses who work in diabetes health-care, one for diabetes educators, and one for medical practitioners. There was no information about preparation programs for other health-care professionals.

The programs offered for nurses are formalised as continuous professional educations which does not exceed five days. The curriculum includes basic diabetes management such as blood glucose testing and foot care. There are four diabetes educators' programs, which have duration of four weeks, available in Saudi Arabia. These programs are provided by the National Guard Health Affairs in Jeddah, the

Diabetes Centre at King Saud University in Riyadh, the Armed Forces Health Affairs in Taif, and the National Guard Health Affairs in Riyadh. There is no evidence that the curriculum of these programs is similar. Medical practitioners' preparation programs are provided by the Diabetes Centre at King Saud University. The duration of these programs varies from three months to one year. Other health professionals do not attend specific diabetes programs.

Diabetes Registry. The Saudi Diabetes Registry (SDR) started in 1996 as a paper-based application. Newly diagnosed patients were registered using a form that was completed by health-care providers. The working plan for the registry was for it to gradually involve health-care organizations (King Faisal Specialist Hospital and Research Centre, 2009).

During the period 2000-2001, a secure, web-based registry was designed and implemented by the King Faisal Specialist Hospital and Research Centre with the aim of facilitating the registration process and providing up-to-date data for research. In addition, the web-based registry was linked to geographical software that depicts the burden of the disease in each region of the Kingdom. The latest published information indicates that more than 41,000 patients were registered in the web-based registry system by the end of December, 2007 (Subhani, 2009). It should be noted that this number reflects the prevalence of those diagnosed and receiving treatment rather than the number of people in the population who have the disease.

Initiatives to manage diabetes. In response to this growing health problem, several health-care initiatives have been announced over the last few years to manage diabetes in Saudi Arabia. The most significant initiative was the government's establishment of the Diabetes National Committee, which is directly supervised by His Highness Prince Sultan Bin Abdul-Aziz (Badwilan & Bakhet, 2007). The Diabetes National Committee's mission is to plan, supervise, and support activities to manage diabetes on the national level. In addition, the committee is in charge of the implementation of the Executive Saudi National Plan to Combat Diabetes 2008-2018.

The plan was designed by the Ministry of Health (MOH, 2009a). The aim of this plan is to develop a systemic approach to the treatment of the disease on a national level and across different health-care organisations. The plan consists of seven goals: 1) to reduce risk factors; 2) to detect and prevent T2DM, the metabolic syndrome, and other risk factors; 3) to improve the quality of diabetes health services; 4) to enhance T2DM surveillance, follow-up and outcome evaluation; 5) to support diabetes research; 6) to support patients and families; and 7) to activate community partnerships. In accordance with these domains, the outcomes of the current study are expected to inform and facilitate future interventions, especially those supporting people with diabetes.

Almost all public health organisations are partners in the provision of diabetes care in Saudi Arabia (see Figure 1.3). In addition to current organisations, the MOH has allocated 20 million Saudi Riyals (US$ 5,333,333) to promote diabetes care through establishing 20 diabetes centres in the Kingdom. Eight have been established to date (Khoja, 2010). Human resource development is also a key issue.

The MOH signed an agreement with the King Khalid Eye Specialist Hospital to train ophthalmology specialists (not physicians) to conduct eye examinations to detect diabetes eye complications (MOH, 2008).The goal of this initiative is to decrease the workload on general practitioners at the primary health-care level, as well as to improve eye screening outcomes in health centres.

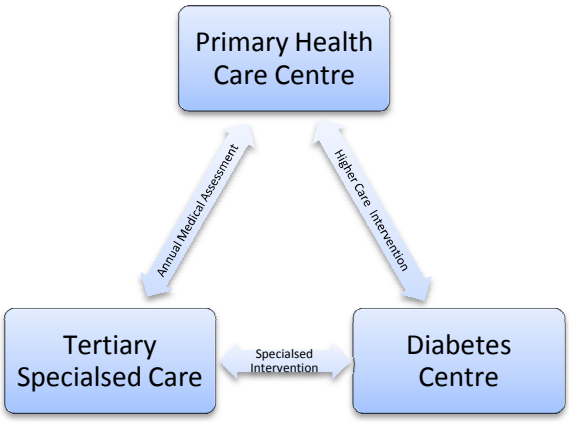

Figure 1.3. Diabetes patients' health-care pathways in the Saudi public health system

Chapter Summary

Diabetes Mellitus is a growing global health challenge for every health-care system and Saudi Arabia is not an exception. Even though health services are provided on a large scale across the country, diabetes services may need further development and coordination in order to facilitate and improve diabetes care outcomes, especially in the event of the anticipated increase in incidence. Initial exploration of the current diabetes situation in Saudi Arabia indicates that international standards and recommendations are not implemented in every aspect of diabetes care. Moreover, if current diabetes health-care interventions and self-management approaches are not adequate, it is very likely the new health plan will

fall well short of the goal of providing a sustainable national diabetes health-care service for the future.

This study explored the current management of T2DM in the primary health-care setting. The study consisted of three phases: I) the translation and validation of the Arabic Summary of Diabetes Self-Care questionnaire; II) measuring diabetes self-management practices among T2DM participants; and III) exploring T2DM and health provider participants' perspectives about factors affecting T2DM self-management outcomes. Steps, approaches, and outcomes for each phase are presented throughout the following four chapters.

Chapter 2 is the literature review and composed of four sections: 1) an introduction to diabetes and its negative consequences; 2) diabetes in Saudi Arabia; 3) standards of diabetes management and the description of the Chronic Care Model (CCM); and 4) diabetes self-management. In light of the extremely limited number of T2DM self-management studies in Saudi Arabia, this chapter concludes by clarifying the need to explore current interventions to manage diabetes with particular interest in factors affecting self-management.

Chapter 3 identifies the methodological approaches that were undertaken in each phase of the study. The chapter begins by outlining the overall study design and research setting. The chapter is then divided into three sections, which correspond with the three phases of the study. Each section describes the sample and instruments used, and the specific data analysis undertaken in detail. The chapter concludes with a summary of the ethical considerations relevant to the study and an outline of how they were managed.

The study findings are presented in Chapter 4. Findings are presented in numerous tables, figures, and explanatory comments. The chapter begins by identifying the characteristics of three out of four study locations that were utilised for data collection, so the reader will understand the broad health-care context of the study. The chapter is then divided into three sections in a similar manner to methodology chapter.

Finally, the study discussion and conclusion are presented in Chapter 5. In this chapter, a summary of the main findings is presented, followed by an exploration of these findings in the context of the extant literature. Finally, the strengths and limitations of the various phases of the study are identified and concluding remarks are made.

CHAPTER 2 : LITERATURE REVIEW

Introduction

Successful T2DM management depends on successful self-management practices. In the current study, self-management is defined as any activity undertaken by the patient for the purpose of improving his or her blood glucose control. However, effective T2DM self-management requires significant input from different parties, including patients, families, health-care providers, and health-care systems and supporting organisations in the community. Chapter 2 explores, synthesises and summarises theoretical and empirical research that relates to diabetes management. The chapter is divided into four main sections: Part 1) introduction to diabetes and its complications and negative consequences on different parties; Part 2) diabetes in Saudi Arabia, including the disease trend, risk factors, and health-care interventions; Part 3) diabetes management, including standards of care and a detailed description of the Chronic Care Model (CCM) which was used as the study's framework; and Part 4) diabetes self-management, including the self-management concept, theory and models, factors affecting self-management and the measurement of diabetes self-management.

Part 1: Overview of Diabetes

Diabetes is a group of metabolic disorders caused by insulin deficiency and resistance (ADA, 2008). The common elements of these diseases are hyperglycaemia and glucose intolerance (Harris & Zimmet, 1997). Insulin is a hormone produced by beta cells in the pancreas. Insulin allows blood glucose to move into the cells of the

body to produce energy and it stores extra glucose as glycogen in the liver and skeletal muscles. When glucose amounts exceed those required by the body for energy and the storage capacity in the liver and skeletal muscle, it is stored in the fat cells, leading to weight gain.

Diabetes is classified according to its clinical presentations as: type 1 diabetes (T1DM), type 2 diabetes (T2DM), gestational diabetes mellitus and other lower-prevalence diabetes types (IDF, 2010). Type 1 diabetes mellitus represents 5–10% of the total diabetes cases worldwide (Ballard, 2009). Type 1 diabetes occurs when the body's auto-immune system destroys the insulin producing cells (beta cells). The factors leading to T1DM are not well understood; however, viruses, environmental variables, genetic factors and auto-immune processes may contribute to the incidence of the disease (National Diabetes Information Clearinghouse [NDIC], 2010). Gestational diabetes, which results from insufficient insulin production and insulin resistance due to physiological changes in some pregnant women, is commonly diagnosed before the affected person experiences symptoms (WHO, 2011b).

T2DM represents 90–95% of total diabetes cases internationally (Ballard, 2009). According to the National Diabetes Information Clearinghouse (2010), approximately 80% of T2DM patients are overweight or obese. The clinical manifestation of T2DM appears in the form of insulin resistance whereby the body does not utilise insulin properly, within years of onset, the decreased insulin production results in increased blood glucose and leads to the development of diabetes, and long term medical complications (American Diabetes Association [ADA], 2010).

Predisposing factors of T2DM include: overweight and obesity, family history of T2DM, old age, and little physical activity. Excess weight, obesity and genetic predisposition are major risk factors for T2DM among Saudi nationals (Elhadd, Al-Amoudi, & Alzahrani, 2007). T2DM is more prevalent in certain ethnic groups such as Latino, Aboriginal Australian and African-Americans. Although T2DM usually affects people who are 40 years of age or over, there is considerable evidence that the precursors to the disease, problems with weight as well as insulin and glucose metabolism, which are features of the metabolic syndrome, are present in at least some individuals before birth. Due to dietary and other factors in pregnancy and early childhood (Huang et al., 2009); the disease is increasingly affecting younger people (IDF, 2010). In general, there are two physiological processes that occur before the development of T2DM. These conditions are impaired glucose tolerance (IGT) and impaired fasting glycaemia (IFG) (WHO, 2011b). Impaired glucose tolerance is characterised by higher blood glucose level but not to the level required for a diagnosis of diabetes. In impaired fasting glycaemia, there is consistent fasting blood glucose level above normal level.

Impact of T2DM

The long term medical complications of T2DM are classified into micro and macro vascular complications. Microvascualr complications include retinopathy, neuropathy and nephropathy. Retinopathy affects 40–60% of people with T2DM, 10% of who develop proliferative retinopathy (Eye Diseases Prevalence Research Group, 2004; Klein, 1997). Similarly, diabetes nephropathy is a major cause of renal failure. Due to the increasing prevalence of T2DM the incidence of end stage renal disease increased by 55% among African Americans since 2000 (United States Renal

Data System, 2009). In Europe and Australia, diabetic nephropathy is the main predisposing factor for renal failure (Atkins, 2005). According to Al-Khader (2001), the incident rate of end stage renal failure of Saudis with diabetes is 45%. In 15–30% of cases, people experience Macrovascular complications, including cardiovascular disease, peripheral vascular disease, and cerebrovascular disease or stroke. In America, people with diabetes are two to four times more likely than those who do not have diabetes to develop cardiovascular disease and stroke (Folsom, Szklo & Stevens, 1997; Cowie & Eberhardt, 1996). Furthermore, mortality may increase among people who are also hypertensive (Roglic, Unwin, & Bennett, 2005).

T2DM places a significant physical and psychological burden on the affected persons and their family members. Dietary restrictions and constant blood glucose testing, along with a medication regimen that may include injecting insulin, are great impositions. According to Brown, Brown, Sharma, Brown, Gosum, and Denton (2000, p.18), "those with diabetes were willing to trade a significant proportion of their remaining life in return for a diabetes-free health state". Understandably, many T2DM patients become depressed as a result of medical complications that increase their susceptibility to pain and impair physical activities and decrease social networking (Jensen, Chodroff, & Dworkin, 2007). Depression is a critical factor that may lead to fewer self-care activities, which increases the chances of medical complications (Lin et al., 2004). Close family members often play an important role in caring for and supporting their affected family member. Consequently, the burden of the disease is transferred to them as well.

People with uncontrolled diabetes usually require considerably more health-care than individuals without diabetes or those who have controlled diabetes. They

are frequent visitors at primary health-care facilities and they are hospitalised more often. When they are hospitalised they stay on average four days longer than other patients (Carral et al., 2002). The major economic effect on T2DM patients is the loss of work production that consequently leads to loss of income (Gore, Brandenburg, Hoffman, Tai, & Stacey, 2006). Brod, Christensen, Thomsen, and Bushnell (2011) surveyed 1,404 participants who had T1DM and T2DM with the aim of estimating loss of productivity time per person. The sample was recruited from the US, UK, Germany and France. The result showed an estimated loss of productivity time of 14.7 hours per month, which accounted for a per person production loss of US $2,294 per year (Brod, Christensen, Thomsen, & Bushnell, 2011). The economic burden of the disease may also include a portion of if not all medical costs, especially medications, depending on the characteristics of the health-care system of the country. According to Morsanuttoa et al. (2006), pharmacological products, hospitalisations and diagnostic examinations accounted for 52%, 28% and 11% respectively of the individual's annual medical costs.

In general, people with diabetes utilise health resources 1.5–5 times more than those without the disease (Lucioni, Garancini, Massi-Benedetti, Mazzi, & Serra, 2000). The increased utilisation has an effect at a national level. For instance, in the UK, people with diabetes consume 9% of the total National Health Service budget. In Italy, the condition consumes 7% and in Taiwan, 12% (Currie, Kraus, Gill, Stott, & Peters, 1997; Lin, Chou, Lai, Tsai, & Tai, 2001; Lucioni et al., 2000). In UK, the Economic Intelligence Unit (2007) identified that the direct and indirect costs of diabetes amount to a loss of 1.2% of the UK total gross domestic product. Similarly, in the US and India the loss has been estimated to be 1.2% and 2.1%, respectively. In summary, T2DM impacts negatively on several affected parties including: the person

with the disease and their family, the community, the health-care system, and the entire country. Therefore, investigating approaches to manage the disease and decrease its negative impact is a priority for all countries.

Part 2: Type 2 Diabetes Mellitus in Saudi Arabia

A 2008 literature search for Saudi Arabian studies yielded a paucity of published Saudi studies in international accredited scientific journals. Studies about the self-management of diabetes were almost absent. For example, using the combination of the words “Saudi” and “diabetes” only 76 studies were identified in CINHAL. The same technique in the OVID search engine yielded just four studies. There is no clear reason for the meagre contribution of Saudi Arabian academics to the international body of knowledge. It could be that the studies undertaken fall short of the standards required for publication in international journals and it may also reflect the fact that insufficient attention is given to diabetes health-care in the country.

In an effort to identify more local literature, the *Saudi Medical Journal* website was utilised. The Journal publishes research and other articles that are of interest to Saudi health professionals. The search identified 133 studies but, unfortunately, the majority focused on the medical aspects of diabetes such as its prevalence and complications. It is interesting to note that all of these studies were published by physicians. Input from other health professionals involved in diabetes management was not evident. The total identified Saudi Arabian studies was synthesised and presented in three sections: diabetes trends, risk factors and health

interventions. Inclusion criteria were: studies undertaken in Saudi Arabia, studies that recruited people with diabetes as study sample and studies aim to identify diabetes related problem or to improve diabetes-care intervention. Studies which investigate medical aspects such as body metabolism and physiological changes were excluded.

The Diabetes Trend

As mentioned in Chapter 1, the IDF (2010) predicted that the prevalence of T2DM in the Middle-East and North Africa (MENA) region will almost double between 2010 and 2030. However, there was no consensus on the number of T2DM diabetes cases in Saudi Arabian studies. Chronological classification of Saudi prevalence studies revealed two in the 1980s, three in the 1990s and two during the last ten years. In 1981, Bacchus, Bell, Madkour and Kilshaw (1982) surveyed a convenience sample of 1,385 male participants. The blood samples of recruited participants were examined and assessed against the WHO criteria at the time (Fasting Blood Glucose ≥ 8 mmol/L or Random Blood Glucose ≥ 12 mmol/L) for the presence of type 1 or type 2 diabetes. The study revealed a prevalence rate of 2.5% among the study population.

Although this study could be recognised as the first step undertaken in Saudi Arabia towards the management of diabetes and investigation of the problem, the study had several limitations. These limitations included the non-random sample, the relatively small number of participants, the fact that only one small geographical area (a small town) was investigated, the inclusion of a relatively large proportion of

young participants (15–24 years olds comprising 38% of the study sample), and the involvement of male participants only.

The second study during the 1980s was undertaken by Fatani, Mira and el-Zubier (1987). In this study, 5,222 participants were surveyed to identify the diabetes prevalence in the Western Region of Saudi Arabia. Results showed the prevalence as 4.3% for the sample, with a higher prevalence in females (5.9%) than in males (2.9%). However, as the published material did not include a detailed methodology, the information required to critically evaluate the findings was not available. For example, it is not known how the diagnosis of diabetes was made, whether the sample was obtained at random from the general population, or if the age of the participants was taken into account.

Four studies were undertaken during the 1990s for the purpose of identifying total diabetes prevalence (Anokute, 1990; Al-Nuaim, 1997; El-Hazmi, Warsy, Al-Swailem, Al-Swailem, Sulaimani, & Al-Meshari, 1996; El-Hazmi, Warsy, Al-Swailem, Al-Swailem, & Sulaimani, 1998). In the first study, Anokute (1990) surveyed 3,158 participants among patients of King Saud University hospital (out-patient & in-patients). Diabetes was diagnosed through urine and blood glucose analysis. Results revealed that 6% of the study sample had diabetes. Anokute concluded that the prevalence in Saudi Arabia was similar to that in the United States at the time. Together with previous studies, the study suggested a rising T2DM prevalence in Saudi Arabia. However, the study had two important limitations: the study sample did not include women and it focused on recruiting young people from the university community, who tend to be urban rather than rural. Therefore, the outcome could not be generalised.

In the mid-1990s El-Hazmi et al. (1996) conducted a population-based, age stratified study involving 23,493 participants from 34 locations in Saudi Arabia. Using blood glucose analyses, in the overall group (2 to 70 years), the prevalence of insulin-dependent diabetes mellitus (T2DM), non-insulin-dependent diabetes mellitus (T2DM), and impaired glucose tolerance (IGT) was 0.2%, 5.5% and 0.5% in males and 0.2%, 4.6% and 0.9% in females. However, in the 14-70-year age group, the prevalence of IDDM, NIDDM and IGT was 0.2%, 9.5% and 0.7% in the males and 0.2%, 6.8% and 1.3% in the females, respectively. Furthermore, a significant increase ($p < 0.001$) was obvious in the age group > 30 years, where the prevalence of T2DM and IGT rose to 17.3% and 1.3% in the males and 12.2% and 2.2% in females, respectively.

Two years later, the same researchers (El-Hazmi, Warsy, Al-Swailem, Al-Swailem, & Sulaimani, 1998) recruited a larger population-based, age stratified sample of 25,337 men (46.2%) and women (53.8%). The estimation of diabetes was 6.3% for men and 5.5% for women. The overall estimate of the prevalence of insulin-dependent diabetes mellitus, non-insulin-dependent diabetes mellitus, and impaired glucose tolerance in the total Saudi male population was 0.2%, 5.6% and 0.5% respectively, while the prevalence in the total Saudi female population was 0.3%, 4.5% and 0.7% respectively. Furthermore, differences were observed in the prevalence of diabetes mellitus and impaired glucose tolerance among the provinces. Type 2 diabetes mellitus increased to 28.8% for males and 24.9% for females over the age of 60 years, while impaired glucose tolerance increased to 1.6% and 3.6%. Four years later, El-Hazmi and Warsy (2000) recruited another 14,660 participants from the population for the purpose of identifying diabetes and obesity. Results showed no significant differences in prevalence percentages between men and

women (4.84% vs. 4.82%) than that estimated in earlier studies. While the prevalence of diabetes for different age groups is not reported, it is reasonable to conclude that the findings would be similar to those of the 1996 and 1998 studies.

The results of El-Hazmi's studies are supported by the latest Saudi study. The Coronary Artery Disease in Saudis Study (CADISS) Al-Nozha et al.(2004) recruited 17,232 participants between the years 1995 and 2000, which indicated that 23.7 % of the population aged over 30 years had diabetes (male 26.2%; female 21.5%). Furthermore, diabetes was significantly (p = .00) more prevalent among Saudis living in urban areas (25.5%) compared to those in rural areas (19.5%). Although the study is regarded as the major study in identifying diabetes prevalence within the context of Saudi Arabia, as Aljoudi and Taha (2009) point out, the results did not classify diabetes types among participants.

In summary, while there appear to be great discrepancies in the reported prevalence of diabetes in Saudi, there are several methodological issues to take into account (Al-Nozha et al., 2004). Taking these into account, the discrepancies are largely attributable to the various ages of the populations under study. On the basis of the more recent studies it is likely that the real prevalence of diabetes was 20% and 25% for females and males respectively in the 30 to 60 year age group and 25% and 30% for females and males respectively in the over 60 year age group. What is not certain is the ratio of T2DM to T1DM in the general population. Again, it is likely that the ratio is similar to that found elsewhere with T2DM accounting for 90% to 95% of all cases of diabetes. A consistent finding of the later Saudi studies is the higher prevalence in males than females.

The finding of a higher prevalence in urban than rural areas is also important because it confirms the belief that T2DM is associated with overweight and obesity, which is in turn associated with the Western style diet consumed increasingly by more affluent urban dwelling Saudis. Despite the differences in methods, including the age groups studied, Al-Nozha et al. (2004) claim that the higher prevalence of diabetes seen in more recent studies is likely to be attributed to an increasing incidence of diabetes in the Kingdom of Saudi Arabia reflecting a true increase in prevalence. Finally, the fact that the MOH estimated the prevalence of diabetes in Saudi, based on the diabetes register, to be 12% (MOH, 2010), when the population prevalence in people over 30 years of age is more likely to be somewhere between 20% and 30%, makes it clear that many Saudis who have the disease are currently unaware and receive no primary health-care for the condition.

Risk Factors

Excess weight, obesity and genetic predisposition are major risk factors for T2DM among Saudi nationals (Elhadd, Al-Amoudi, & Alzahrani, 2007). Similar to numerous countries, Western fast food restaurants attract young people in Saudi Arabia increasing the prevalence of obesity among the younger population (Al-Rethaiaa, Fahmy, & Al-Shwaiyat, 2010). However, Arif, Al-Saif, Al-Karrawi and Al-Sagair (2011) argued that, overall obesity in Saudi Arabia is more likely to be caused by a combination of sedentary lifestyle and high consumption of traditional food.

In general, traditional food is an important form of generosity in Saudi Arabia. These include the most well-known dishes prepared for social gatherings

such as *margog*, *mandy* and *kabsa*. These dishes contain high calories. For example, *kabsa* is made of rice and lamb or camel meat. It is prepared by cooking the rice and the meat together for about one hour which makes the rice full of fat.

Al-Turki (2000) recruited 3,186 participants with diabetes and hypertension for the purpose of examining the prevalence of obesity and overweight as risk factors of the disease. Results showed that 41% of the sample were obese (BMI > 30–40 kg/m2) and 5% morbidly obese (BMI > 40 kg/m2). Overweight participants were estimated as 35% overweight (BMI > 25–29.9 kg/m2). Only 19% of the patients had the recommended body weight of BMI < 25 kg/m2.

The role of Saudi traditional food in increasing the chance of obesity and T2DM was examined in a case control study by Midhet, Al-Mohaimeed and Sharaf (2010). They randomly recruited 238 T2DM people and 215 non-diabetics to examine whether dietary practices and physical activity modify the risk of T2DM regardless of the family history. The results showed adjusted odds ratios for eating *kabsa*, vegetable, dates and having a sedentary lifestyle as 5.5; 0.4; 1.8; and 2.5 respectively. The researchers concluded that encouraging a more active lifestyle and healthful dietary habits among Saudi people may decrease the risk of developing T2DM.

In a larger study, Al-Othaimeen, Al-Nozha and Osman (2007) investigated obesity prevalence among Saudi citizens by recruiting 19,598 participants. Data were obtained from the National Nutrition Survey that included a stratified random sample of houses in every region in the country. Measurements included BMI, skin-fold thickness and arm circumference. Results showed that obesity was more prevalent in

the north of the country (Ha'il City, 33.9%) than the south (Jazan City, 11.7%). Based on gender classification, obesity was higher in women (23.6%) than men (14.2%) while excess weight was evident in men (30.7%) more than in women (28.4%). The results of the study may highlight the environment's role in increasing obesity. The geographical structure of the north region of Saudi Arabia is opposite to the south region (close to Yemen) where mountains and hard geographical structures feature. Thus the results may clarify that those who live in mountainous regions undertake more physical activity, therefore, have higher energy consumption than those who live in the urban environment. This claim is supported by Al-Nozha et al. (2007) whose study indicated that the inactivity among southern Saudis was the lowest in the country.

A lack of physical activity appears to be a major predisposing factor for obesity and diabetes (Al-Nozha et al., 2007; Al-Nuaim, 1997; AlQuaiz & Tayel, 2009; Elhadd et al., 2007). According to Al-Nozha et al. (2007), physical inactivity is very high among Saudi nationals aged between 30–70 years (96%). Inactivity among women is 98%; the rate for men is 94%. Further, the central region of Saudi Arabia recorded the highest inactivity percentage (97.3%). Similarly, a study by AlQuaiz and Tayel (2009) revealed that physical inactivity is very high in the central region (Riyadh, the capital city). Among 450 participants, the study showed that 82.4% were inactive, with a higher prevalence among women (87.6%) than men (71.5%). The study identified the underlying causes of this inactivity as lack of resources (80.5%) especially for female participants with lower incomes. Participants were also asked about their diet. Unhealthful dietary practices were evident among 80.3% of the participants, who mentioned that lack of willpower was a major challenge in continuing their diet regimen.

Despite the limitation of the AlQuaiz and Tayel (2009) study, where the participants came from the same geographical region, the results were in accordance with Al-Nozha et al. (2007). Both results indicated a high prevalence of inactivity among Saudi nationals, especially women. Factors leading to inactivity were identified as lack of time, stamina, and resources. These factors may represent the women's situation in Saudi Arabia, where they have numerous obligations including cooking, childcare and participating in social gatherings. In combination with societal rejection of outdoor sports for women and lack of sports organisations, these factors play major role in preventing an active lifestyle among women in Saudi Arabia. Further cultural issues will be addressed in the light of the results of the current study in Chapter 5.

It is interesting to note that no study has investigated the physical activity habits of expatriates while they are in Saudi Arabia. As mentioned in Chapter I, the estimated number of expatriates is 6,487,470 (27% of the Kingdom population). Such an investigation may highlight the cultural role in modifying healthful lifestyles. In other words, do people who practice healthful lifestyles in their own countries change their habits on arrival in Saudi Arabia? The situation in other Gulf Cooperation Council countries is no different in regard to local people. According to Mabry, Reeves, Eakin and Owen (2009) the percentage of physically active people (150 minutes of physical activity per week) in the Gulf Cooperation Council countries ranges from 39% to 42.1% for men and 26.3% to 28.4% for women.

It is also noted that there are no published Saudi studies that examined early life developmental risk factors for T2DM, yet, a consensus is building internationally that T2DM results from the metabolic syndrome, which begins during pregnancy

(Huang et al., 2009). While some details of the mechanism remain uncertain, there is substantial evidence that adiposity (obesity) and the metabolic syndrome cluster, essentially insulin resistance and dyslipidaemia, are synergistic in the pathogenesis of inflammation. Systemic and liver inflammation in those children with the cluster is likely to predict diabetes and cardiovascular disease in later life (Huang et al., 2009). This is important for the Saudi Government and those health professionals working to halt, and even reduce, the growing prevalence of T2DM and its complications. It is important because it may be possible to prevent a large proportion of T2DM that becomes symptomatic in adulthood by addressing overweight and obesity in asymptomatic children.

Health-care Intervention

The extremely high prevalence of diabetes in Saudi Arabia means that a tremendous effort is required to manage the disease over the long term, including an attempt to decrease further medical complications for affected people. As mentioned previously, it is imperative that the Saudi Government and health authorities engage in efforts to promote healthful diets and exercise regimes in the general population, especially among pregnant women, children and adolescents. For those who already have T2DM, these efforts must include modification of the health-care system as well as health education and enhanced patient self-management. Investigations of these interventions have been undertaken by several researchers, with particular emphasis on health education and health system modification.

According to Al-Khaldi and Khan (2000), 80% of Saudi diabetic patients received health education during their contact with primary care health centres. In

their cross-sectional study, 198 medical records of people with T2DM were reviewed for the purpose of measuring health education interventions. Results revealed that diabetes patients received education concerning the following issues: healthful diets (77%); medication (21%); how to inject insulin (44%); foot care (39%); exercise sessions (25%); and signs of hypoglycaemia (21%). However, the researchers did not define health education interventions and consequently, the study fails to inform the reader about the modes of diabetes health education in primary health-care settings. This limitation was avoided in a more recent study by Uddin, Ahmad, Kurkuman, and Iftikhar (2001) that explored and briefly described health education and self-management interventions in the primary health-care of people who have T2DM.

Uddin, Ahmad, Kurkuman and Iftikhar (2001) recruited 300 participants with T2DM. All recruited participants attended 12 patient education sessions delivered by two trained nurses in the field of diabetes. The sessions covered five units of patient self-management skills; however, neither the skills nor the structure of the sessions were precisely described in the article. Blood glucose control was identified by the glycosylated haemoglobin (HbA1c) level of < 6.7 %. The results showed that glycaemic control in the male group increased from 1.72% before the intervention to 50% after the intervention. Similarly, the female group's glycaemic control improved from 8.6% to 58.6%. Clearly, the improvement for both groups was almost 50%. Taking into account the lack of detailed information about the interventions and approach to data analysis, the usefulness of the study is limited.

In a retrospective study by Azab (2001), patients' level of glucose control was investigated among patients of three primary health-care centres in Riyadh. Among these centres, 991 medical records for diabetes patients were retrieved to determine blood glucose levels on two occasions in two consecutive months without any intervention as a retrospective study. Blood glucose readings showed excellent glycaemic control (fasting blood glucose (FBG), 4–7 mmol/L) among 21% of the study sample at the first reading compared to 25% at the second reading. Poor glycaemic control (> 10 mmol/L) was evident in 49% and 44% for the first and second readings, respectively. According to Azab, no difference was found between male and female groups in terms of blood glucose control. However, the researcher did not explain why there was a small improvement even through there was no planned intervention. It is possible that this improvement could be an indirect result of the research team following-up the participants who knew about the second reading. In other words, the changes were a product of the Hawthorn effect. Alternatively, the participants may have altered their behavioural patterns in anticipation of the follow-up in an attempt to please the researchers. The study concluded that health education is vital if diabetes management outcomes are to meet the national goal of diabetic control, which requires that > 40% of diabetic people should have excellent blood glucose levels, while those with poor control should not exceed 10% (MOH, 2010).

Azab (2001) found no difference between male and female groups in terms of blood glucose control; however, Abdelmoneim and Al-Homrany (2002) examined the relationship between gender, the number of health education sessions attended and glycaemic control. Glycaemic control was defined to be 180 mg/dL as the upper limit for acceptable control. One hundred and ninety-eight medical records (108

women and 90 men) were included in the study. The results showed that men had a lower mean fasting blood glucose level (201.8 ± 64.2 mg/dL) than women (230.0 ± 75.2 mg/dL). The researchers recommended that, despite differences in glycaemic control between genders, health education at primary health-care centres ought to be revised to take into consideration differences in age and level of education. However, the participants' level of education was not included as a variable in the study; thus, this recommendation could be accepted as hypothetical explanation rather than evidence that emerged from the study.

Further, Abdelmoneim and Al-Homrany (2002) did not describe in detail the mechanisms by which health education was delivered or the educational materials used to improve the quality of patient education. Health education was investigated in a study by Al-Khaldi and Al-Sharif (2002) who aimed to evaluate the availability of diabetes health-care resources in primary health-care in the Aseer region. In the Al-Khaldi and Al-Sharif study, 242 primary health-care directors responded to a questionnaire. The researchers designed a questionnaire based on the quality assurance and mini-clinics manuals issued by the Directorate General of Primary Health Care Centres, which contains six main sections: PHCCs data, availability of the diabetic mini-clinic, availability of the essential drugs for diabetes, availability of the essential items of laboratory investigations, availability of diabetic health education materials and patterns of participation of the community.

Results showed that 90% of primary health-care centres had special medical records for diabetes patients, a special registration system and a specific protocol for diagnosis and treatment. In addition, 80.4% of the participating primary health-care centres issued diabetes identification cards for their patients while 97.5% had active

health education programs, but with limited education facilities. Several points may affect the rigour of the study, including the omission of details about the psychometric properties of the questionnaire used, the absence of an explanation of why the instrument fell short in identifying the amount of educational resources available and the inclusion of primary health-care centre directors as participants—such individuals are more likely to deliver biased feedback. Moreover, similar to previously mentioned studies, 'educational program' were not specifically defined.

Interestingly, the psychometric properties of the instruments used in previous Saudi studies were generally unclear. This trend was also evident in the study by Al-Khaldi and Khan (2002) that assessed the impact of mini-clinics on diabetes care in primary health settings. The authors provided no clear description of the instrument used, its validity or its reliability. Further, the researchers' conclusion was arguable. They concluded that increased distribution of diabetic educational pamphlets was a sign of improved diabetes outcomes in terms of glycemic control. Given the scientific limitations of this and the other intervention studies reviewed, it is understandable why so few are published in international peer-reviewed journals.

Attention to expatriate diabetes patients was identified in only one Saudi study undertaken by Qari (2005) that involved 200 participants recruited from King Abdul Aziz University Hospital (n = 100) and Erfan and Bageddo Private Hospital (n = 100) in the western region. Recruited Saudi nationals from the first centre represented 51% of that sample group compared to 62% from the Erfan centre group. The aim of the study was to compare government and private performance on achieving recommended glycaemic control. An analysis of the participants' medical records revealed no significant mean difference in HbA1c between the two groups.

To determine the quality of overall primary health-care services, Al-Ahmadi and Roland (2005) reviewed 31 studies on primary health-care in Saudi Arabia and identified three major issues: poor access to health-care, ineffective management of chronic disease, and poor referral patterns. In addition, the study identified several negative factors including a lack of evidence-based practice, poor professional development, poor management and organisational factors, and failure to use a referral system. The researchers concluded that there was a substantial variation in the quality of primary health-care services.

Al-Khaldi and Al-Sharif (2002) came to the same conclusion and suggested formulating committees with diabetes expertise to supervise and coordinate diabetes care delivery. In addition, Eledrisi et al. (2007) identified a 'huge gap' in the Saudi care system, where knowledge of effective diabetes interventions is not reflected in practice.

In a retrospective study Al-Hussein (2009) included 651 medical records and measured good quality diabetes care, which was identified as a HbA1c < 7 %, with tested frequency of three months (Al-Hussein, 2009). Of the 651 patients, 55.4% underwent routine blood tests. Results revealed that 20.6% (95% CI = 17.5–23.9%) of the sample had a HbA1c score of < 7. Although Al-Hussein (2009) is the only study concerning diabetes health services in this sector, it suggests there is no significant difference between Ministry of Health organisations and the National Guard in terms of the proportions of registered T2DM patients who meet the recommended levels of glycaemic control. However, the researcher did not mention that measuring the quality of health-care services should address frequency and time of health interventions rather than addressing the HbA1c value alone. In fact, many

factors contribute to glycemic control, for example, patient self-management level, age, type and timing of medications, body weight and fitness level.

Summary

The Saudi studies indicated a significant gap in current T2DM health-care interventions, especially self-management approaches. The majority of published Saudi studies were concerned with disease prevalence rather than disease management. These studies were undertaken by clinicians, while scientific contributions from nurses and other health professionals were not identified. More importantly, although several Saudi studies recommended improving health-care interventions, no researchers seem responded to such recommendation. Therefore, there is a need to explore diabetes related health-care intervention in Saudi Arabia. However, in order to undertake such research, it is necessary to first explore international diabetes management and self-management approaches to better define the scope of the knowledge and practice gap in Saudi Arabian T2DM health-care interventions.

Part 3: Managing Type 2 Diabetes Mellitus

Although numerous specialised health organisations are interested in the field of diabetes, the World Health Organization (WHO) and the American Diabetes Association (ADA) have been major bodies in diabetes care regulations since the 1980s. For the purpose of the current study, the ADA guidelines and recommendations were used to represent the desired standards of diabetes management. These standards are updated on an annual basis to reflect the latest evidence-based information. Diabetes management, including standards and recommendations, are presented in the following sections. In addition, diabetes self-management is presented as a component of the Chronic Care Model (CCM) which was utilised as the conceptual framework for the third phase of this study. The CCM is presented after the sections describing diabetes recommendations.

Diabetes Management Standards and Recommendations

The ADA has issued a series of recommendations that aim to improve different aspects of diabetes management. The ADA (2008) recommended that diabetes patients keep their blood glucose level within certain ranges in different blood tests. Among these, HbA1c is the recommended test for glycemic control. The target is a glycosylated haemoglobin (HbA1c) level of ≤ 7.0%. Alternatively, fasting blood glucose (FBG) and random blood glucose (RBS) can be used when the HbA1c is not available. The target level for FBG is ≤ 126 mg/dL, while for RBS, it is 180–200 mg/dL. These tests facilitate the measurement of diabetes intensity and are utilised to guide health-care interventions to manage the disease.

HbA1c should be measured every three months. Other blood glucose tests, such as random blood glucose, can be performed by the patient as part of the blood glucose self-monitoring. The ADA recommends blood glucose tests should be performed at least three times a day for patients on insulin therapy. Patients on oral medication are advised to test when possible, so the results can be used to guide their health-care plan and optimise glycaemic control (ADA, 2008).

In general, every individual should engage in regular physical exercise. Regular exercise is particularly important for individuals with diabetes because it lowers blood glucose levels. The ADA (2008) recommends that diabetes patients should engage in physical exercise for a minimum of 150 minutes per week. The exercise should be of moderate intensity, sufficient to elevate the heart rate to 50–70% of maximum. However, people who have diabetes should be careful not to injure themselves during exercise and should check their feet accordingly for any injury or wound.

Similarly, the ADA (2008) recommended health-care providers should facilitate patients' self-management activities to enable them to play an active role in addressing their own needs including teaching patients about each aspect of their diabetes management plan. For example, health providers should teach T2DM patients about foot-care. When a patient learns to perform foot-care, he or she will be in the best position to identify foot-related diabetes complications, which will in turn help health providers to undertake early medical interventions.

Lifestyle modification is a major goal for self-management education including dietary recommendations such as reducing the intake of saturated fats and

simple sugars and increasing physical activity. In addition to these modifications are smoking cessations and weight loss programs when required. However, it is impractical to leave the full responsibility of managing and monitoring diabetes complications to the patient. For those patients who take a passive role in their diabetes management plan, such delegation of responsibility is likely to lead to the late discovery of medical complications. Detailed aspects of self-management are provided later in this chapter.

The ADA (2008) recommended providing patients with timely diabetes self-management education (DSME) when the disease is first diagnosed. According to the ADA, behaviour change should be the key outcome. The recommendation emphasises the critical role of national DSME standards. The published American Standards for Diabetes Self-Management Education (Funnell et al., 2009) identified three areas where standards should be applied: structure, process and outcomes. Phase III of the current study will attempt to shed some light into these areas of self-management education programs in the primary health-care setting. The standards are:

- Documented administrative profile where structure, mission and goals are well described as part of the whole diabetes management. (Structure)

- DSME should be advised by a group of stakeholders such as health-care professionals, diabetes patients and community members. (Structure)

- DSME should address specific educational and behavioural targets based on the special needs of the population. (Structure)

- DSME should be monitored by a competent coordinator with academic preparation or experience allowing him or her to evaluate implemented programs. (Structure)

- DSME should be delivered by at least one instructor with current knowledge in education, diabetes and chronic disease management. In addition, there should be a feedback mechanism to ensure that participants' needs are met. (Process)

- DSME should have a documented curriculum incorporating updated evidence-based guidelines. Curriculum content should identify diabetes and pre-diabetes patients' needs. Curriculum outcomes should be evaluated based on pre-established criteria. (Process)

- DSME should have documented individual assessment to direct the selection of best self-management educational interventions. (Process)

- Individual continuing self-management evaluation should be established in cooperation with the patient and communicated to the referring health-care provider. (Process)

- Patient's self-management outcomes should be evaluated on a regular basis using evidence-based approaches that in turn reflect the educational intervention effectiveness. (Outcomes)

- DSME evaluation should be linked to the documented continuing quality improvement plan. (Outcomes) (Funnell et al., 2009. p.S87-S90)

Managing Chronic Diseases: The Chronic Care Model

The CCM was designed to enhance health-care system outcomes as well as to facilitate individual and population health interventions (Fiandt, 2006). Themodel was developed by Wagner in 1996 to improve chronic patients' health-care as a project at the Health Cooperative of Puget Sound in the State of Washington (Bodenheimer, Lorig, Holman, & Grumbach, 2002b).

The development of the model was a result of extensive literature reviews and logistic support from the Health MacColl Institute for Healthcare Innovation (Bodenheimer, Wagner, & Grumbach, 2002b). In brief, the model connects three main circles of community, provider organisations, and health-care systems (Figure 2.1). The model consists of six domains: community resources and policies; organisation of health-care; self-management support; delivery system design; decision support; and clinical information system. Further information about these domains is provided later in this chapter, however, the next section will emphasise the effectiveness of the model as demonstrated through published studies.

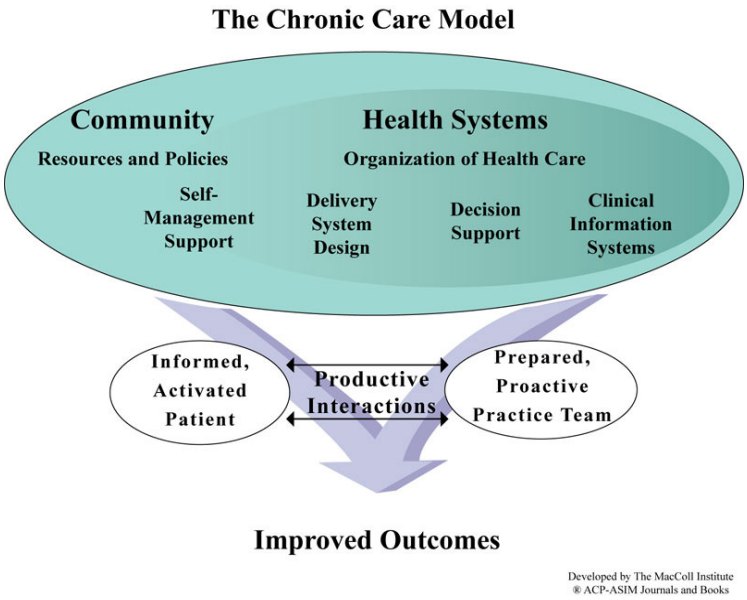

Figure 2.1 The Chronic Care Model (source: Improving Chronic Illness Care Organisation, 2010)

Effectiveness of the Chronic Care Model

The effectiveness of the CCM is demonstrated in numerous studies. In a systemic review, Bodenheimer, Wagner, and Grumbach (2002b) searched 39 published intervention studies in which the CCM was either completely or partially implemented. The review indicated that implementation of the CCM in 32 studies improved at least one process or outcome for diabetes patients. The researchers concluded that integrating the CCM into diabetes health-care services improves their quality. Similar outcomes were identified by Coleman, Austin, Brach and Wagner (2009) who supported the CCM implementation due to its positive outcomes on health systems. They recommended utilising the CCM to redesign health-care services.

According to Liebman, Heffernan and Sarvela (2007), the CCM was successfully utilised to improve chronic care self-management for 580 Latinos with diabetes in the United States. The intervention took place over three years and included the formalisation of different activities including dietary drop-in sessions and exercises. Data were extracted from the disease registry, participation data and clinical data on glycemic control. Generally, results indicated a reduction of HbA1c values among patients, with 200 of them attaining the target HbA1c values of < 7%. The HbA1c values reduced from 8.6% to 8% for 275 participants who attended the interventions (p- value was not reported). The researchers concluded that CCM improved the care of diabetes patients and reduced HbA1c. However, despite significant improvement in HbA1c status, improvements in HbA1c could result from several factors other than the intervention. In other words, participants who choose to attend the intervention activities for three years were possibly more motivated to address their own health plan than patients who did not attend.

This limitation of Liebman, Heffernan and Sarvela (2007) was avoided in a study undertaken by Parchman, Pugh, Wang and Romero (2007) that used a cross-sectional study to assess the CCM implementation status effects on glycaemic control of the patients while controlling for self-care behaviours. A total of 618 T2DM participants were recruited from 20 primary clinics in South Texas. HbA1c values were extracted from medical records and measured against CCM status assessed through the Assessment of Chronic Illness Care (ACIC) survey. ACIC is an instrument to measure quality improvement for chronic diseases services (Bonomi, Wagner, Glasgow, & VonKorff, 2002). Results showed an inverse relationship between ACIC and HbA1c scores. Specifically, each one point increase in ACIC was correlated with a 0.144% HbA1c reduction ($p < .00$).

The researchers concluded that improvements in the primary health-care clinic were positively correlated with improved blood glucose control among the clinic patients. These outcomes were supported by Nutting et al. (2007) who found that for every unit increase in clinician reported CCM use, there was a 0.30% reduction in HbA1c ($p < .00$) and a 0.17% reduction in the lipid ratio ($p = .02$).

The CCM was employed by the American Bureau of Primary Health-care to guide an initiative to reduce health disparities and improve diabetes care. The initiative was evaluated later in three studies in 2004 and 2007 (Chin et al., 2004; Landon et al., 2007; Quinn et al., 2007). In the first study, Chin et al. (2004) did a pre-post evaluation on a random sample of 969 people with diabetes among 19 participating health-care centres. Results revealed an improvement in key processes such as HbA1c measurement (80–90%; adjusted odds ratio [OR], 2.1; 95% CI = 1.6–2.8%), eye examination referral, foot examination and lipid assessment (55–66%; OR = 1.6, 95% CI = 1.1–2.3). The study did not identify improvement in outcomes during the first year of the initiative's implementation. The researchers concluded that the collaborative initiative induced positive improvements in diabetes care based on identified outcomes.

Landon et al. (2007) recruited a larger sample of 9,658 patients from 44 health centres. The participants had different medical diagnoses, including diabetes, asthma and hypertension. For diabetes patients, significant improvement was evident in care processes such as foot examinations (21%) and HbA1c assessment (16%). Improvements in intermediate outcomes were not identified.

Quinn et al. (2007) included 34 health centres in a study where 2,364, 2417 medical records and 2212 participants were randomly selected and reviewed separately in 1998, 2000 and 2002. The study design utilised randomised controlled trials with longitudinal evaluations. Intervention in this study comprised extra learning sessions to enhance patients' empowerment and behavioural change while the control group attended fewer learning sessions. The results revealed an improvement in 11 diabetes processes and a significant reduction of HbA1c levels (–0.45%; 95% CI = –0.72 to –0.17).

In Australia, the CCM has been used in Aboriginal community health centres. Si et al. (2005) included 12 health centres involving 295 T2DM patients. Care processes and the status of chronic care services were evaluated using the Assessment of Chronic Illness Care scale. The study result indicated that quality of diabetes care was associated with four components of the CCM model: organisational support, community, clinical information system and delivery care design. In addition, an increase of one score for organisational influence, community linkage and clinical information system was associated with a 4.3%, 3.8% and 4.5% increase in adherence to standard care process, respectively.

In addition to the clinical outcomes improvements described earlier, the CCM results in organisational savings. Bodenheimer, Wagner, and Grumbach (2002b) found that improving glycaemic control through the CCM resulted in savings over both the short and longer term. They based their conclusion on a review of 27 studies where 18 of which reported a cost reduction. Munroe, Kunz, Dalmady-Israel, Potter and Schonfeld (1997) found that changing the service delivery design resulted in an

estimated savings of US$143.95/patient/ month to US$293.39/month for chronic disease patients.

The CCM framework has been utilised and adapted by over 1,000 health-care organisations, including about 500 community health-care centres that were associated with the Health Resources Services Association Bureau of Primary Health-care (Epping-Jordan, Pruitt, Bengoa, & Wagner, 2004; Wagner et al., 2001). In addition, the CCM was adapted by the American College of Physicians (Barr & Ginsburg, 2006), the Health Disparities Collaborative (Martin, Larsen, Shea, Hutchins, & Alfaro-Correa, 2007), US Medicare and Medicaid centres, multiple academic health centres in the US and thousands of physicians' offices across the US (Siminerio, Zgibor, & Solano, 2004; Warm, 2007) .

Further, successful integration and positive outcomes of the CCM encouraged the WHO to utilise the model (Epping-Jordan et al., 2004). The WHO joined the CCM developer (MacColl Institute for Healthcare Innovation) to adapt the model for international use. The result of the collaboration was the Innovative Care for Chronic Conditions framework (ICCC). The model was modified so that it could be applied internationally, especially in developing countries.

These modifications took place on the micro (low), meso (middle), and macro (high) levels of the CCM. On the micro level, the word 'prepared' was added to the word 'patient' for the purpose of describing patients in countries where health service availability is a major concern. Therefore, the term 'prepared patients' referred to those who had health-care support. The meso level of modification emphasised continuity and coordination of health-care services between health-care

organisations. The macro level involved the support of political leaders and media utilisation.

According to Epping-Jordan et al. (2004), the CCM was implemented in Canada, Mexico, Morocco, the Russian Federation, Rwanda and the UK. However, implementation of the CCM at a country level requires political support and the involvement of decision-makers. From an organisational perspective, leadership vision and financial support are essential to integrate the model into the system (Bodenheimer, Wagner, & Grumbach, 2002b; Fiandt, 2006). Similarly, organisational culture and motivation are critical factors in implementing the model (Wu et al., 2003).

Leadership role in supporting the CCM to improve health-care services for the general population may explain the leadership role in preserving the status quo in countries in significant need to adopt the CCM. A simple example of the leadership role was given by Epping-Jordan et al. (2004) when they argued that leadership would help reduce the burden of chronic diseases through legislation and regulation.

Ineffective chronic care legislation and regulation may exacerbate chronic health service disparities. Such disparities are evident in many developed countries. In the US, Becher and Chassin (2001) found that 40% of people who had a chronic disease did not have adequate access to appropriate health-care services. In addition, 20% of the health-care services provided were not evidence-based. The situation in Australia, Canada, New Zealand and the UK is similar, wherein 33–49% of people with a chronic disease were not given advice on health risk behaviours (Blendon, Schoen, DesRoches, Osborn, & Zapert, 2003). If this is the case in those developed

countries where health-care services follow best practice, a worse situation may exist in developing countries where the quality of the services provided is not evaluated rigorously. The current study will shed some light on health-care disparities in Saudi Arabia by the analysis of T2DM participants and their health-care providers' interview data obtained in the third phase of the study. In addition, the study utilised the extension part of the Summary of Diabetes Self-Care Activities questionnaire that identifies the advice provided by health professionals on health risk behaviours.

The Chronic Care Model Components

Clinical Information System. The clinical information system aims to provide structured data on patient or population disease management that facilitates effective and efficient health-care utilisation (Fiandt, 2006; Metzger, 2004). In general, the clinical information system is located on registries such as the diabetes registry. The function of the registry is to identify patients with diabetes, identify individuals who need further or more advanced interventions, support health-care providers with current and complete patient data and generate population-based reports (Better Diabetes Care, 2007). Other registry functions include timely reminders to schedule appointments and the linking of the patient's condition to the treatment plan (Fiandt, 2006). Generally, registries are highly effective for processing measures such as frequency of foot examinations, but they may not significantly affect clinical outcomes (Warm, 2007).

However, registries may not be available in every health-care organisation. Further, the availability of registries does not guarantee their utilisation in everyday patient care. The availability of patients' registries in physicians' organisations in the

United States and the level of their utilisation in the management of patients' health-care services were investigated by Schmittdiel, Bodenheimer, Solomon, Gillies and Shortell (2005). In total, 1,040 health-care organisations were included in this cross-sectional telephone survey. Results showed that 47% of the sample had at least one disease registry where diabetes was the most identified disease. Linkage between the registry and the clinical data system was not evident in 51% of the sample. The researchers found that the utilisation of registries was related to the physicians' access to information technology and the quality of the technology utilised. As part of the current study, the researcher explored health-care providers' usage of clinical information systems in the study locations. More information on this topic is presented in Chapters 4 and 5.

Community Resources and Policies. Linkage with community organisations provides extended support services, such as social support agencies and diet preparation workshops, which may not be available in acute care health systems (Warm, 2007). Further, community linkage provides peer support by enabling people with diabetes to meet their peers in their neighbourhood and community. Community involvement and social relationships support people with diabetes to continue optimal self-management practices (Fiandt, 2006). According to Uchino (2004), there is an improvement in outcomes when people with diabetes are encouraged to engage in physical exercise with a friend. Further, in a review of 100 published studies, Hogan, Linden and Najarian (2002) found that 80% of the studies reported positive outcomes when social support interventions were utilised.

In contrast, negative social influences on people with diabetes have been acknowledged in numerous studies. For example, Egede and Osborn (2010) showed people with diabetes in cardiology care who had limited social support had more depressive symptoms. Studies have argued that low social support may contribute to the formulation of a fatalistic attitude such as ignoring self-management practices. Researches indicated that women are more affected by low social support than men (Egede & Osborn, 2010; Jackson, 2006; Kacerovsky-Bielesz et al., 2009). As a negative consequence of limited social support, patients who receive help were more exposed to nagging and criticism by family members than those who were independent (Carter-Edwards, Skelly, Cagle, & Appel, 2004). A possible explanation for criticism and nagging in this situation might be acknowledged as a sign of the carers' inability to cope with caring activities.

Consequently, positive social support and community resources appear to be important factors that help people with diabetes to improve their self-management. For example, Barrera, Toobert, Angell, Glasgow and Mackinnon (2006) undertook pre-post educational interventions to assess and improve diet and active social-ecological resources. Social-ecological approach integrates social support from formal organisations, neighbourhoods, worksites and community organisations to enhance chronic diseases management.

The researchers explored food preparation sessions as potential mediators affecting the self-management of women with T2DM. The interventions successfully enhanced participants' diet-specific and activity-specific family and neighbourhood resources. In addition, the researchers concluded that manipulating ecological resources, 'mediators' may improve T2DM patients' diet, exercise and lifestyle

practices. Improvement over a span of 12 and 24 months in terms of dietary intake, physical activity and stress management were all improved (Toobert, Glasgow, Strycker, Berrera, Ritzwoller & Weidner, 2007).

Therefore, from a population health perspective, the community is an active partner with health-care systems where community-based organisations, media, schools and religious organisations play a critical role in addressing community needs and initiating and maintaining population health programs (Syme, 2004). For example, media programs can change dietary practices especially for women (Anschutz, Van Strien, & Engels, 2008). Without community linkage, health systems may fail to provide efficient chronic disease interventions. Moreover, when the community members are not involved in the decision-making regarding population health-care interventions, these interventions may fail to reach their goals or at least fail to satisfy the needs of the population.

In the context of Saudi Arabia, although the Government injects millions of dollars annually to improve chronic disease health-care services, the absence of community partnerships works against development of ecological resources. Similarly, the dominance of medical practitioners as decision-makers has encouraged acute care support for primary health-care services in the country. Unfortunately, there are no studies supporting this claim except those that evaluate the primary health-care situation in the Kingdom, such as Al-Ahmadi and Ronald (2005). Due to the long-term dominance of physicians in health-care decision-making and the absence of community partnerships, people with chronic diseases as well as community organisations, may not be willing to participate actively in health policies and setting regulations. Unless patients and community organisations are given the

chance to participate in directing health-care services, improvements in primary health and chronic diseases care might not be achieved. By identifying a range of issues relevant to T2DM participants and their health-care providers, the current study is sought to take one step towards highlighting their needs to improve diabetes health-care in Saudi Arabia.

It will be extremely beneficial for the Saudi Government to adopt a community-based approach to diabetes care because the Saudi community has many positive characteristics that could enhance the delivery of chronic care services such as the Islamic culture and strong social relationships. Islamic tenets encourage people to support each other regardless of their religion or ethnicity. From a social relationship perspective, when a family member or relative needs any kind of help, all Muslims must fulfil the role of support-provider. For example, the holy Qur'an explicitly requests Muslims to take care of their parents, which should be a major life goal.

Islamic tenets could be utilised by health professionals to enhance patients' self-management practices and overcome depression. According to Ali, Liu and Humedian (2004), employing the five daily prayers or passages from the holy Qur'an for meditation and spiritual therapy among Muslim patients may improve health outcomes. Although there is no supporting evidence for this claim in the context of Saudi Arabia, international studies indicate that people who have T2DM are more comfortable when they utilise prayer to reduce stress and to cope with the afflictions associated with the disease (Hunt, Arar, & Akana, 2000; Yeh, Eisenberg, Davis, & Phillips, 2002).

The Saudi community has cultural and social norms that impose behavioural limitations. The most important of these is restricted women's lifestyles. In general, the social norms do not encourage women to participate in outdoor sports activities. Although there are some private sports organisations, the majority of them do not have facilities for women. In addition there are the requirements of their social live, which include attending all family gatherings, visiting friends, and managing the house. Women with T2DM do not have the same opportunities as men to practice self-management. Such a situation does not support patients to manage their care plan, which in turn means that health-care providers have few solutions for controlling blood glucose except by using medication.

Decision Support. Evidence-based practice guidelines should be available to all health-care providers to support them to make decisions regarding diabetes management practices (Fiandt, 2006). Without guidelines that are based on the most recent scientific evidence, there is the increased probability that many patients will not receive updated information about various aspects their care. For example, health-care providers may not prescribe the best and most current medication according to the patient's medical needs. The CCM decision support component encourages the integration of evidence-based guidelines and the sharing of them with the patient, utilising accredited patient education approaches, and integrating specialist expertise (Bodenheimer, Wagner, & Grumbach, 2002b).

One of the positive aspects of decision-making support tools is their ability to change clinical practice. According to the Improving Chronic Illness Care

Organization (2010), in order to successfully change health-care practices, guidelines need to be thoroughly integrated into the system where health-care providers and patients have access to them before reaching consensus on any decision. This integration includes, but is not limited to, timely reminders and feedback.

The Institute for Healthcare Improvement (2010) suggests several steps in the integration of evidence-based guidelines for the aim of changing health-care practices. These steps include evaluating current guidelines and modifying them with updated evidence-based ones, involving other health-care providers in reviewing new guidelines and reaching agreement on best-practice guidelines that can be easily integrated with the organisation's resources, connecting guidelines with the information system, updating guidelines yearly, and working to avoid barriers to best practices.

Decision support does not necessarily require the health-care provider to use complicated computerised programs. Simply utilising what works for the provider and the patient, such as an insulin titrating algorithm, is sufficient to satisfy the requirements of the CCM (Warm, 2007). However, the provision of decision support instruments does not guarantee their utilisation by health-care providers (Grol, 2001; Schmittdiel et al., 2005). Decision support resources or approaches have not been explicitly identified in previous Saudi Arabian studies. The current study explored decision support tools used in three primary health-care centres.

Delivery System Design. Delivery system design should respond to the clients' needs. In cases of chronic disease, dominance of acute care delivery design

presents a significant barrier to effective health-care interventions (Anderson & Knickman, 2001; Bodenheimer, Wagner, & Grumbach, 2002a). However, even in cases where chronic care delivery design is implemented, following traditional health-care approaches and unproven health-care interventions can lead to barriers to continuity of delivery system design (Harris, Ekoé, Zdanowicz, & Webster-Bogaert, 2005). Two examples of such barriers are curriculum directed health-care interventions and the great demand for patients' medication compliance by health-care providers.

The patient is the main party in health-care interventions and the one who experiences the daily challenges; therefore, curriculum directed interventions may erode the patient's confidence to manage his/her diabetes (Anderson et al., 2005; Tang, Funnell, Brown, & Kurlander, 2010). Similarly, some interventions, such as dispensing medication, are vital. However, dispensing medication and expecting the patient to comply with the instructions to take it may not support the patient's active involvement in the health-care plan.

Alternatively, utilising the medication concordance concept can benefit both health provider and patient (Hayes, Bowman, Monahan, Marrero, & McHorney, 2006). Medication concordance refers to an agreement between the patient and health-care provider about what medication works best for the patient as well as taking into account social and cultural factors (Dickinson, Wilkie, & Harris, 1999). According to Hayes et al. (2006) medication concordance facilitates patient involvement in the health-care plan as well as avoids a paternalistic approach of some health-care providers.

In general, the need to manipulate the delivery system design to improve patient health-care services has been recommended by numerous researchers (Coleman, Gill, & Wilkinson, 1998; Norris et al., 2002; Rich et al., 1995; Shojania et al., 2006; California Medi-Cal Type 2 Diabetes Study Group, 2004). Among delivery designs, case management service has been frequently cited as an effective approach (Rich et al., 1995). According to Coleman et al. (1998) case management is effective in alleviating the negative outcomes of diminished resources. In specific, the Coleman et al. (1998) study of T2DM management in South Africa found that 82% of 220 diabetes patients were managed effectively by nurse case managers. Further, other authors found that case management services could be integrated with disease management programs or delivered with additional supportive interventions. In either design, case management is positively related to improving patients' health-care services (Norris et al., 2002).

The California Medi-Cal Type 2 Diabetes Study Group (2004) searched for evidence of a case management role in reducing HbA1c among 362 Medicaid participants. Results showed that a HbA1c reduction of 0.65% was evident among participants who received case management compared with the control group over the six months. Likewise, Shojania et al.'s (2006) undertook a systemic review and showed HbA1c reduction in 26 studies was related to two quality improvement categories: health-care team change (0.67 %; 95 % CI = 0.43–0.91 %) and pharmacist case management (0.52 %; 95 % CI = 0.31–0.73 %). The researcher described health-care team change as the change of the structure or organisation of the primary health-care team such as utilising multi-disciplinary team and expansion of professional roles.

Further, the health-care team change reduced HbA1c values by 0.33% compared to controls. Case management attained a similar outcome with 0.22% ($p = .04$) reduction in HbA1c. The researchers concluded that allowing the pharmacist case manager to alter medication doses without the doctor's approval effectively improved diabetes services (Shojania et al., 2006). Similar outcomes were found by Doucette, Witry, Farris, and McDonough (2009) and Wubben and Vivian (2008). In contrast, Doucette, Witry, Farris, and McDonough (2009) came to a different conclusion. The latter researchers found that the mean for both HbA1c and blood pressure were not significantly different between the study groups over one year after introducing case management. Possible reasons for the different findings in previous studies in this paragraph could be the broad factors that can affect the outcomes such as personal factors.

A number of researchers have explored different approaches to manipulating delivery system design such as employing diabetes specialists (Lee, Ahn, & Kim, 2009), diabetes consultants (Anderson et al., 2009), and providing special training to health-care providers (De Berardis et al., 2005; Rubak, 2005). In general, these studies have reported positive outcomes as a result of utilising these delivery approaches. However, the implementing interventions such as diabetes consultants might not work for every health-care system for several reasons, including system orientation and economic constraints. In addition, health-care services should involve all health team members (Fiandt, 2006). One-to-one patient-physician interventions are time consuming and marginalise other health team members' contributions (Warm, 2007). To overcome this limitation, cluster and group visits approaches should be a part of the delivery system design.

Organisation of Health-care. The health-care organisation domain of the CCM represents the meso level in organising and facilitating optimal health-care for people with chronic diseases (WHO, 2010). According to Wagner et al. (2001), in order to organise effective health-care services that are capable of managing chronic diseases, health-care systems should have organised health services and applications, and a supportive culture. Enhancing the ability of health systems to handle the burden of chronic diseases successfully requires decision-makers and health leaders to achieve the following objectives: provide genuine support to health-care organisations and their management panel; apply evidence-based interventions to enhance system change; enhance the continuing quality improvement applications and monitor errors; make quality of care indicators the basis for incentives; and set an official plan for managing chronic diseases across health-care organisations (Wagner et al., 2001).

The approach of health-care systems to organised health-care is a crucial factor in adopting chronic disease interventions. For example, when a health-care organisation is establishing a new case management service, if it is applied efficiently, the new service may attain its goal smoothly. In contrast, if the new service is not applied efficiently, it may overlap with other services, resulting in duplication of health-care services and thus wasting resources. According to Plsek and Greenhalgh (2001), the classical 'reduce and resolve' approach of health-care organisations should be replaced by a new respondent framework that allows successful health-care service applications.

Atun, de Jongh, Secci, Ohiri and Adeyi (2009) argued that the health-care organisation plan should be clear regarding the method by which new programs and

services are introduced within the wider package of provided services. Further, they suggested horizontal and vertical designs of adapting new programs. Horizontal program designs are integrated within the system to fill the limitations of other programs, while vertical programs are adopted as stand-alone programs that do not interfere with available ones. According to Greenwood, Suddaby and Hinings (2002), adopting new program depends on the view of decision-makers and other stakeholders on the positive and negative outcomes of each approach. In any case, political, economic, social and cultural factors have the greatest effect on the adoption decision (Atun et al., 2009).

It is important to remember that even after adopting programs into the system health, programs are still susceptible to failure because the program outcomes are still vulnerable to the system level of acceptance. Lorig (2003) explored factors affecting self-management programs in clinical settings and identified numerous factors leading to poor program outcomes, including: absence of a clear infrastructure to support self-management; failure to recognise self-management staff as central to the system goal; lack of quality measurements to provided health services where the impact on the system outcomes is not evaluated; and lack of system support, such as referral to self-management programs.

All of the factors discussed above were rooted into health-care system and direct attention towards the dominance of the acute care model in the management of chronic diseases within health-care systems globally. The dominance of the acute care model may explain the persistent disparities in chronic care services both within and between countries. White, Beech and Miller (2009) posed important questions in

this context, what are the possible causes of disparities in diabetes health-care and what efforts are being made to identify them?

Several disparities in diabetes care have been identified, including the lack of medication, self-management services, chronic diseases clinics (Alberti, Boudriga, & Nabli, 2007a), drug plans, diabetes education centres (Brown et al., 2002), patient involvement (Kravitz et al., 2003), and adopting evidenced-based self-management services (Wolpert & Anderson, 2001). According to Comellas et al. (2010), in order to overcome these disparities, programs should be evaluated periodically against peer-led programs and self-management should be promoted in a cost-effective and culturally acceptable manner. The scope of the current study tried to cover diabetes health service disparities in Saudi Arabia.

Self-Management Support. Self-management refers to the patient's ability to understand and apply basic health-care skills that enable him or her to manage the disease (Lorig, 1993). However, the patient's involvement is a crucial requirement of successful self-management support. Many researchers stressed the importance of understanding patients' perspectives and opinions about delivering health-care services in such a way that patients are considered partners in care (Bodenheimer, Lorig, Holman, & Grumbach, 2002b; Delamater, 2006; Hayes et al., 2006; Lorig, 2003). Further, partnership is accomplished by involving patients in regular meetings with health-care providers to exchange knowledge, so patients' goals and treatment preferences are incorporated into their health-care plans (Rayman & Ellison, 2000). In addition, the involvement may enhance patients' self-efficacy and consequently

increase the likelihood of achieving successful health-care interventions (Hayes et al. 2006).

Establishing other CCM components may not enable optimum patient outcomes without a self-management education program where the patient receives detailed information on the CCM components and how to employ them in order to facilitate timely health-care intervention. Self-management education is priority in health-care systems where the CCM is utilised. For example, the 'Healthy People 2010' initiative by the US Department of Health and Human Services identified increasing the number of diabetes education recipients from 40% to 80% as apriority goal (Warm, 2007).

According to Boren, Fitzner, Panhalkar and Specker (2009), the economically positive impact of self-management interventions outweigh the outcomes of traditional approaches. In addition, the positive relationship between self-management education and improved diabetes care has been identified by several studies. In a systemic review, Warm (2007) found self-management was correlated with improved services in 19 out of 20 studies. Further, Norris, et al., (2002) undertook a meta-analysis to measure the effect of self-management interventions on blood glucose level of T2DM patients. Several medical data bases were searched for related clinical trials. Among the 31 studies included, self-management interventions reduced HbA1c by 0.76% (95% CI = 0.34–1.18%) compared with the control groups. The effect continued for four months but decreased to 0.26%. The researchers concluded that self-management is effective in improving T2DM participants' blood glucose level. However, Norris, et al., did not explain the drop after the first four months of the case management service implementations.

The outcomes of effective and efficient self-management support programs may depend largely on the programs' content, on who deliver the programs, and how those programs are delivered. In a systemic review Krichbaum, Aarestad and Buethe (2003) identified several factors that enhanced the outcomes of self-management programs, including: the patients' involvement in their care plans, an active learning approach, assessment of the patients' feelings about their disease and educating the patients in the necessary skills to alter their own self-management plan.

Bodenheimer, Wagner, and Grumbach (2002a) differentiated between traditional patient education programs and self-management ones. They argue that traditional patient education delivers information and technical skills about the chronic disease, but they identified problems associated with focusing on controlling the disease and concluded that disease-specific education more effectively changed behaviour and improves clinical outcomes. The aim of traditional programs is patient compliance. In contrast, self-management education programs focus on problem solving skills where the patient identifies the problems while the educator provides the approaches for solving these problems in light of the presented chronic illness. The self-management approach might increase the patient's confidence in taking care of his or her own medical condition to enhance self-efficacy and improve clinical outcomes.

Lorig (2003) recommended five core self-management skills that should be incorporated into self-management support programs. These elements are problem solving skills that enable patients to act independently to overcome everyday difficulties; decision-making skills such as how to modify the physical exercise load; resource utilisation skills where the patient is trained to reach the optimum outcomes

of provided resources, such as support groups and community diet preparation sessions; patient-provider communication skills to enhance relationships and cooperation; and taking action. Among these skills, taking action represents the difference between passive and active patient involvement in his/her health-care plan. To activate the taking action element, several approaches have been described in the self-management models and programs, including motivational interviewing. Detailed information about self-management models and programs is presented later in this chapter.

In addition to Lorig's (2003) recommendations, Fiandt (2006) identified seven topics to be covered in self-management education programs to enhance patient's self-efficacy: peer support; role modelling of positive behaviours; physical activity; nutrition; continuing medical care involvement; the role of social support, including family members; and setting and implementing behavioural goals. Fiandt suggested that delivering of these topics should be monitored by the program provider to ensure effective patient outcomes. However, the program provider must be competent and trained to deliver such interventions (Flinders Human Behaviour & Health research Unit, 2010; Stanford Patient Education Research Center, 2010). The health-care provider should be familiar with several topics such as effective care for chronic conditions, the application of healing modalities, pharmacotherapy, the effect of behaviour on health and the fundamentals of screening (Epping-Jordan et al., 2004; Liebman et al., 2007). According to Fiant (2006), self-management interventions should focus on experiential learning where the culture of participants does not conflict with the program interventions. Therefore, involving self-management counsellors is critical during the program preparation time (Epping-Jordan et al., 2004). The involvement of patients in improving health-care services is

a necessity because patients have the right to choose their desired health-care interventions.

The application of self-management knowledge and understanding was not evident in any of the Saudi studies previously reviewed. The curriculum of current diabetes self-management program in Saudi primary health-care centres is presented in a one-page document that has several key indicators, including medication, exercise, diet and foot care. The health-care provider is required to document the delivered topic. There are no guidelines that inform health-care providers to deliver and document detailed self-management education interventions. The third phase of the current study explored this aspect by interviewing health-care providers.

Part 4: Diabetes Self-Management

Self-Management Concept

According to Lorig (2003), the term 'self-management' was introduced by Albert Bandura. Generally, the importance of self-management lays in its role in preparing people with chronic diseases to actively manage their own health-care plan. Theory and models of self-management programs are presented in the following section.

The Social Cognitive Theory

Social cognitive theory is increasingly being applied to diabetes self-management health interventions. Bandura (1977) developed his social learning theory from psychological studies investigating behaviours in children. The theory

explained how children's behaviours develop and how they modify their behaviours through reinforcement and modelling. This theory was refined by Bandura (1986) and renamed the social cognitive theory. The name of the theory was modified as a result of its' significant social influence on behaviour.

In brief, according to the social cognitive theory, human behaviour is the result of human and environmental interactions. Therefore, human behaviour is dependent on how the individual interacts with the environment. For example, in order to develop good self-management behaviour, it is vital for people who have T2DM to understand how they interact with their surrounding environment.

Bandura (1977) argued that two expectations lead human beings to embrace new behaviours. These expectations are outcome and efficacy. In the case of T2DM, outcome expectancy is what people with T2DM expect by engaging certain practices. For example, a person with T2DM may expect to have optimal glycaemic control if they eat certain foods and not others. However, outcome expectancy may not be sufficient to activate self-management practices in such people. Based on Bandura's theory, the reason for this is their lack of efficacy expectancy (self-efficacy), which facilitates the adoption of self-management practices. This type of expectancy explains why some people with T2DM do not embrace good self-management practices despite their knowledge of its positive outcomes.

Self-efficacy is defined as "people's judgments of their capabilities to organise and execute courses of action required to attain designated types of performances" (Bandura, 1977, p. 391). But more simply, self-efficacy is the person's level of confidence that they can complete a given action or task. According

to Bandura (1986), an individual's ability to learn from his or her interactions and observations and modify his or her behaviour depends on several personal capabilities (self-efficacy). However, an individual's self-efficacy may vary according to the level of difficulty of the new behaviour (magnitude), what has been learned from previous experience (generality) and the level of expectation (strength).

Therefore, the outcome of an individual's interactions to improve self-efficacy depends on his or her capacity to create thoughts and symbolise the environment (symbolising capability); anticipate behaviour (forethought capability); learn from other people's experiences (vicarious capability); alter his or her own self-regulations and standards (self-regulatory capability); and self-reflect (self-reflective capability) (Bandura 1977). People with T2DM, as with all people, have differing levels of self-efficacy. Those individuals with the capacities identified by Bandura will be much more likely to self-manage their T2DM successfully, while those who lack them will struggle. The task for health-care providers is to help patients to build these capabilities so they are able to achieve optimal glycaemic control.

Bandura's theory is widely applied to chronic disease care, including diabetes self-management. Health-care providers and program designers need to consider the theory in order to establish or refine their healthcare interventions. More importantly, health-care providers who work in the field of diabetes should understand how to provide information in such a way that support patients to change their behaviour in a positive way that improves health outcomes. In addition, health-care providers should understand that "people's level of motivation, affective states, and actions are based more on what they believe than on what is objectively true" (Bandura 1997. p. 2).

Stanford Program

The Stanford self-management program is delivered over six weeks in duration and is structured to motivate and educate people with chronic diseases to engage in healthful lifestyle behaviours (Stanford Patient Education Research Centre, 2010). Participants attend two-and-a-half-hour workshops for six weeks. These workshops are delivered by trained health professionals and a patient as an expert. Topics cover: problem solving, physical activities, medication-taking, effective communication, nutrition and the evaluation of new medications. At the end of the program, each participant receives a book 'Living a Healthy Life with Chronic Conditions' and a tape, 'Time for Healing'. According to the Stanford Patient Education Research Centre (2010), the Stanford program was based on a five year randomised trial completed in 1996.

During the evaluation of the Stanford program, several assessments were made to measure its effectiveness (Lorig et al., 2001; Lorig et al., 1999). Indicators for improvement in patient self-management included health status, healthcare utilisation, self-efficacy, and self-management behaviours. In an early evaluation of 952 participants with chronic diseases, the first six months of the program indicated improvement in exercise duration, cognitive symptoms management, communication with the healthcare team, and health resources utilisation (Lorig et al., 1999). Evaluation was performed two years after the program was implemented. The study included 831 participants and compared their baseline data with their current situation after attending the program in terms of their health distress, emergency department visits and self-efficacy. Results showed a reduction in admissions to emergency/outpatients department and health distress ($p < .05$) and improvements in self-efficacy ($p < .05$) (Lorig et al., 2001). According to the Stanford Patient

Education Research Centre (2010), participants who participated in the intervention experienced a significant improvement in glycemic control, with an overall healthcare cost saving ratio of 1:4 and behavioural improvements that were sustained over three years.

The evidence supporting the Stanford program encouraged other international health-care systems, such as Australia, Canada, the UK and Japan to incorporate the program to facilitate self-management outcomes (Stanford University, 2010). For example, the Stanford Chronic Disease Self-management Program was implemented in a group of 200 people with a variety of chronic conditions. According to Murphy, Saunders, Campbell, Jackson and Berlowitz (2003), implementing the program for six month duration resulted in decreased participants' hospital re-admissions by almost one-third.

In the UK, the Stanford model was adapted through the expert patient program (Donaldson, 2003), which is delivered through weekly sessions over six weeks and involves the transfer of self-management knowledge and skills from an expert patient as well as peers. The application of the expert patient program was supported by evidence of improved patient self-efficacy (Kennedy et al., 2007) including patients from minority populations (Griffiths et al., 2005). However, the improvement in self-efficacy was not a mediator of cost reduction and hospital admission outcomes (Griffiths, Foster, Ramsay, Eldridge, & Taylor, 2007). This limitation on cost outcomes contrasts with the findings of a systemic review of randomised trials of psychological interventions in T2DM management undertaken by Ismail, Winkley and Rabe-Hesketh (2004) that included 12 studies, resulted in a lower mean HbA1c in people who received the intervention compared with those

who received ordinary care (pooled mean difference, ·32; 95% CI: ·57 to ·07%) equivalent to an absolute difference of ·76%.

However, the effectiveness of the Stanford model and its derivative programs has some limitations including the inability of some patients to learn in groups or to discuss their personal difficulties in an open environment (Victoria Department of Human Services, 2010). In addition, since the program contents are inter-dependent, missing one session may minimise the participants' understanding of the program.

Within the context of the UK, Greenhalgh (2009) argued that expert patients programs have been supported by several misconceptions concerning Lorig's Stanford model. The limitations identified were: studies supporting the model's positive outcomes are susceptible to publication bias, expert patients do not have a higher effect than normal health-care provider interventions, and the model training was not effective across social and ethnic groups since those who were recruited were carefully selected from stable and insured patients.

On the other hand, these limitations do not accord with some of the published evidence, such as the improvements found in UK Bangladeshi minority T2DM patients (Griffiths et al., 2005). Generally, international adaptation of the Stanford model has demonstrated that the model is suitable in various contexts. In the context of Saudi Arabia, Stanford program strategy of utilising expert patients may effectively increase Saudi women's social capacity and lead to the implementation of T2DM self-management educational programs (Shad, 2009).

The Flinders Program

According to the Flinders Human Behaviour and Health Research Unit (2010), the Flinders self-management program was first designed in South Australia (SA) as a self-management model. It has since been developed into a sophisticated program that utilises model-related studies to structure its content and assessment tools. In addition, the program construction is based on the results of the SA HealthPlus trials that enrolled 3,100 patients into its intervention arm.

Six principles guide the program to achieve self-management improvement. These principles assume that patients with chronic health conditions understand their medical condition; a medical care plan that both patient and provider are satisfied with; a mutual decision-making contribution; the ability to manage their health condition symptoms; the ability to manage the complications of their medical condition; and willingness to embrace a healthful lifestyle. To achieve these goals, the program utilises numerous assessment instruments such as: the Partners in Health Scale, the Cue and Responsive Interview, and the Problems and Goals Assessment (Flinders Human Behaviour & Health Research Unit, 2010).

The program and its assessment instruments have been utilised extensively in Australia with supporting evidence of positive outcomes (Lawn et al., 2007). The strength of the program lies in its systemic approach to overcoming the obstacles that hinder the ability of patients to continue recommended self-management practices. In addition, it provides sophisticated information about those who are involved with the program for several years. However, health providers are required to be certified in order to deliver the program. Recently, the Flinders Human Behaviour and Health Research Unit offered an online certification to enable more providers to utilise the

program. A main limitation of the program is that it is a time-consuming intervention. Clinics with long waiting lists may be unable to apply all the program interventions. From the patients' perspective, the program involves face-to-face interviews, which may be confrontational and thus may discourage some T2DM people from continuing the program (Victoria Department of Human Services, 2010).

To implement the Flinders program in the current study context, the program supervisor would face several challenges such as certifying the providers where the majority of them do not speak English, ensuring the patients' willingness to extend their primary health-care centre visits to participate in interviews, and accessing the MOH funds for program implementation.

Motivational Interviewing

Motivational interviewing was first described as an intervention by Miller in 1983 (Rubak, 2005). It is defined as a 'directive, client-centred counselling style for eliciting behaviour change by helping clients to explore and resolve ambivalence' (Rollnick & Miller, 1995, p. 305). By utilising motivational interviewing in health-care, health providers can help patients identify their own goals and understand how to reach them. Brainstorming is used rather than direct guidance and enables hesitant patients to act positively regarding their health condition (Rubak, 2005).

Motivational interviewing could be provided by any member of health-care team who received adequate training. Unlike the Stanford model, motivational interviews do not require patients to attend counselling sessions and, as such, it

provides a flexible approach involving a wider group of people who have chronic disease who are unable to attend regular classes (Rollnick & Miller, 1995).

The effectiveness of motivational interviewing in the management of chronic diseases was confirmed in several studies targeting various diseases such as asthma (Schmaling, Blume, & Afari, 2001), hypertension (Woollard, Beilin, Lord, Puddey, MacAdam, & Rouse, 1995), and diabetes (Channon, Smith, & Gregory, 2003; Clark & Hampson, 2001; Smith, Heckemeyer, Kratt, & Mason, 1997; West, DiLillo, Bursac, Gore, & Greene, 2007). In addition, positive motivational interviewing outcomes have been assessed through systemic reviews and meta-analysis (Knight, McGowan, Dickens, & Bundy, 2006; Rubak, 2005).

Studies involving people with diabetes indicate that motivational interviewing effectively changes patients' behaviours towards managing their health condition. According to Clark and Hampson (2001), motivational interviewing successfully in enhanced the adherence to weight reduction and glycaemic control in obese women with T2DM. Similarly, Channon et al. (2003) recruited 22 young people with diabetes to assess the effect of motivational interviewing interventions on their diabetes control. Results indicated a significant reduction of the HbA1c, fear of hypoglycaemia, and improvement in the ability to live with diabetes ($p < .05$). Taking the small sample of this study into account, the results may warrant further studies to determine motivational interviewing's effectiveness.

Factors Affecting Self-Management Outcomes

The active involvement of chronic disease patients in their health-care plan is crucial to the overall success of the plan. However, individual patient characteristics may hinder the person's ability of the person to participate actively in their care plan (Khunti, 1999). There is evidence that socio-demographic factors such as gender and age are important, as well as level of education and general psychological functioning. Further, self-management practices can be negatively affected by poverty or low income (Commission on the Social Determinants of Health, 2008; Ramachandran, Snehalatha, Vijay, & King, 2002; Wachtel, 2005). For example, low income people with T2DM are at significant risk of lower blood glucose than those who have high income (Levine, Allison, Cherrington, Richman, Scarinci, &Houston, 2009). People with T2DM are at risk because they can't afford blood glucose monitoring devices.

Biderman, Noff, Harris, Friedman and Levy (2009) investigated the effects of socio-demographic variables on people's satisfaction with their treatment and their adherence to treatment. Data were collected from 630 patients through individual interviews and the Diabetes Treatment Satisfaction Questionnaire (DTSQ) (Biderman, Noff, Harris, Friedman & Levy, 2009). Multivariate analysis showed women were less satisfied than men ($p = .036$). In addition, patients using insulin or who had diabetes complications had lower satisfaction and adherence levels ($p = .001$).

Alberti, Boudriga and Nabli (2007a; 2007b) conducted two studies in Tunisia and found chronic health-care practices such as timely blood glucose monitoring were significantly associated with age. These studies explored the factors that affect

the quality of diabetes health-care. In the first study, 580 participants with diabetes (T2DM??) were recruited from 12 primary health-care centres. Two years later, the study was replicated with a larger sample of 2,160 T2DM participants from 48 health-care centres (Alberti et al., 2007b). The study revealed that younger patient age was significantly associated with better self-management practices ($p = .05$). The result could be explained as younger age reflects more independent, better educated patients in Tunisia who are in a better position to attend primary health-care appointments and thus gain more from the health-care process.

Education level is important factor affecting the self-management practices of patients with chronic health problems. For example, The Institute of Medicine identified education-related factors that can affect patients' self-management and adherence to care plans (White et al., 2009). These factors are health literacy and numeracy. Health literacy was defined as the level of the individual's ability to understand information, and thus their competence to use the information provided to reach personal health related decisions (Nielsen-Bohlman, 2004). Numeracy is part of overall health literacy. Numeracy is the individual's ability to utilise numbers in everyday activities (Rothman et al., 2006). Numeracy is critical to the successful performance of self-management tasks such as taking insulin or calculating food intake (White et al., 2009).

Factors affecting diabetes patients' self-management practices are inter-related. For example, people with a low education level and low health literacy may not be able to overcome everyday challenges. This may produce continuous stress that leads to low self-efficacy and depression. Therefore, each factor exhibited by the patient will contribute in some degree in fostering another contributing factor.

In a randomised controlled trial, King et al. (2010) assessed inter-relations among diabetes self-management factors in the US. Data were collected from 463 T2DM participants with increased Body Mass Index (BMI) (above a certain level?). Socio-demographic, psychological and environmental variables were measured and compared with self-management practices and physiological outcomes. Results showed that self-efficacy, problem solving, environmental and social variables were independently correlated with diet and physical exercise. Diet helped explain the BMI variance (beta = –0.17, p = .0003). Medication practices were correlated with lipid ratio (beta = –0.20, p = .0001) and HbA1c (beta = –0.21, p < .0001). The researchers concluded that in order to enhance T2DM self-management practices, health-care providers should target their interventions to improve patients' self-efficacy, problem solving capacity and social-environmental status.

Nagelkerk, Reick and Meengs (2006) suggested effective strategies to improve patients' self-management practices and overcome depression include establishing and maintaining a proactive attitude in the patient. Good self-management practices do not exist in a vacuum but require the health-care team to provide encouragement and promote the patient's accountability. Other patient-related factors that may prevent optimal self-management practices include: frustration with uncontrolled blood glucose level; lack of knowledge about the diet plan; lack of understanding of the care plan; assuming accountability for self-management activities; attendance of self-management program; lack of acceptance of the disease; diabetes complications; financial issues; fatigue; and depression (Alberti, Boudriga, & Nabli, 2007a; Brown et al., 2002; Hill-Briggs & Gemmell, 2007; Jerant, Friederichs-Fitzwater, & Moore, 2005; Nagelkerk et al., 2006).

Khattab, Khader, Al-Khawaldeh and Ajlouni (2009) investigated factors responsible for poor glycaemic control among T2DM patients in Jordan. In this cross-sectional study, 917 participants were recruited randomly over six months and data were collected via a pre-structured questionnaire; clinical data were extracted from patients' medical records. According to the findings, 65% of the participants had HbA1c $\geq$ 7%. A multivariate analysis showed that increased duration of diabetes (OR = 1.99, $p \leq .0005$), failure to follow the recommended diet plan (OR = 2.98, $p \leq .0005$), negative attitude towards diabetes disease and increased barriers to the self-management were significantly associated with increased odds of poor glycaemic control.

People with diabetes have double the risk of diabetes complications including depression (Anderson et al., 2001). The presence of depression increases the chance of poor self-management practices, threefold (DiMatteo, Lepper, & Croghan, 2000) and negatively affects patients' energy, brain function and self-efficacy, which in turn leads to poor self-management practices (Katon et al., 2009). Over time, depression has a gradual negative effect on patients' self-management practices (Bell et al., 2010; Katon et al., 2009).

Similar effects might be produced by the patient's fear of the disease. Scollan-Koliopoulos, Walker and Bleich (2010) explored the influence of having a family member with an amputation on the patient's perception of the risk of having the same experience. Interestingly, the researchers found that participants who had a family member with an amputated leg due to T2DM complications (gangrene), perceived themselves to be at high risk of amputation but were nonetheless judged to be practicing poor foot care. In contrast, fear of amputation was positively associated

with higher foot-care among participants who do not have a family member with an amputation experience. The outcome of the Scollan-Koliopoulos et al., (2010) study indicated that when patients are threatened by severe diabetes complications, avoidance of such experience, including the required self-management practice, might be their first choice. The implications for diabetes management may encourage health-care providers to avoid threatening diabetes medical complications as a way to force patients to practice self-management activities. This approach may dangerously deactivate patients' self-regulatory capabilities and may be effective for others.

Importantly, health providers should acknowledge patients' perspectives and experiences (Carbone, Rosal, Torres, Goins, & Bermudez, 2007; Zoffmann & Kirkevold, 2005). Religious faith, family, and medical practitioners have commonly been identified as factors that either improve or prevent positive self-management activities. Anderson and Knickman (2001) stated that patient empowerment is the cornerstone for any initiative to improve patients' self-management. When patients are empowered, they take the lead in their own health-care plans. For example, Kravitz et al. (2003) observed 559 patients' requests for health-care services in an ambulatory health-care setting. Results showed that patients made 545 requests; new patients mostly requested diagnostic analysis ($p < .001$) while patients with health distress were concerned about medical services requests ($p < .05$). General practitioners mentioned that the visits that included a request were more demanding. The researchers concluded that client's requests for these services influenced medical practitioners' decisions regarding mode of treatment and diagnostic assessments to satisfy patients' requests.

However, Cooper, Booth, and Gill (2003) suggested that not every health professional has the resources to work in partnership with patients. Resources are not limited to physical ones but include health providers' capacity to work positively to enhance patients' willingness to practice recommended self-management activities. Similarly, understanding patients' expectations of their medical practitioners is critical (Burke, Earley, Dixon, Wilke, & Puczynski, 2006). Several barriers, including cultural issues, may be an obstacle to integration of patients with their health-care plans. For example, the Saudi culture is highly influenced by Islamic teachings, which enforce respect for older people, religious leaders, and highly educated people. The public mistakenly interpreted such teaching to mean they should not question anything that comes from those who are 'superior'. When such misconception is applied to health-care, it results in patients who are unwilling to discuss possible medications or care plan alternatives with medical professionals out of respect. Therefore, patients are unwilling to ask a lot of questions because of lack of knowledge of alternatives due to several factors such as cultural beliefs and literacy.

On the other hand, supporting patients through transferring information and skills to master problem-solving techniques is a cornerstone of overcoming self-management barriers. In a cross-sectional meta-analysis of 36 studies, Hill-Briggs and Gemmell (2007) found a positive correlation between T2DM patients' problem solving ability and glycemic control. According to Hill-Briggs and Gemmell (2007) 50% of reported problem-solving interventions did improved HbA1c level among adults with T2DM. The percentage among children with diabetes was 25%. Helping patients to utilise problem solving skills requires health-care providers to maintain a

collaborative relationship and promotes pro-activity and support in order to enhance the patient's confidence (Nagelkerk et al., 2006).

Furthermore, health-care providers play a vital role in facilitating good self-management outcomes (Brown et al., 2002; Khunti, 1999). For example, the ability of health-care providers to communicate effectively with patients is the means of transferring and sharing information. Jerant, Friederichs-Fitzwater and Moore (2005) emphasised the fact that miscommunication is a barrier to effective self-management. In their study, 54 patients with a chronic illness participated in focus groups to inform the establishment of a home care program. Among the barriers identified, miscommunication between health-care providers (especially doctors) and patients was a significant issue that prevent optimum self-management utilisation by the patients.

Rose, Harris, Ho and Jayasinghe (2009) explored the relationship between general practitioners' (GP) communication style and patients' self-efficacy in a cross-sectional Australian study. In total, 105 diabetes patients completed the study. The results showed that in the presence of patients with high self-efficacy, a high GP communication rating was significantly associated with controlled blood glucose. However, the association was not significant among those who had low self-efficacy. The researchers concluded that there is a complex relationship between GP communication level, self-efficacy, and patients' ability to self-manage their blood glucose. Interestingly, although physicians are aware of possible barriers, such as communication and trust, they tend not to admit to these barriers in their own practice. According to Sequist, Ayanian, Marshall, Fitzmaurice and Safran (2008), when an inefficient self-management practice occurs, physicians usually identify the

cause as a patient-related factor. Therefore, health-care providers, especially physicians, should be aware of their patient communication styles as a predisposing factor hindering optimal health-care services and self-management practices.

Similarly, Alberti, Boudriga, and Nabli, (2007b) investigated factors affecting quality of health-care services for 2,160 diabetes patients in Tunisia. Medical records data, physician and organisational characteristics from national reports, interviews and questionnaires were extracted and analysed. In addition to communication factors, numerous factors affected the quality of diabetes health-care. Among these, doctors' motivation to pursue optimal patient care was significantly associated with the quality of care ($p = 0.05$). According to Brown et al. (2002), physicians are motivated by the presence of information technology, continuing medical education, time availability, and remuneration. Incorporating issues that motivate health-care providers should be taken into account when planning quality programs for chronic disease management.

In conclusion for this section, it is evident that numerous factors affect diabetes self-management outcomes. These factors relate to the patients, their families, the community, the environment, and the health-care system including health-care providers. It is important to identify and understand these factors if the goal is to improve self-management outcomes. The current study explored a variety of these factors within Saudi Arabia where no similar study has been undertaken. It is anticipated that the study will inform health planners about challenges that need to be overcome in order to improve patients' self-management outcomes.

Measuring Diabetes Self-Management

The measurement of diabetes self-management activities is essential for monitoring individuals' progress in meeting management objectives and also for evaluating the effectiveness of health-care interventions. With these goals in mind, a number of self-management activity measures have been developed such as: the Diabetes Regimen Adherence Questionnaire (Brownlee-Duffeck et al., 1987); Self-Reported Measure of Compliance (Cerkoney & Hart, 1980) and the Summary of Diabetes Self-Care Activities (Toobert & Glasgow, 1994). However, a search of the literature failed to find an instrument that has been translated into Arabic and validated in an Arabic speaking country. A focus of the current study is the translation of the revised Summary of Diabetes Self-care Activities (SDSCA) (Toobert et al., 2000) into Arabic and its validation in the Saudi Arabian context. A valid and reliable instrument to measure diabetes self-management activities offers opportunities to engage in empirical research and to use the findings to promote diabetes self-management in Arabic speaking countries.

The original Summary of Diabetes Self-care Activities (SDSCA) instrument is widely utilised in diabetes studies. It is a brief self-report questionnaire that is used to measure T2DM patients' self-management activities in five domains (see Appendix A). The instrument was designed in the US by Toobert and Glasgow (1994) in 1994 and revised in 2000. The revision utilised the results of seven studies (five RCTs and two observational studies) involving 1,988 people with diabetes (Toobert et al., 2000).

For the revision, Toobert et al., (2000) divided the SDSCA into two parts where the first represents the summary and the second is an extension of the

instrument (see Appendix A). Unlike the summary, the extension has not been validated. However, the researchers have recommended utilising the extension to obtain wider data abstraction when time and resources are sufficient. The summary consists of 11 self-care items that are loaded on the following five scales: diet, exercise, blood glucose testing, foot-care and smoking. With the exception of smoking, each item instructs the respondent to record how many days they performed the specified self-care activity based on the past seven days. The minimum answer is zero days and the maximum is seven days. The smoking question asks if the participant smokes and instructs those who smoke to identify how many cigarettes they smoke per day. Although smoking is not part of direct T2DM self-management, it is included in the SDSCA because it is important to know the smoking status of the patients (Toobert et al. 2000). Detailed information about this instrument is presented in the methodology chapter.

The SDSCA questionnaire has been utilised by health-care researchers in numerous countries, including the US (Daly et al., 2009; Kim et al., 2009; Ruelas, Roybal, Lu, Goldman, & Peters, 2009); Canada (Rabiau, Knauper, Nguyen, Sufrategui, & Polychronakos, 2009); Australia (Rose et al., 2009); Denmark (Rubak, 2005); and South Korea (Lee et al., 2009). Moreover, the instrument has been successfully utilised to serve several research designs, such as cross-sectional (Jordan & Jordan, 2010; Lee et al., 2009; Xu, Pan, & Liu, 2010), randomised controlled trial (Rubak, 2005; Stuckey et al., 2009), clinical trial (Anderson et al., 2009), control-intervention cohort study (Tang et al., 2010), pre- and post-intervention (Comellas et al., 2010), and longitudinal (Fisher et al., 2009; Katon et al., 2009).

The SDSCA questionnaire was employed to measure self-management practices in the US where it has been utilised in the general population as well as minority groups including: African-Americans (Tang et al., 2010), Chinese Americans (Xu et al., 2010), Filipino-Americans (Jordan & Jordan, 2010), American Indians (Bell et al., 2010), and Korean American immigrants (Kim et al., 2009). The SDSCA has been translated into Spanish for the Hispanic population in the US (Vincent, McEwen, & Pasvogel, 2008) and also into Chinese languages (Xu, Savage, Toobert, Pan, & Whitmer, 2008).

A comparison of the SDSCA with other instruments in the field of diabetes self-management has revealed that the SDSCA promotes calculation of each category separately, while others, such as the Diabetes Regimen Adherence Questionnaire (Brownlee-Duffeck et al., 1987) and the Self-report Measure of Compliance (Cerkoney & Hart, 1980) use overall scores. In addition, the instrument provides direct, brief, reliable and valid measures (Toobert et al, 2000; Vincent et al., 2008; Xu et al., 2008). However, the revised version does not include a medication sub-scale. According to Toobert et al., (2000) the medication scale was excluded from the main set of items because of its ceiling effects and lack of variability among participants that resulted in unsatisfactory test-retest reliability for included items. Another limitation of the study instrument is derived from its self-reported data that is inherently susceptible to a positive response bias (Pearson et al., 2005).

In the current study, the instrument translated from English to Arabic language. These languages differ from each other syntactically, morphologically and semantically (Elkateb et al., 2006). According to Bahameed (2008) there are several factors that may affect the translation quality including conceptualisation of culture

and untranslatability, where no equal meaning to the original word is available in the translated language. These factors were taken into account in this study. Furthermore, detailed information about each step of the translation process needs to be provided as recommended by Birbili (2000). Further information is presented in Chapters 3 and 5.

Summary and Conclusion

The chapter reviewed relevant T2DM literature with the main focus on self-management interventions. The chapter consisted of four parts: diabetes at a glance, T2DM in Saudi Arabia, diabetes management and diabetes self-management. The section titled 'Diabetes at a glance' provided information about diabetes as a disease and its classifications and impacts. It is evident that the prevalence of T2DM is already very high in Saudi and that the prevalence is increasing due to diets high in sugar and saturated fat and subsequent overweight and obesity. The review of Saudi studies showed that numerous studies did not clarify recruitment techniques, inclusion and exclusion criteria. The review revealed a significant gap in knowledge and practices towards managing the disease, especially regarding self-management interventions. Based on the findings from Saudi Arabia, it is evident that exploring self-management practices and factors affecting them were not addressed. Therefore, it is a priority to explore these areas due to their correlation with optimum self-management outcomes.

International studies on diabetes management were reviewed to explore current data in order to facilitate the understanding of the burden of the potential knowledge and practice gap in Saudi Arabia. Published studies investigating diabetes management from the two angles of health systems and self-management were

therefore reviewed. From a health system perspective, there were indications that the CCM is an effective and highly recognised disease management framework. Similarly, from a self-management perspective, several approaches have been utilised to improve self-management outcomes. These interventions are not yet utilised in Saudi Arabia. Although there were several self-management measurement instruments in the field, for the purposes of this thesis, the SDSCA measure has been adopted for the exploration of the self-management practices of T2DM patients in Saudi Arabia. This step is important in order to draw the first self-management measurement line within the Saudi context.

In conclusion, there is a significant need to explore T2DM self-management in Saudi Arabia. Specifically, there is a need to explore factors affecting self-management practices among people who have T2DM. In regard to internationally reviewed studies, the CCM was employed to support the current study application. In addition, the SDSCA questionnaire was utilised to explore self-management practices and the American Diabetes Association recommendations (2008) were the standards of the explored interventions and practices.

CHAPTER 3 : METHODOLOGY

Introduction

In the previous chapter, numerous studies conducted in The Kingdom of Saudi Arabia and elsewhere were reviewed. The review was used to develop the methodology of the current study. Chapter 3 begins by outlining the overall study design and research setting. The chapter is then divided into three sections that correspond with the three phases of the study: Phase I) translation and validation of the SDSCA instrument; Phase II) measuring self-management activities using the Arabic version of the SDSCA; and Phase III) identifying factors affecting T2DM patients' self-management activities. Each section describes the sample, instruments used and the specific data analysis undertaken in some detail. The chapter concludes with a summary of the ethical considerations relevant to the study and an outline of how they were managed.

Overall study design

The study used an exploratory quantitative approach and the study was conducted in three sequential phases. A general overview of the three phases of data collection and analysis is presented in Table 3.1. The table shows that Phase I involved assembling both a small sample of 33 people and a large sample of 210 people with T2DM for the purpose of validating an Arabic version of the Summary of Diabetes Self-Care Activities (SDSCA) questionnaire. In Phase II the Arabic version of the SDSCA was administered to a purposeful sample of 210 patients who had been previously diagnosed with T2DM. Purposeful sampling was employed to serve the exploratory nature of the study (Schneider, Elliott, LoBiondo-Wood, & Haber, 2003). Phase III consisted of a thematic quantitative analysis of the

questionnaire data involving 18 patients with T2DM and 12 health professionals involved in T2DM management.

Table 3.1
General overview of the study design

	Goal	Sample size	Sampling & Location	Analysis methods
Phase I	Translation and validation of the Arabic version of the SDSCA	33 people with T2DM and 210 T2DM participants	- Purposeful - Primary health centre	-Test-retest reliability (Cronbach's alpha)-factor analysis
Phase II	Measuring self-management activities of T2DM participants	210 T2DM participants	- Purposeful - 3 central primary health centres in Almadinah, Saudi Arabia	- Descriptive analysis. - Categorization of self-care activities. - Standard regression analysis.
Phase III	Exploring factors that affect patients' self-management	18 T2DM participants + 12 diabetes care health professionals	- Purposeful - 3 central primary health centres in Almadinah, Saudi Arabia	Thematic quantitative content analysis

Setting

The study was conducted in three of the four main primary health-care centres (average population covered by each centre = 18,000) covering the Saudi Arabian Almadinah region catchment (total population = 1,100,093) (Ministry of Economy and Planning [Saudi Arabia], 2010). The centres provide the highest level of primary health-care services in the Almadinah region. They are the only primary health-care organisations that provide continuous diabetes medical services for T2DM patients. They deliver self-management interventions and act as gatekeepers for the delivery of acute care services. Furthermore, the diabetes services provided

by these primary health-care centres are representative of Saudi's diabetes chronic disease management programs (Al-Ahmadi & Roland, 2005). For several years, these four main health-care centres have worked to support smaller centres in their districts (average n = 8) by providing more advanced health services, such as specialist care and medical diagnostic facilities. In addition, medical and nursing supervisors situated in the main health centres have supervised their medical and nursing colleagues working in the smaller centres.

Phase I – Translation and validation of the instrument

The translation of the SDSCA was guided by the World Health Organization's (WHO, 2008) Steps of Translation and Adaptation of Instruments (see

Figure *3.1* and Appendix D). Translation and validation of the instrument was attained through specific stages of professional translation, expert panel review, and psychometric evaluation. While very similar to the steps suggested by WHO, the present translation differed in that the stage of "cognitive interviewing", which involved an expert panel establishing the content validity of the instrument, was undertaken prior to, rather than as a part of, pre-testing.

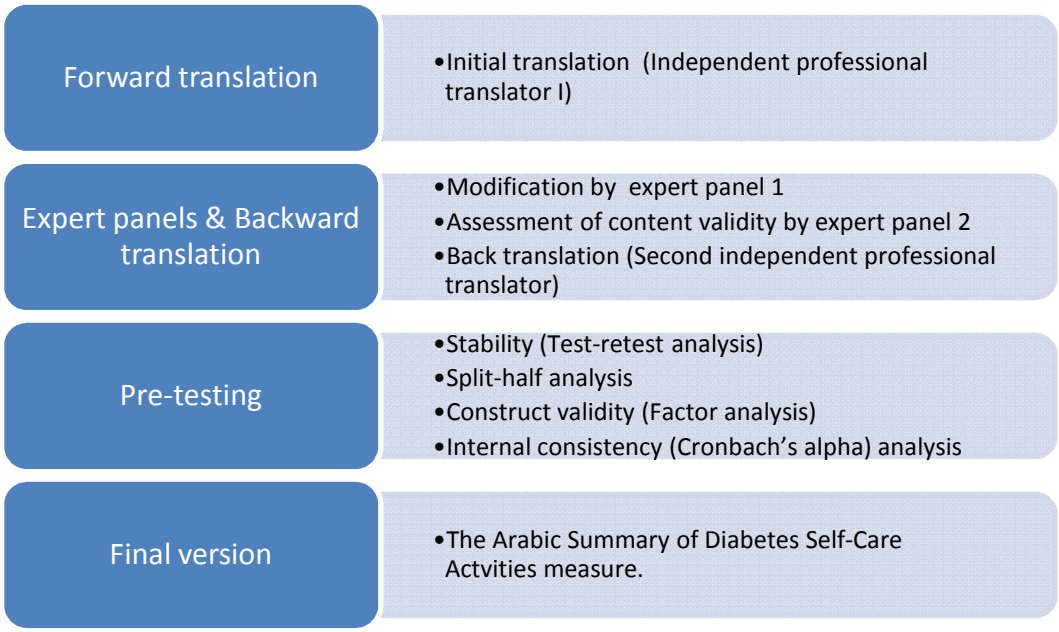

Figure 3.1 Flow chart depicting the process used for translation and validation of the instrument

A detailed description of the translation and validation procedures is presented in the following sections in the order of: the original SDSCA instrument;

forward translation; expert panel review and back translation; pretesting; and final revision.

The Summary of Diabetes Self-care Activities (SDSCA) Questionnaire

The original Summary of Diabetes Self-care Activities (SDSCA) instrument (Toobert et al., 2000) is widely utilized in diabetes-related studies (Bell et al., 2010) and has been translated into Chinese (Xu at al., 2008) and Spanish (Vincent et al., 2008). Toobert et al. (2000) developed the SDSCA questionnaire in two parts. The first part contains essential questions and the second part contains additional questions designed to provide more detailed knowledge of the patient's self-care recommendations. The first part consists of 10 questions about self-care activities, which are loaded on four sub-scales: diet, exercise, blood glucose testing, and foot-care. In addition to these sub-scales, the first part includes a smoking sub-scale (one question).

With the exception of the smoking sub-scale, which was included in the translation but not the validation process of this study, each sub-scale asks the respondents to record how many days they performed the specified self-care activity, based on a seven-day interval. The minimum number of days is "0" while the maximum is "7". The smoking sub-scale requires the respondents to indicate whether they smoked, and if so, how many cigarettes per day. The first part of the SDSCA has been the subject of extensive reliability and validity testing (Toobert et al., 2000). The second part contains several sub-scales that explore health-care provider interventions with regard to diet, exercise, blood glucose testing, and medication. This part of the instrument has not been formally validated.

The aim of Phase I of the study was to translate both parts of the instrument and validate the Arabic version using a similar process to that Toobert et al. (2000)used to validate the original instrument and Xu et al. (2010) to validate the Chinese version and Vincent et al. (2008) used with the Spanish version.

Forward translation

In the first stage, the English version of the SDSCA was translated from English to Arabic. Forward translation of the full SDSCA instrument (24 items) was delegated to a professional independent translator who performed the translation for a fee. Since the translator was not located in the same city as the researcher, a third party, who is a health professional colleague, volunteered to liaise between the translator and the researcher. The translation processed over one week and the result of the forward translation "Arabic-SDSCA_1" is attached in Appendix E.

Expert panels and back-ward translation

Modification by expert panel 1. Following a careful study of the Arabic translation, the researcher questioned the accuracy of the vocabulary, especially the health-related vocabulary, which might be interpreted differently by respondents due to the various dialects that are common in all Arabic speaking countries. The issue was discussed with health professionals at the regional diabetes centre. As a result, the researcher arranged for the translated version to be reviewed by a panel of diabetes specialists at the regional centre. The initial panel consisted of a diabetes medical specialist and two diabetes nurses, one male and one female, and the researcher.

In the second stage, the expert panel met on two separate occasions. Before the review began, a protocol was developed to systematically identify the appropriateness of the translated words and sentences. The group agreed that there were three important questions to be addressed: 1) Is the translated word in Arabic the exact equivalent of the word in English; 2) If the Arabic word is not the exact equivalent, is there a better alternative Arabic word to use; and 3) Is it likely that the alternative word will be easily understood by the general Arabic speaking population completing the questionnaire?

If an English word could have had multiple meanings for a research participant, the most appropriate Arabic word was used in its place. For example, Item 9 of the SDSCA within the foot care sub-scale contains the question "on how many of the last seven days did you inspect the inside of your shoes?". The Arabic translation of the English word "shoe" was "jazmah", which is not commonly used in Saudi Arabia. Therefore, the panel replaced the word "jazmah" with the word "he'th'a" that might be interpreted as "sandal", "sports shoe", "boot", or similar footwear. In total, five words were used in the initial translation were replaced with words the panel believed to be more appropriate. The second version the Arabic SDSCA questionnaire containing 24 items is presented in Appendix F (Arabic-SDSCA_2). Upon completion of this stage, the translated instrument was ready for content validity assessment by an extended panel of experts.

Assessment of content validity by expert panel 2. In the third round of revision and modification, the researcher utilised the snow-balling technique to recruit another, larger panel of experts to undertake a content validity analysis of the questionnaire. The researcher contacted a small group of people with experience in

diabetes management who were known to him and these people identified colleagues who were then invited to participate in the content validity assessment. Following Polit and Beck's (2006) and Lynn's (1986) recommendations, eight people were recruited who were deemed to be expert in the diabetes health-care field.

The majority of these experts were nurses, but the sample also included a medical doctor, a first aid trainer, and a hospital administration specialist (see Table 3.2). Four members of the panel were working at the King Abdul-Aziz University Hospital in Jeddah, and four were working at the King Fahad Hospital in Almadinah. As shown in Table 3.2, males and females were equally represented. The age of panel member ranged from 25 to 62, with a mean age of 39 years. Six participants worked in the diabetes management field and had a mean experience of 5.6 years. Aside from being experts in the field, three members of the panel had T2DM. In addition, there were variations among panel members in terms of professional background, general health-care experience, and specialised diabetes experience. These variations in the characteristics of panel members were important because they enriched the process of establishing the content validity of the instrument.

Table 3.2

Experts panels' characteristics

ID	Gender	Age	Profession	Work in health-care	Specialised (diabetes) experience (years)	Duration since T2DM incidence (years)
1	M	43	Medical practitioner	Yes	6	0
2	F	25	DM educators (nurse)	Yes	3	0
3	F	30	DM educators (nurse)	Yes	4	0
4	F	26	DM educators (nurse)	Yes	5	0
5	M	35	Nurse	Yes	10	0
6	F	40	Nurse	Yes	6	2
7	M	62	Hospital admin. specialist	No	No	25
8	M	47	First aid trainer	No	No	11

The purpose of the content validity analysis was to determine whether the language, content, and structure of the Arabic version of the instrument was appropriate for measuring diabetes self-care activities in an Arabic-speaking population. The approach to establishing the Content Validity Index (CVI) was identified in Polit and Beck (2006). The CVI consists of two domains. The representativeness domain (R-CVI) identifies how the item is representative of a scale within an instrument, and the clarity domain (C-CVI) identifies how clear the item is to the reader.

Both the R-CVI and the C-CVI are applied to each item and then to the scale as a whole in the form of the Item CVI (I-CVI) and the Scale CVI (S-CVI). The I-CVI is the proportion of experts who rate an item as relevant, while the S-CVI is the proportion of items rated as relevant by all raters (Polit & Beck, 2006). An I-CVI agreement proportion of .78 or above indicates acceptable content validity (Denise,

Cheryl, Tatano, & Steven, 2007). The overall S-CVI score is calculated by taking the average of the items scores (Lynn, 1986).

Following a review of the Arabic SDSCA measure, participants were instructed to record their responses in the content validity questionnaire (see Appendix G) (Polit & Beck, 2006; Schilling et al., 2007; Wynd, Schmidt, & Schaefer, 2003). The protocol involved the following steps: panel members were asked to rank each item for its clarity and representativeness on a four point ordinal scale: (1) item is not representative / clear; (2) item needs major revision to be representative / clear; (3) item needs minor revision to be representative / clear; and (4) item is representative / clear. Additional space on the form was available for comments and suggestions. An example of one item of the content validity measurement form is presented in **Error! Not a valid bookmark self-reference.**.

After ranking by panel members, the researcher derived summary dichotomous variables by collapsing categories one and two (1) and categories three and four (2). A score of one indicated an unsatisfactory outcome while a score of two indicated a satisfactory one. Those items that required minor revision were amended according to the suggestions made by panel members in discussion with the researcher.

Table 3.3
Content validity questionnaire exemplar

Item	Representativeness score	Comments	Clarity score	Comments
How many of the last seven days did you eat high fat foods such as red meat or full-fat dairy products?	1 2 3 4		1 2 3 4	

Content validity index report. Eight experts were involved in assessing the content validity index of the translated SDSCA questionnaire. The representativeness analysis identified two items with 87.5% representativeness: Item 10 - Inspect the inside of your shoes; and Item 16 - Space carbohydrates evenly through the day. All remaining 22 items demonstrated 100% representativeness. Consequently, all items were retained in the translated questionnaire.

The results of clarity analysis revealed that a total of 10 items did not reach the perfect clarity score of 100%, the remaining 14 items did. Among those items that did not reach a perfect score, three of them were in the first part of the SDSCA questionnaire (Items 1-11) and the remainder were in the second part. Specifically, nine items scored 87.5% (Items 3, 8, 10, 13, 17, 18, 19, 20, 22), while one item (Item 12) achieved a score of 75%. Items that reached the score of 87.5% were incorporated directly into the questionnaire.

Item 12 was modified in accordance with the respondents' recommendations. Item 12 asked respondents to tick what their health-care provider advised them to do with regard to diet issues such as lowering their dessert intake. Each sub-item was modified to fit within the cultural context of the study location. For example, in Item 12 the term 'share' was replaced with the term 'piece', that is, rather than asking how many shares of vegetable and fruit ate per day, the question became how many pieces of vegetable and fruit ate per day. The change satisfied the majority of respondents who did not understand the use of the term 'share' in this context.

In summary, the content validity analysis revealed a representativeness score (R-CVI) of 95.3 (95.3%) and clarity score (C-CVI) of 94.8 (94.8%). These scores

indicate good agreement among panel members. The calculation process was performed through summing I-CVI results as percentages and dividing the result by the total number of items (24 items). The final result of the content validity analysis revealed satisfactory representativeness and clarity outcomes. The panel members' comments were very helpful in providing a wider perspective about the translation process. The modification process made a significant contribution to the quality of the final instrument because words in the formal Arabic language that were difficult for many people to understand were replaced by colloquial words in everyday use in the Arabic speaking population. The end result of the validation process was the third version of the Arabic Summary of Diabetes Self-Care Activities questionnaire (Arabic-SDSCA_3) (Appendix H).

Back translation

Following the translation recommendations of WHO, the third version of the A-SDSCA_3 was back-translated into English by a second independent professional translator. The back-translated version was remarkably similar to the original instrument with the exception that the phrase "seven days" in the final Arabic version was converted to "one week" in the back translated version. Because the original English version of the instrument used the phrase 'seven days', the original phrase was retained in the final version of the A-SDSCA. The back-translated version of the A-SDSCA is presented in Appendix I.

While the outcome of the previous systematic steps resulted in the development of the Arabic Summary of Diabetes Self-Care Activities (A-SDSCA) measure, the psychometric properties of the translated instrument had yet to be

examined thoroughly. A description of the validation process is provided in the following pre-testing section.

Pre-testing (reliability and validity)

Assessing the reliability, construct validity, and internal consistency of the instrument is a vital part of its overall evaluation (Elliott, 2004). The aim of this stage was to explore the A- SDSCA instrument's ability to consistently elicit answers from respondents and accurately measure T2DM self-management activities among them. For ease of understanding, this stage of the translation and evaluation process is divided into the following steps: a description of the first and second samples used for this purpose; the procedure used to undertake split-half and test-retest analysis (reliability/stability), factor analysis (construct validity); and Cronbach's alpha (internal consistency).

Study populations and sampling procedures

The first sample was purposively recruited from a primary health-care centre providing primary health-care services, including the management of chronic diseases such as diabetes in the city of Almadinah that serves a population of 5,000 people. Participants were recruited through posters that were located in visible areas at the study location including the health-care centre halls and waiting rooms. In addition, the researcher, research assistant, and the chronic diseases clinic nurse asked attending T2DM patients whether they would be willing to participate. The

second strategy, the personal invitation, proved to be more successful. Recruitment took one week.

Approximately 100 people were approached and 33 agreed to participate in the study. The most commonly given reasons for not taking part in the study were: too busy, required to pick up children, not in the mood, and uncomfortable talking about health-care services. There was no indication that people declined to participate because they were unable to read the questionnaire. It was made clear to people that the researcher would read the questions and record their response. The mean age of the 33 participants was 48 years (Range: 35-70 years). Seventeen of the participants were male (52%) and the mean duration of time since diagnosis of T2DM was 11 years (Range: 2-21 years). Twenty-five participants completed the questionnaire twice, with a one week interval, to determine test-retest reliability. The mean age for the sample was 47 years (Range: 35-70 years), 52% (n=13) were males, and the mean time since T2DM diagnosis was 11 years. No other socio-demographic data were collected because the aim of this phase was to test the instrument not to investigate these independent variables.

After data collection began, the researcher realised it would be beneficial to establish the construct validity of the A-SDSCA instrument to further understand the factors associated with differences in diabetes management in the Saudi population. Due to the fact that the first sample was not sufficiently large to undertake factor analysis, the researcher recruited a second, larger sample for this purpose. According to Bryant and Yarnold (1995), the subjects-to-variables ratio (STV) should be no lower than five, while Hatcher (1994) suggested that 100 is the minimum number of participants required for factor analysis. However, the suggested minimum number

varies, for example to 150-300 by Graeme and Sofroniou (1999); to 200 by Gorsuch (1983); and 300 by Norušis (2005). Since there is no universal agreement on the number of participants required to run factor analysis (Garson, 2009), based on the review of the literature and the number of items in the A-SDSCA instrument an a priori decision was made that a sample of 200 people or more would satisfy the statistical requirements of the procedure.

A second purposeful sample of T2DM patients was recruited from three more primary health-care centres in Almadinah. Along with the health-care centre that was used to obtain the first sample, these centres comprise the main primary health-care facilities for the city. The second sample and its' study locations' characteristics are explained in Phase II section of this chapter. The researcher recruited 70 participants from each centre, giving a total of 210 the sample size requirements. The recruitment process of posters and personal invitations was used to recruit the second sample. The same personnel undertook the recruitment. Approximately 600 people were approached the 210 (33%) agreed to participate in the study. The reasons given for non-response were similar to those given in the first sample. Males and females were represented equally.

Procedure. Participants recruited into the first sample were asked to complete the questionnaire following their verbal informed consent (see Ethics section for further details). Most participants completed the questionnaire in the waiting room of the facility while waiting to be seen by the physician. The researcher or the research assistants remained with the participant to answer any questions. If

the participant was not able to read the questionnaire, the researcher or research assistant read the questionnaire items one by one and recorded the participants' responses. The researcher and the research assistant recorded the participants' contact phone number during this first data collection. To minimise bias in the collection of data, the researcher and research assistant met during the early phases of the study to discuss collection protocol.

In order to be able to calculate test-retest reliability, participants were contacted by phone one week later when the questionnaire was administered a second time as an interview. The one week separation between test and retest was identified by Vincent, McEwen, and Pasvogel (2008) who did the Spanish translation of the original SDSCA. Participants who did not answer their phone three times or did not show an interest in undertaking the second round of the test were excluded from the retesting analysis. In total, 25 participants completed the questionnaire twice. Diamond and Jefferies (2001) suggested a sample size of at least 30 for test-retest reliability. However, several studies have reported using lower numbers successfully (Trochim & Donnelly, 2007; Vincent et al., 2008).

Participants recruited for the second sample were informed through study recruitment posters that their participation in the study was voluntary. Potential participants were provided with an information sheet informing them that they were free to withdraw at any time during the study process. Similar to the first sample, verbal agreement to complete the questionnaire was taken as consent to participate. Participants completed the study questionnaire during their health centre visit. Participants were informed that they may record their responses directly into the questionnaire or they may delegate one of the research team to do the task. Although

some participants did recorded their responses personally, the majority asked the researcher, the research assistant, or the chronic disease nurse to record their responses. No further contact was made with these participants.

Statistical analysis

Statistical analysis was undertaken by the researcher with assistance from the faculty statistician. All statistical calculations were undertaken using SPSS (v.17) software.

Split-half analysis (reliability). The split-half test was undertaken to assess the consistency of the participants' responses (Trochim & Donnelly, 2007). In split-half reliability testing all items that purport to measure the same construct are randomly divided into two sets. The total score for each randomly divided half is calculated. The split-half reliability estimate is simply the correlation between these two total scores (Trochim & Donnelly, 2007). Split-half analysis was attained utilising the first sample of 33 participants. Participants' responses were either directly recorded by the participants, the researcher, or the research assistant.

Test-retest (reliability/stability). The A-SDSCA questionnaire was administered to the first sample of participants on two separate occasions one week apart so that test-retest could be calculated. This statistical procedure assesses the level of agreement between the same participants' answers on two different

occasions (Aday & Cornelius, 2006). The Pearson product moment correlation coefficient (r) indicates the strength of the association between participants' responses to the questionnaire on the first and second times of completion (Munro, 2005).

Factor analysis report. Factor analysis was implemented to identify the agreement between the theoretical concept of self-management and the A-SDSCA measure. Furthermore, this analysis is proposed to verify clustered items under each sub-scale of an instrument (Stratton et al., 2000). Completing factor analyses in this stage required assessing the suitability of the data by inspecting the correlation matrix using the Kaiser-Meyer-Oklin test, and Bartlett's test of Sphericity (Bartlett, 1954). Identifying retained factors from the Principal components analysis was mainly based on the indication of the parallel analysis as recommended by Field (2009).

Cronbach's alpha (internal consistency). The aim of using Cronbach's alpha was to evaluate the instrument's internal consistency. Cronbach's alpha was employed to assess the instrument and its sub-scales internal consistency. The minimum acceptable alpha score for the internal consistency is .70 (DeVon et al., 2007).

Summary

The SDSCA was translated into Arabic and validated according to the WHO (2008) guideline represented in the steps of translation and adaptation of instruments. Translation indicators showed satisfactory outcomes for each included process in the forward translation, expert panels and back translation stages. Forward translation was undertaken by a private independent professional translator. Two panels of experts were involved in the modification processes where the first consisted of three health professionals while the second extended expert penal consisted of eight experts. The first panel modified the translated version of the instrument while the extended panel undertook the content validity analysis and ranked the instrument's clarity and representativeness, and comments about the instrument modification. The instrument representativeness score (R-CVI) was 95.3 (95.3%) while the clarity score was (C-CVI) of 94.8 (94.8%) indicating acceptable levels. Furthermore, the instrument showed acceptable psychometric properties throughout a consecutive reliability and validity evaluation including: split-half, test-retest, factor analysis, and Cronbach's alpha. Therefore, the current Arabic Summary of Diabetes Self-Care Activities (A-SDCA) instrument can measure self-management practices among Arab speaking populations in the context of current study (see Appendix J).

Phase II – Measuring self-management activities using the A-SDSCA

Overview

Following the successful translation and validation of the A-SDSCA in Phase I of the study, Phase II utilised the A-SDSCA to identify socio-demographic characteristics and factors affecting self-management activities among people who have T2DM in Almadinah, Saudi Arabia. The sample recruited for Phase II consisted of the 210 T2DM patients whose data were used for factor analysis, as previously described. Factors affecting T2DM self-management practices were identified by measuring association correlations between selected variables and associated levels of self-management activities. Descriptive, univariate and multivariate statistical analyses were undertaken.

Instruments

The study questionnaire consisted of three main sections: socio-demographics, the A-SDSCA, and the extended A-SDSCA. In addition, a recent fasting blood glucose or glycosylated haemoglobin (HbA1c) level result was obtained. Each section of the questionnaire represented several variables or sub-scales.

Socio-demographic variables. The socio-demographic questions were designed to be easily understood and answered by the Arabic speaking respondents. Cultural differences in the interpretation of some variables, such as income, required the researcher to derive variables for the purpose of analysis. The socio-demographic questions that were used in the questionnaire are presented in Table 3.4.

Table 3.4
Socio-demographic questions

Age (years)	□ 26-45	□ 46-65	□ 66 ≥		
Gender	□ Male	□ Female			
Income/Year/Saudi Riyals	□ 1-25,000	□ 25,001-50,000	□ 50,001-75,000	□ 75,001-100,000	□ > 100,000
Education background	□ None	□ Primary school	□ Secondary (Middle) school	□ High school	□ University or upper level
For how long have you been diagnosed with T2DM (years)	□ < 2	□ 2-4	□ 5-7	□ 8-10	□ > 10
Other health problems	□ Heart	□ Hypertension	□ Kidney	□ Eye	

Age. Although T2DM can affect young people, this study defined the age of 26 as the lower threshold for including participants in accordance with the Saudi study by Al-Nozha et al. (2004) that identified T2DM prevalence among various age groups. The findings showed that only 12.1% of identified diabetes patients in Saudi Arabia were aged between 30-39 years. The percentage increased with the participants' age (23% at 40-49-years, 33.8% at 50-59-years and 36.5% at 60-70-years. $p < .00001$). Therefore, the current study sought to widen the inclusion of T2DM patients by lowering the age inclusion threshold to 26 years. This study age categories were: 26-45; 46-65; and 66 and above. Employing socio-demographic

variables including the age categories in the regression analysis revealed distributed effects (significant but weak effects) among the independent variables. Therefore, the age variable was re-categorised into < 65 and ≥ 65, the latter was considered to be the threshold for potential impaired body functions, which could affect self-care practices.

Gender. Previous studies indicated that gender has an effect on self-management practices among T2DM patients (Biderman et al., 2009). More importantly, within the Saudi cultural context, females generally have fewer facilities in which to practice physical exercise. According to Al-Nozha et al. (2007), physical inactivity is very high among Saudis aged between 30-70 years (96.1%) and females are more inactive (98.1%) than males (93.9%) ($p < .001$). Furthermore, female gender could affect self-management practices and access to health-care. The researcher included gender to examine its effects on self-management practices among the participants.

Income. The third socio-demographic variable was the participant's income. Income is an important factor that can affect self-management practices among people with T2DM (Resnick, Foster, Bardsley, & Ratner, 2006). Although Saudi people who have diabetes receive free health-care, low income status may prevent people from purchasing services or medical devices that are not provided by the Ministry of Health such as blood glucose meter (Glucometer) and blood-strips. Therefore, the low purchasing power of low income diabetic patients may affect self-management outcomes. The purchasing power of Saudi Riyals has declined during the last ten years and the consumer price index has increased by 37% from 2000-

2008 (United Nations Statistics Division, 2011), however, people's incomes have not necessarily risen accordingly.

According to Albaz (2005), Saudi citizens who have a low income are classified into three categories based on their marital status and family size (poverty groups): 1) singles who have a yearly income up to 19,920 Saudi Riyal (SR) (US$5312); 2) couples who have income up to 30,000 SR (US$8000); and 3) families who have two children with yearly income up to 36,984 (US$9862). Albaz based his classifications on people who do not pay rent for their homes (60% of the sample). For the remaining 40%, the amount of money directed towards rent would negatively affect their estimated yearly income.

Albaz (2005) study, income was initially classified into five groups: 01-25,000; 25,001-50,000; 50,001-75,000; 75,001-100,000; and more than 100,000 SR. However, in order to discriminate between groups that had low numbers, the income was presented as a binary variable with categories of less than or equal to 50,000 and greater than 50,000 SR. The low income group in the current study include those with yearly income up to 50,000 SR taking into account the assumption that they are renting their homes.

Education. The US Institute of Medicine (date) suggested that health literacy and numeracy affects patients' adherence to care plans and levels of self-management (White et al., 2009). Health literacy is defined as the level of the individual's ability to understand information, their competence to use the information provided, together with health services, to reach personal health-related decisions (Nielsen-Bohlman, 2004). As part of overall health literacy, numeracy

refers to the individual's ability to utilise numbers in everyday activities (Rothman et al., 2006).

Level of education is negatively correlated with many health outcomes and it is also a proxy measure of health literacy and numeracy (Rothman et al., 2006). According to the Ministry of Economy and Planning (2010), 7.45% of all Saudi citizens are illiterate. Females represent the majority of illiterate people (73%). The education variable used in the socio-demographic section of the current study's instrument was classified into five categories that represent the hierarchical education levels in Saudi Arabia: none (no formal education), primary school (six years duration), secondary school (three years), high school (three years), and university (minimum of 4 years) and above. Due to insufficient numbers in some cells, these five categories were collapsed into two variables, no formal education and educated for statistical purposes.

Incidence of diabetes. The length of time since first diagnosis was divided into five categories (< 2, 2-4, 5-7, 8-10, and more than 10 years). Previous studies indicated that there is a positive relationship between the duration of T2DM and the presence of diabetes related complications (Khattab et al., 2009; Stratton et al., 2000). The current study included diabetes duration to determine whether duration was associated with T2DM participants' self-management practices. Due to insufficient numbers in some cells, for statistical purposes the duration of diabetes incidence was later collapsed and presented as < *8 years* and => *8 years*, again.

Other health problems. Diabetes leads to micro and macro-vascular complications including retinopathy, neuropathy, nephropathy, peripheral arterial

disease, stroke, congestive heart failure, and angina (I.D.F, 2010). Participants were asked to indicate whether they had other medical conditions, such as, eye disease, kidney disease, heart disease, or hypertension.

Blood glucose level. The HbA1c level, taken from the participant's medical record, was used to document glycemic control. The time frame for this test was three months prior to baseline as recommended by the Saudi National Guidelines and the American Diabetes Association. However, due to data unavailability in the study locations, fasting blood glucose (FBG) was recorded as an alternative. These two tests were categorized as 'controlled blood glucose' and 'uncontrolled blood glucose'. On the basis of a recent recording, participants were identified as having a controlled blood glucose level if they had HbA1c ≤ 7% or FBG ≤ 130mg/dl (ADA, 2008). Any value above these thresholds was considered to be an uncontrolled blood glucose level status. The degree of blood glucose control was presented as a binary outcome variable as either controlled or uncontrolled.

Phase II participants' demographic and diabetes related characteristics

The Phase II participants' demographic and diabetes related characteristics used for statistical analysis are summarized in Table 3.5**.** As the Table 4.4shows, there was an equal number of males and females. The majority of participants in this sample (82%) were aged between 26 and 65 years of age. Almost 55% had a yearly income of less than 50,000 Saudi Riyals (< US$13,000). Approximately 33% of participants had no formal education.

Sixty-six per cent of the recruited sample had been diagnosed with T2DM for more than eight years. Blood glucose testing records indicated that only 15% of the participants had blood glucose level in range recommended by the 2008 American

Diabetes Association. Medical complications had already affected some participants in the form of heart disease (4%), hypertension (30%), kidney disease (2.4%), and eye disease (17%).

Table 3.5
Participants' characteristics

Variable	Number	%
Age/Years*		
26-65	172	82
65 >	37	18
Sex		
Male	105	50
Female	105	50
Income/year		
< 50,000	116	55
≥ 50,000	94	45
Education level*		
No formal education	70	33
Formal educated	139	67
T2DM duration/Year		
< 8	71	34
≥ 8	138	66
Blood Glucose*		
Controlled	30	15
Uncontrolled	174	85
Other health problems		
Have Heart Disease	8	4
Have hypertension	62	30
Have kidney disease	5	2.4
Have eye disease	35	17

* Incomplete data

Characteristics of the Study locations (Phase III)

A necessary first step was determining that the staff and facilities at the study location centres were similar. If they were dissimilar, the differences could be account for possible differences in individual self-management approaches. The characteristics of the health-care centre to recruit the first sample of 33 participants whose data were used to undertake split half and test-retest was not presented. These data were not used in Phases II and III. As described in Chapter 2, these centres only offer basic primary health-care services. The centre staff members were general practitioners (GPs), nurses, pharmacists, and senior and junior administrative personnel. Patients who needed to consult dieticians, podiatrists, ophthalmologists, diabetes nurse specialists, and medical specialists were required to travel to the regional diabetes centres located in hospitals.

Health-care team

As shown in Table 3.6, the characteristics of health-care workers at the three study locations varied. The number of employees ranged from 26 at PHCC 2 to 46 at PHCC3. Data drawn from PHCC1 and 2 indicated that 16% and 12% of the employees respectively, were expatriates. Information about the nationalities of the workforce in PHCC3 was not available. The ratios of nurses to GPs were 3.5:1, 5.3:1, and 2.5:1 for PHCC1, 2 and 3, respectively.

Table 33.6
Study locations workforce

PHCC[1]	Staff No.	Saudi No. (%)	Non-Saudi No. (%)	Nurses No. (%)	GP No. (%)
1	31	26 (84)	5 (16)	14 (45)	4 (13)
2	26	23 (88)	3 (12)	16 (62)	3 (12)
3	46	N/A	N/A	18 (40)	7 (15)
Total	103	49 (48)	8 (8)	48 (47)	14 (14)

[1]*PHCC: Primary Health-care Centre.*

Diabetes care services

As table 3.7 shows, each PHCC has a chronic disease clinic with a nurse assigned to manage patients with a range of chronic diseases, including T2DM. Specialised diabetes clinics were listed as existing in PHCC1 and 3, however, there was no specialist diabetes staff in Centre 1 and in Centre 3 only one diabetes medical specialist who operated a clinic two days per week.

Table 3.7
Diabetes care characteristics at the study locations

PHCC	Chronic Disease Clinic	Diabetes Clinic	Diabetes Specialist	Nurse Health Educator	DSME[1] Guidelines by MOH	DSME Guidelines by PHCC
1	✓	✓	×	✓[2]	×	×
2	✓	×	×	✓[3]	×	✓
3	✓	✓	✓[2]	✓[2]	×	×

[1]*DSME: Diabetes Self-management Education.* [2]*Part-time* [3]*Female educator only*

Diabetes registries

Data obtained from the diabetes registries at the study locations indicated the PHCC provided primary health-care services to approximately 54,000 people (see Table 4.3). PHCC1 provided services to 8,931 people while Centre 3 provided health-care services to 28,352. According to the managers of the participating PHCCs, the diabetes prevalence of their catchment areas was 12% based on the national estimates.

However, the number of registered diabetes patients was far lower than the expected prevalence rate possibly because a significant number of people with diabetes remained undiagnosed, and a significant number of those who were diagnosed had not registered for treatment. Based on a 12% prevalence rate, there should have been 7,285 residents in the catchment areas on the PHCCs registry lists; however, there were only 1,669. Table 3.8 shows the classification of the registered patients.

Table 3.8
Registered diabetes people at the study locations

P.H.C.C.	*Population*	*Saudi*	*Non-Saudi*	*Estimated DM*	*Reg.*[1] *DM1*	*Reg.*[1] *DM2*	*Total DM*
1	8,931	8,200	731	1,071	84	460	544
2	16,787	15,492	1,290	2,014	NA	394	394
3	28,352	27,882	470	4,200	108	623	731
Total	54,070	51,574	2,491	7,285	192	1,477	1,669

[1] *Registered patients*

A-SDSCA questionnaire

Phase II of the study utilised the A-SDSCA questionnaire including its extension (see Appendix K). As indicated previously, both the A-SDSCA and the extension were derived from the original English version of the Summary of Diabetes Self-care Activities (SDSCA) instrument designed by Toobert et al. (2000).

The main section of the A-SDSCA consists of five self-care subscales: diet (2 items), exercise (2 items), blood glucose testing (2 items), foot care (2 items) and the smoking sub-scale (1 item). The first three sub-scale items ask the respondents to record how many days out of seven they performed the specified self-care activities. The minimum number of days was "0" and the maximum was "7". For the purpose of providing wider information for this exploratory study, the researcher added the medication sub-scale to the A-SDSCA questionnaire. Respondents were asked to answer one of the two questions in the medicine sub-scale: 1) During the last seven days, how many days did you take your recommended insulin injections? Or 2) During the last seven days, how many days did you take your recommended number of diabetes pills?

Participants were asked: Do you smoke? If they answer was "yes", the respondents were asked how many cigarettes, *shisha*, or *mia'ssil* (different types of smoking in Arab countries) they smoked per day. It is important to emphasise that including all these types of smoking does not mean that smoking one cigarette is equal to smoking one *shisha* because the latter may take up to one hour to be smoked. However, the question sought to identify smoking status and the quantity of tobacco consumed per day. If the response to the item was 3 or less, the respondent was considered to be a *shisha* or *mia'ssil* smoker. Smoking status was collapsed to

smoking or non-smoking for data analysis. The A-SDSCA instrument and its extension were scored separately. Detailed information about the scoring approach is provided in the data analysis section.

The second part of the instrument covers several sub-scales that explore health-care provider interventions with regard to diet, exercise, blood glucose testing, and medication. Items included in the extended A-SDSCA aimed to identify whether health professionals provided appropriate heath care information to T2DM participants and the number of days per week certain diabetes self-care activities had been undertaken. Participants were asked to either tick boxes relevant to the services they received during their visit to the health-care centre, or to circle the number of days they practiced the self-care activity. Data were analysed in the form of frequencies and percentages.

Procedure

Participants were provided with information about the study procedures and the A-SDSCA and the demographic questionnaires previously described. Each participant also received an open A4 size envelope to insert the study questionnaire after completion. Distributing the study materials was mainly performed by the chronic disease nurse. Participants were asked to complete the questionnaires, put them into the envelope, seal the envelope, and hand it to the nurse or the doctor during their clinical consultation. Data collection for female participants was delegated to the research assistant and the female nurses in the chronic care clinics.

In the next step, a clinic nurse or physician recorded either the HbA1c or the FBG level on the provided envelopes and placed their responses into a collection box

or handed it to the researcher. The HbA1c or FBG result had been measured in the last three months for each participant and was entered in their medical records

Each primary health-care centre was provided with a collection box that was secure and easy to access in the health centre hall. The option was offered to participants who wanted to hand in the envelope themselves. The researcher checked the quantity of returned questionnaires on a daily basis with a view to ending the recruitment when the target sample number was reached. Returned questionnaire data were entered and verified, cleaned, and summary scores were calculated prior to analysis.

Data analysis

Data preparation. The researcher undertook data analysis with the guidance of an SPSS analyst, a biostatistician and his supervisors. Data analysis was undertaken using SPSS v.17 software. Specific steps and procedures included in the statistical analysis were guided by Pallant (2007). Data analysis was processed through several stages. Initially, the raw data were examined for omissions, inconsistencies, and possible data entry errors. The researcher corrected identified problems by checking the data with the hard copy of the questionnaires.

Following cleaning, the data were scrutinised for missing values. According to Munro (2005) the researcher should define missing data patterns confidently before proceeding in data analyses. This means that the researcher should know why the missing value exists and whether it could affect the outcome of the analysis. Utilising the Missing Values analysis function available in SPSS, it was found that

the pattern of missing data was completely at random. Because it was possible to score the A-SDSCA instrument even if a proportion of data were missing, no data imputation was undertaken. Scoring the A-SDSCA and the derivation of additional variables used in the analyses is described below.

As mentioned in Phase I, the main part of the A-SDSCA has four sub-scales: diet (2 items), exercise (2 items), blood glucose testing (2 items), and foot care (2 items). In addition to these four sub-scales, a question asked participants whether they smoked. The sub-scale items of the A-SDSCA utilise an eight point scale with numbers ranging from zero to seven. The A-SDSCA was scored by calculating the mean score for each item, calculating the mean for each sub-scale, and computing the mean of the total A-SDSCA scale.

To further explore participants' self-management practices, binary "cut-of" variables were derived for A-SDSCA sub-scale scores to identify the proportion of participants whose self-care management was within American Diabetes Association (2008) recommended guidelines in Khattab et al.(2009) and the USA (Katon et al., 2009) (see Table 3.9). Participants whose practices were within the recommended guidelines were coded as "1", and those who were not were coded as "2".

Table 3.9
A-SDSCA sub-scale categories

Practice as recommended	Code	Diet	Exercise	Blood testing	Foot care	Medication
Yes(days/week)	*1*	≥ 3	≥ 3	≥ 5	≥ 3	$= 7$
No(days/week)	*2*	≤ 2	≤ 2	≤ 4	≤ 2	≤ 6

In addition to the main A-SDSCA items, items in the extension part of the instrument were also scored. The A-SDSCA extension has nine items covering

several sub-scales that explore health-care provider interventions with regard to diet, exercise, blood glucose testing, and medication. With the exception of items 16-20, the extension items were scored by computing the frequency and percentage. Items 16-20 were scored similarly to the A-SDSCA items.

As described in table 3.5, a series of binary variables were derived to summarise the socio-demographic characteristics of participants, length of time since diagnosis, and blood glucose level.

Descriptive statistics. Descriptive statistics were calculated to describe the A-SDSCA in terms of means, standard deviations, skewness, and kurtosis. The frequency of each item of the A-SDSCA extension was also computed. In addition, percentages were extracted to show the proportion of those who received specific medical recommendation versus participants who did not.

Bivariate analysis. The aim of the bivariate analyses was to identify associations among the independent variables and the participants' everyday self-management practices. Therefore, a number of independent sample t-tests with two-tailed significance were undertaken to assess the association of the means of the instrument sub-scales with the independent variables. Statistical significance was defined as the $p = 0.05$ level (2-tails). Medication, diet, foot care, exercise, blood glucose monitoring t-test tables are presented in Chapter 4.

Multivariate analysis. The last Phase of data analysis was undertaking a multivariate analysis. The aim of the analysis was to identify factors accounting for variations in the overall participants' self-management practices. The A-SDSCA means were employed to process a Multiple Regression Analysis (MRA) that predicts how much of the variance in self-management practices that could explained by the independent variables such as age, gender, education, duration since T2DM diagnosis, blood glucose level, and smoking status. This stage was guided by the professional SPSS specialist. Statistical significance was defined as $p = 0.05$ level (2-tails).

Prior to interpreting the results of the MRA, several assumptions were evaluated. First, stem-and-leaf plots and boxplots indicated that each outcome variable in the regression was normally distributed and free from univariate outliers, with the exception of the medication scale. Treating the medication scale data with log transformation did not improve the distribution; therefore, the original data were retained. Second, to further inspect the data distribution, a plot of standardised predicted values was compiled that indicated the assumptions of normality, linearity, and homoscedasticity of the residuals were met. Third, Mahalanobis distance did not exceeded the critical χ^2 of 18.48 with df =7 (at $\alpha = .001$) for any cases in the data file, indicating that multivariate outliers were not a concern. Fourth, relatively high tolerances of predictors in the regression model indicated that multicollinearity would not interfere with the ability to interpret the outcome of the MRA.

Phase III – Factors affecting T2DM patients' self-management activities

Overview

The aim of phase III was to explore factors possibly affecting T2DM patients' self-management activities in greater depth. Specifically, Phase III sought to identify factors related to Saudi patients and providers, and the Saudi health-care system that were not captured using the questionnaire administered in Phase II. It was envisaged that this phase would serve to introduce an expanded list of potential causal factors that could be assessed in future studies. In this phase of the study, interviews with T2DM patients and health-care providers were undertaken in Almadinah, Saudi Arabia. These raw data were analysed by means of quantitative thematic analysis and guided by the Chronic Care Model as the theoretical framework.

Samples

Identifying the sample size for qualitative designs is usually guided either by the data saturation principle or adapting a pre-defined sample size as recommended by Streubert and Carpenter (2003) and, Taylor, Kermode, and Roberts (2006). The term saturation in the current study means that data becomes repetitive and no new theme can be detected from the participant interviews (Taylor et al., 2006). This study utilised the latter approach. Since the study sought to collect in-depth data about factors affecting T2DM self-management, it was envisaged that recruiting a small heterogeneous sample from Phase II participants would increase the likelihood of discovering a broad range of factors associated with diabetes self-management. Therefore, the researcher utilised the sample matrix calculation method (Ritchie &

Lewis, 2003) to identify the number of participants required. The sample matrix calculations suggested a sample size of 24 T2DM patients. In addition, it was decided to recruit 12 health-care professionals who were currently working in the field of diabetes management to obtain their views about the reasons why patients' did or did not achieved satisfactory glycaemic control.

Having access to patients in three health-care centres, the researcher decided to recruit equal numbers from each. This strategy was employed simply to ease recruitment. The participant characteristics considered to be important were: level of diabetes control, age, and gender.

The first criterion for the sample matrix was the level of diabetes control (HbA1c level) as classified by the American Diabetes Association (2008). The HbA1c threshold for controlled diabetes was to be equal or less than seven per cent (+). Those patients who did not meet this criterion were classified as having uncontrolled diabetes (-). The second criterion age was classified as those who were younger than 55 years of age (-) and those participants who were 55 years of age or older (+). The rationale for specifying age in the matrix was to represent older people who may have some level of body dysfunction preventing them practicing self-management activities independently. The third criterion was gender because of the Saudi social context it was anticipated that women (F) may experience care differently from men (M). Allowing for eight participants per health-care centre, the distribution of participants per centre with the required variety of characteristics is presented in

Figure *3.2*.

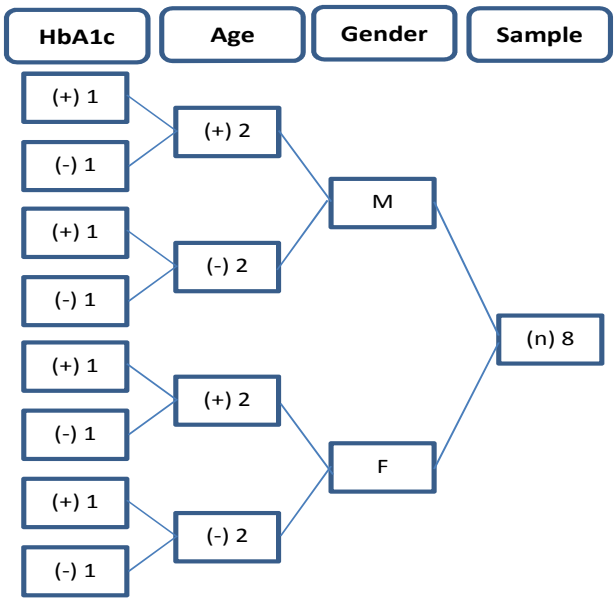

Figure 3.2 T2DM participants' Sample matrix

The second group of participants consisted of 12 health-care professionals who provide diabetes care in the primary health-care centres. Although they were not medical specialists, they provided diabetes health-care for the primary health-care patients as part of their daily responsibilities. Therefore, they were all in a position to provide information about factors affecting self-management practices that may not have been identified in Phase II. As each study location has separate male and female chronic care clinics, the researcher recruited a female doctor and nurse from the female clinic and a male doctor and nurse from the male clinic, giving a total of four health professionals from each health-care centre. The inclusion criteria for health professional participants were:

- They were employed in one of the three study locations; and
- They had a direct role providing diabetes health-care.

Instrument

Semi-structured individual interview technique was utilised to explore factors affecting self-management practices among T2DM patients. The interview approach facilitates in-depth exploration to the participants' perceptions about factors affecting their daily care performance (Ritchie & Lewis, 2003; Schmitt, 2006). Both T2DM participants and diabetes health-care providers were interviewed. However, there were different sets of questions for each group that were implemented through interview schedules (see Appendix L). Interview schedules were prepared by the researcher. The contents of the schedules were reviewed by the research supervisor. The aim of each interview schedule was to guide the information flow and to unify data gathering approaches for the researcher and his assistant.

Generally, the interview questions were prepared to help participants express their answers and thoughts clearly. As recommended by Endacott (2005) the interviews included closed and open-ended questions for both groups. In addition, the A-SDSCA questions were utilized with T2DM participants to 'open the gate' for more detailed questions. For example, participants were asked: Over the last seven days, how many days did you participate in at least 30 minutes of physical activity? This question was followed by several related questions, for example: What physical activity was it? Did you perform the activity alone? Was it easy to practice?

Procedure

The invitation to participate in Phase III appeared at the end of the A-SDSCA questionnaire administered in Phase II. Information about the interviews was included in the posters that were utilised to recruit participants during the second

phase of the study. Interviews with female participants were undertaken by the female research assistant. The majority of the interviews were performed directly after the participant completed the questionnaire. Audio recorded interviews were undertaken in an unattended office at the study locations. The time taken for the interviews varied between 30-90 minutes. To increase the reliability of the collection of the interviews data, the research assistant was provided with the interview questions schedules (see Appendix L) and protocol (see Table 3.10) prior to interview stage. In addition, the researcher trained the assistant in interviewing techniques stressing the importance of being non-judgmental, and being aware of the potential influence of body language and intonation when asking questions. The researcher emphasised the assistant's need to promote an atmosphere in which the participants were relaxed, had a clear understanding of the purpose of the interview, understood the voluntary nature of their participation, and were confident their responses would be respected. Interestingly, most of the female participants refused to permit an audio recording of their interviews; however, they agreed to allow the research assistant to transcribe their responses. The refusal would not have been unexpected had the interviews been undertaken by the researcher because Saudi social customs prohibit females from having a conversation with a male stranger such as the researcher. A possible explanation was that the female participants were not used to undertaking recorded interviews.

The final stage of this phase of the study was to interview the health-care providers. The interviews took place during their working time at the study locations. Performing the interviews during work time was suggested by the participants and approved by the primary health-care management at the study location. Because some of the non-Saudi health-care providers did not speak Arabic clearly, the

interviews were conducted in both Arabic and English. Interviews for health-care providers were undertaken at the chronic care clinics. Before audio recording of the in-depth interviews, the researcher documented each participant's demographic data. Health-care provider participants were asked to identify their age (in years), professional backgrounds, length of service, and experience in the diabetes field.

Verbatim transcription of T2DM male participants' and health-care providers' interviews was undertaken by the researcher while the research assistant provided the interview transcripts for T2DM female participants. Despite the fact that the women who participated in the interviews were not as forthcoming with information as the men, perhaps for cultural reasons previously mentioned, the overall quality of data in terms of codable material was not too dissimilar.

Table 3.10
Interview protocol

Steps	Phase	Guide
1	Objectives	To understand health professionals' perceptions. To understand factors underpinning their perception. To explore diabetes participants' experience with available functions that relate to diabetes self-management. To identify opportunities for diabetes care within the chronic care services in the Saudi public health-care system. To understand the barriers that may prevent optimum self-management outcomes.
2	Introduction	Introduce the study, confidentiality, and timing. Introduce participant's rights. Register demographic data. Start audio recording (OR) note taking.
3	During the interview	Guide the participant through the study questions (use provided study question form). Clarify each answer by probing sub-questions.
4	Ending the interview	Finish and complete covering raised issues during the interview. Turn off the recorder. Thank the participant and mention how s/his contribution is valuable to this study. Reassure confidentiality of information.

Data analysis

The conceptual framework. The current study utilised the Chronic Care Model (CCM) (Wagner, 1998) as the conceptual framework to code the interview data. The rationale for utilising the CCM came in twofold. First, the CCM has been widely used to organise primary health-care services for patients with chronic disease. Second, coding the interview data in accordance with the small number of CCM domains facilitates good agreement between coders, therefore, maximising inter-rater reliability (Carey, Morgan, & Oxtoby, 1996; Hagelin, 1999).

Data analyses approach. Data analysis was processed for the interviews' manuscripts. No notes were included in the analysis. Quantitative content analysis is a method of systematic assessment and extraction of quantitative data from qualitative research resources (Kondracki, Wellman, & Amundson, 2002; Woodcock, 2008). The method is widely used to analyse and quantify texts (Krippendorff, 2004; Rourke, Anderson, Garrison, & Archer, 2001). The implementation of quantitative content analysis procedures in the current study was adapted from Krippendorff's steps of content analysis which have been used in numerous nursing studies (Barbara & Ellen, 2002; Carolan, 2005). The steps were:

- Classifying the interview data into units. The researcher applied a physical distinction where each participant's interview was identified as a unit.

- All units were included in the analyses "Sampling".

- Establishing a coding schedule derived from the CCM to code the texts.

- Reducing the data to manageable representations was performed through cross tabulation where units were displayed in a vertical manner while codes were identified horizontally in the table to enable frequencies and proportions to be identified for each code (see Appendix M).

- Identifying the outcome of the analyses. Krippendorff (2004) described this step as "Abductively inferring contextual phenomena"

(p85). The term abductive means that the researcher should connect the text meaning to the context in order to identify the study outcome.

- Narrating the answer to the research question for the purpose of informing the reader in a comprehensive manner (Krippendorff, (2004). This step is presented in Chapters 4 and 5.

The researcher undertook training to apply the methodology by first reading articles that used Krippendroff's content analysis steps. Following this he watched several video presentations by the CCM developer Dr. Wagner (Director of Improving Chronic Illness Care) and his team. Video sessions were initially presented at the 2004 Epidemiology, Biostatistics and Clinical Research Methods Summer Session in collaboration with the Seattle VA Epidemiologic Research and Information Centre (ERIC) and the University of Washington. Sessions are available at:
http://www.improvingchroniccare.org/index.php?p=The_Chronic_Care_Model&s=2

http://www.researchchannel.org/prog/displayseries.aspx?fID=1695;

The data, which were in Arabic, were analysed by the researcher in Arabic. This was important, because it is very likely that, in an analysis of Arabic sentiments translated into English, important nuances of the language would have been lost. As a native Arabic speaker, the researcher was able to embed the data in the appropriate cultural context. Two further steps were undertaken following data analysis. First, colloquial expressions used by participants in the interviews were converted to

formal Arabic language. This process, which was not a major issue, was conducted by the researcher and the research assistant. Second, the researcher translated a selection of phrases into English to illustrate the results of the interviews.

Reliability of the data analysis approach

Once the data were coded, two strategies were used to enhance the reliability of the content analyses. First, the documented process of analysis described in the preceding section, was followed. Second, inter-rater *"inter-coder"* reliability analysis was undertaken. Kondracki et al. (2002) suggested that at least two researchers conduct the entire quantitative content analysis. As this was not possible due to budget and time limitations, the researcher invited a health professional colleague to independently code a random sample of five interviews. These interviews comprised a combination of T2DM patients and health professionals. The second analyst had a Bachelor's Degree in Nursing and four years' experience in diabetes management. His participation was voluntary.

The second analyst undertook training in the Krippendorff method and CCM in a similar manner to the researcher. Training and reliability testing was completed in one week. The purpose was to attain a coding training level comparable to that of the researcher.

Reliability analyses. To assure acceptable inter-coder reliability "reproducibility", Strijbos et al. (2006) suggests examining 12.5% of each coder's work. Taking into account that the Kappa score might be affected by low coded items number (Rourke et al., 2001), the researcher decided to include the Coefficient Reliability statistical test to support Cohen's Kappa outcomes. Five out of the 36 interviews (13.8%) were tested using these reliability analyses. An example of one element of interview coding is provided in Appendix N.

The first test for inter-coder reliability was the per cent agreement (Coefficient Reliability CR) test. The CR test was processed manually. Coefficient Reliability of 80% was the minimum cut-off score for an acceptable proportion for content analysis (Riffe, Lacy, & Fico, 1998). Calculation details of CR were identified by Holsti (1969) as:

C R = 2 x No. agreed coding / [n1 (No. of codes by first rater) + n2 (No. of codes by second rater)].

The second test was Cohen's Kappa test (Cohen, 1987). Cohen's Kappa is extensively applied to assess inter-rater agreement (De Vries, Elliott, Kanouse, & Teleki, 2008). The test is suitable for dichotomous data as well as items with several response categories (De Vries et al., 2008; Simon, 2006). The cut-off score for Kappa is contentious. Holsti (1969) suggests a score of .70 as the minimum requirement for reliability, while a score of 0.60 and above is recommended by Landis and Koch (1977). Peat (2001) classified scores into .50 as moderate agreement; above .70 as good agreement; and above .80 as very good agreement.

Given this information, the researcher set the cut-off threshold for this study at .70. According to Hruschka et al. (2004) it is good to have a well-estimated summary of kappa when two observers are coding a small sample. The average kappa was calculated by summing all kappa scores and dividing the outcome by the number of interviews undertaken. The outcome of the inter-coder reliability analyses is provided in Chapter 4.

Ethical considerations

Participation in the study was voluntary, informed and anonymous. Potential participants were informed through study recruitment posters that their participation in the study was voluntary (see Appendix O). In addition, the participant information sheets (see Appendix P) informed potential participants that they were free to withdraw themselves or their data from the study at any time during the study process. It was made very clear that their decision not to participate or withdraw from any phase of the study would not prejudice their ongoing care at the health-care centre in any way. To ensure anonymity and confidentiality, the identities of participants were not disclosed. No names or codes were recorded to protect patients' rights.

Before commencing the study, permission and approval was granted by the Curtin University Human Research Ethics Committee approval number HR16/2009 (see Appendix Q). Similarly, approval for the study was granted by Almadinah Region Directorate of Health Affairs, Ministry of Health (Appendix R). The data collection phase was performed under the supervision of the Directorate of Health Affairs in Almadinah, Saudi Arabia.

Phase I. For the purpose of undertaking the test-retest procedure, the researcher documented the participant's first name and contact phone number to ensure that the participant could be contacted and asked to complete the A-SDSCA a second time. The information was recorded on the cover sheet of the questionnaire. In order to preserve the anonymity of the participant, this cover sheet was removed from the remainder of the questionnaire containing the participant's responses. The sheets containing personal information were stored independently from the hard copy questionnaire data. No personal details were ever recorded on an electronic database.

Phase II. The names and contact information of participants in Phase II of the study were not required. These individuals were not identified in hard copy or in any database. Therefore, to preserve the anonymity of these people completely, verbal informed consent, rather than written informed consent, was obtained. Following a full explanation of the study, the act of filling out the questionnaire and dropping it in the collection box was considered to be evidence of their consent to participate.

Phase III. Individual interviews with T2DM patients were undertaken at primary health-care centres (study locations) so that they could both attend their health-care appointment and participate in the study in the same visit. In the interview situation, written informed consent was required because the act of participating in an interview was not considered to be an indication of intent, as was completing a questionnaire and depositing it in a box. One male participant refused to sign the consent form, but declared he was very happy to participate in the interview process. The verbal consent was accepted. The issue was noted by the

researcher who identified a number of possible reasons why some Saudi people may not wish to sign a consent form: 1) a lack of understanding of the research process; 2) a lack of understanding about what they were signing due to illiteracy; and 3) for older men it is insulting to ask for a signature when they have already given their word. For both T2DM patients and health professionals, no names were audio-recorded. All information obtained that would identify an individual participant was kept confidential, and no identifying data will be published.

Individual interviews with health-care professionals were undertaken at their place of work during their working hours. Written informed consent was required and obtained. No names were audio-recorded. All information obtained that would identify an individual participant was kept confidential, and no identifying data will be published.

Results and data storage. All study results are presented as aggregate data only. No individuals or groups of individuals are identified. All hard copy data is stored in a locked filing cabinet in the researcher's private office. Completed consent forms for those people who undertook an interview are stored in a separate locked filing cabinet in the researcher's office. Electronic data is stored on a password protected computer. Access to related electronic information was restricted to the researcher and his supervisors. All research forms and electronic data will be destroyed in five years' time.

CHAPTER 4 : RESULTS

Introduction

In the previous chapter, the study design, sampling, data collection, and data analysis approaches were described. The analyses findings are presented in this chapter in the form of tables, figures, and explanatory comments. The chapter begins by identifying the characteristics of three of four study locations where data were collected to help the reader understands the broad health-care context of the study. The chapter is then divided into three sections corresponding to the three phases of the study: Phase I) translation and validation of the SDSCA instrument; Phase II) measuring self-management activities using the Arabic version of the SDSCA; and Phase III) identifying factors affecting T2DM participants' self-management activities.

Characteristics of the Study locations (Phase III)

A necessary first step in the study's analysis was determining that the staff and facilities at the study location centres were similar. If they were dissimilar, this could account for possible differences in individual self-management approaches. The characteristics of the health-care centre where the first sample of 33 participants whose data were used to undertake split half and test-retest was not included since the data were not used in Phases II and III. As described in Chapter 2, these centres only offer basic primary health-care services. The centre staff members were general practitioners (GPs), nurses, pharmacists, and senior and junior administrative personnel. Patients who needed to consult dieticians, podiatrists, ophthalmologists,

diabetes nurse specialists, and medical specialists were required to travel to the regional diabetes centres situated in hospitals.

Health-care team

As shown in Table 4.1, the characteristics of health-care workers at the three study locations varied. The number of employees ranged from 26 at PHCC2 to 46 at PHCC3. Data drawn from PHCC1 and 2 indicated that 16% and 12% of the employees respectively, were expatriates. Information about the nationalities of the workforce in PHCC3 was not available. The ratios of nurses to GPs were 3.5:1, 5.3:1, and 2.5:1 for PHCC1, 2 and 3, respectively. The discrepancy in nurse to GP ratios among the PHCCs is examined in the following section.

Table 4.1
Study locations workforce

	Staff	Saudi	Non-Saudi	Nurses	GP
PHCC[1]	*No.*	*No. (%)*	*No. (%)*	*No. (%)*	*No. (%)*
1	31	26 (84)	5 (16)	14 (45)	4 (13)
2	26	23 (88)	3 (12)	16 (62)	3 (12)
3	46	N/A	N/A	18 (40)	7 (15)
Total	103	49 (48)	8 (8)	48 (47)	14 (14)

[1]*PHCC: Primary Health-care Centre.*

Diabetes care services

As Table 4.2 shows, each PHCC has a chronic disease clinic with a nurse assigned to manage patients with a range of chronic diseases, including T2DM. Specialised diabetes clinics were listed as existing in PHCC1 and 3; however, there

was no specialist diabetes staff in Centre 1. In Centre 3, only one diabetes medical specialist operated a clinic two days per week.

Table 4.2
Diabetes care characteristics at the study locations

PHCC	*Chronic Disease Clinic*	*Diabetes Clinic*	*Diabetes Specialist*	*Nurse Health Educator*	*DSME[1] Guidelines by MOH*	*DSME Guidelines by PHCC*
1	✓	✓	×	✓[2]	×	×
2	✓	×	×	✓[3]	×	✓
3	✓	✓	✓[2]	✓[2]	×	×

[1]DSME: Diabetes Self-management Education. [2]Part-time [3]Female educator only

Diabetes registries

Data obtained from the diabetes registries at the study locations indicated the PHCCs provided primary health-care services to approximately 54,000 people (see Table 4.3). PHCC1 provided services to 8,931 people while Centre 3 provided health-care services to 28,352. According to the managers of the participating PHCCs, the estimated diabetes prevalence of their catchment areas was 12% based on the national estimation.

However, the number of registered diabetes patients was far lower than the expected prevalence rate. This is possibly due to a significant number of people with diabetes remaining undiagnosed, and a significant number of those who are diagnosed but not registered for treatment. Based on a 12% prevalence rate, there should have been 7,285 residents in the catchment areas on the PHCCs registry lists; however, there were only 1,669. Table 4.3 shows the classification of the registered patients.

Table 4.3
Registered diabetes people at the study locations

P.H.C.C.	*Population*	*Saudi*	*Non-Saudi*	*Estimated DM*	*Reg.[1] DM1*	*Reg.[1] DM2*	*Total DM*
1	8,931	8,200	731	1,071	84	460	544
2	16,787	15,492	1,290	2,014	NA	394	394
3	28,352	27,882	470	4,200	108	623	731
Total	54,070	51,574	2,491	7,285	192	1,477	1,669

[1] *Registered patients*

Phase I: Translation and validation of the A-SDSCA

Participants characteristics

The first sample. To prevent sample contamination, the first group of participants for Phase I was recruited from a primary health-care centre that did not participate in the next phases of the study. The mean age of the 33 participants was 48 years (Range: 35-70 years). Seventeen of the participants were male (52%) and the mean duration of time since diagnosis of T2DM was 11 years (Range: 2-21 years). Twenty-five participants completed the questionnaire twice, one week apart, to determine test-retest reliability. The mean age for this sample was 47 years (Range: 35-70 years), 52% (n=13) were males, and the mean time since T2DM diagnosis was 11 years. No other socio-demographic data were collected because the aim of this phase was to test the instrument, not to investigate these independent variables.

The second sample. The second sample was recruited from three primary health-care centres in Almadinah. A purposive sampling approach was utilised to recruit 210 participants with T2DM. As Table 4.4 shows, there was an equal number

of males and females. The majority of participants in this sample (82%) were aged between 26 and 65 years of age. Almost 55% had a yearly income of less than 50,000 Saudi Riyals (< US$13,000). Approximately 33% of participants had no formal education.

Sixty-six per cent of the recruited sample had been diagnosed with T2DM for more than eight years. Blood glucose testing records indicated that only 15% of the participants had blood glucose level in range recommended by the 2008 American Diabetes Association . Medical complications had already affected some participants in the form of heart disease (4%), hypertension (30%), kidney disease (2.4%), and eye disease (17%).

Table 4.4
Participants' characteristics

Variable	Number	%
Age/Years*		
26-65	172	82
65 >	37	18
Sex		
Male	105	50
Female	105	50
Income/year		
< 50,000	116	55
≥ 50,000	94	45
Education level*		
No formal education	70	33
Formal educated	139	67
T2DM duration/Year		
< 8	71	34
≥ 8	138	66
Blood Glucose*		
Controlled	30	15
Uncontrolled	174	85
Other health problems		
Have Heart Disease	8	4
Have hypertension	62	30
Have kidney disease	5	2.4
Have eye disease	35	17

* Incomplete data

Pre-testing

Stability (Test-retest analysis). Test-retest analysis was undertaken to evaluate the stability of the A-SDSCA-3 over one week (see Table 4.5). Twenty-five

participants completed the questionnaire twice. The outcome of this test showed a statistically significant reliability score (r = .912, p = < 0.001).

Table 4.5
Test-retest reliability result

Correlations	*Correlation*	Sig. (2-tailed)
Test-retest - Pearson Correlation	.912	.000

Split-half analysis. A Split-half reliability analysis which was calculated using data from 33 participants found a correlation score of .9 (Table 4.6).

Table 4.6
Split-half result

Reliability Statistics		
Spearman-Brown Coefficient	Correlation Between Forms	.91
	Equal Length	.95

Internal consistency (Cronbach's alpha) analysis. Based on Cronbach's alphas calculated following factor analysis, Item 4 (special diet) was removed before undertaking this internal consistency analysis. For the remaining eight items of the A-SDSCA questionnaire, the Cronbach's alpha was .76 (see Table 4.7). The α scores for the sub-scales were: diet .89; exercise .83; blood glucose testing .92, and foot care .77.

Table 4.7
Coefficient Alpha result

Scale	Cronbach's Alpha	N of Items
A-SDSCA	.76	8
Diet scale	.89	2
Exercise scale	.83	2
Blood glucose testing scale	.92	2
Foot care scale	.77	2

Construct validity (Factor analysis report). Prior to performing Principal Components Analysis (PCA) on the first 10 items of the A-SDSCA, the suitability of the data for factor analyses was assessed. The correlation matrix revealed the presence of several correlation coefficients .3 and above (see Table 4.8).

Table 4.8
Correlation matrix

	Item1	Item2	Item3	Item4	Item5	Item6	Item7	Item8	Item9
Item 2	.812								
Item 3	.313	.328							
Item 4	-.351	-.313	-.056						
Item 5	.263	.251	.246	-.053					
Item 6	.267	.232	.170	-.046	.717				
Item 7	.324	.299	.191	.119	.122	.164			
Item 8	.276	.255	.262	.105	.143	.191	.867		
Item 9	.309	.249	.324	-.179	.059	.074	.258	.239	
Item 10	.319	.259	.363	-.281	.157	.098	.211	.299	.631

The lowest correlations were evident between Items 4 and 5 and Items 4 and 6, with coefficients of -.035 and -.046, respectively. On the other hand, the largest correlations were between Items 1 and 2 (.81) and Items 7 and 8 (.86). The Kaiser-Meyer-Oklin value was .65, exceeding the recommended value of .6 (Kaiser, 1970, 1974) and Bartlett's test of Sphericity (Bartlett, 1954) reached statistical significance, supporting the reliability of the correlation matrix (see Table 4.9).

Table 4.9
The Kaiser-Meyer-Oklin and Bartlett's test of sphericity

KMO and Bartlett's Test			
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	Bartlett's Test of Sphericity Approx. Chi-Square	Df	Sig.
.646	873.893	45	.000

PCA revealed there were four components with eigenvalues greater than 1.0, explaining 34.4%, 16.4%, 15.4%, and 11.2% of the variance of "every day practices" for these items respectively (accumulated total of 77.1%) (see Table 4.10).

Table 4.10
Principal components analysis

Total Variance Explained							
	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	3.446	34.456	34.456	3.446	34.456	34.456	2.406
2	1.609	16.090	50.546	1.609	16.090	50.546	2.149
3	1.544	15.440	65.986	1.544	15.440	65.986	2.023
4	1.120	11.202	77.188	1.120	11.202	77.188	2.433
5	.785	7.854	85.042				
6	.569	5.694	90.736				
7	.365	3.650	94.385				
8	.266	2.655	97.041				
9	.182	1.819	98.859				
10	.114	1.141	100.000				

Extraction Method: Principal Component Analysis.

a. When components are correlated, sums of squared loadings cannot be added to obtain a total variance.

Applied components were diet, blood glucose testing, exercise, and foot care. An inspection of the screeplot revealed a line break at Component 3, which supported the decision to retain two factors (Figure 4.1).

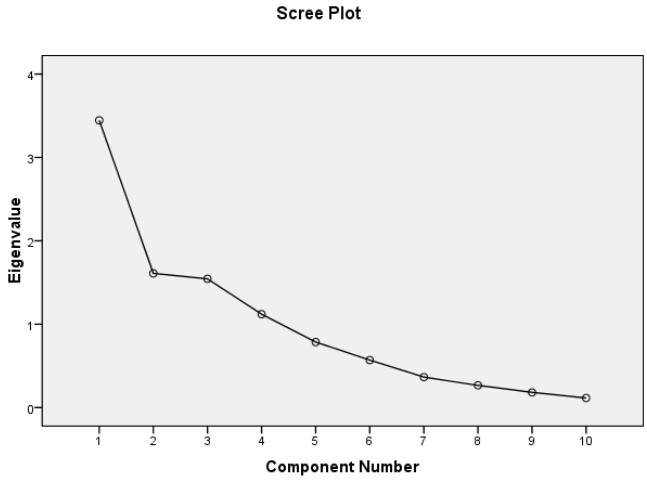

Figure 4.1 Screeplot diagram of A-SDSCA validation

However, to confirm the number of retained factors, parallel analysis was undertaken and the result indicated that four factors should be retained (see Table 4.11) (Pallant, 2007). The eigenvalues of these four factors in the Parallel Analysis test did not exceeded the corresponding criterion values for a randomly generated data matrix of the same size (10 variables × 210 respondents) in the principal components analysis.

The first four eigenvalues scores were: 3.446, 1.609, 1.544, and 1.120. Their corresponding criterion values were: 1.351, 1.243, 1.153, and 1.084, respectively. These four factors were accepted. The fifth eigenvalue score was .785 and did not exceed the corresponding criterion value of 1.026, therefore, it was rejected. A comparison of eigenvalues (PCA) and criterion values from parallel analysis is presented in Table 4.12.

Table 4.11
Parallel analysis

Eigenvalue #	Random Eigenvalue	Standard Deviation
1	1.3515	.0574
2	1.2435	.0409
3	1.1537	.0390
4	1.0842	.0302
5	1.0265	.0244
6	0.9572	.0325
7	0.8977	.0302
8	0.8357	.0318
9	0.7667	.0363
10	0.6834	.0425

Table 4.12
Comparison of eigenvalues (PCA) and criterion values from parallel analysis

Component number	Actual eigenvalues from PCA	Criterion value from parallel analysis	Decision
1	3.446	1.351	Accept
2	1.609	1.243	Accept
3	1.544	1.153	Accept
4	1.120	1.084	Accept
5	.785	1.026	Reject

Since different rotation methods were used, both Orthogonal (Varimax) and Oblique (Oblimin) rotations methods were undertaken consecutively. With Varimax rotation, the rotated component matrix had simple structure with each item loading on one component. However, Item 3 loaded negatively on Component 3 together with foot care items. Similarly, Item 4 loaded negatively on Component 1 together with the diet sub-scale group. Therefore, to overcome these issues with Items 3 and 4, Item 3 was deleted and Item 4 was recoded. As a result, the second rotated

component matrix revealed a simple structure where all items loaded positively on one component. Applying these interventions to Oblimin rotation produced a similar outcome, except Item 4, which loaded on two components (1 and 2). Items 7 and 8 (blood glucose) had negative loadings. Factor analysis outcomes are presented in Appendix S. These validation procedures suggest the instrument has acceptable construct validity.

Phase II: Summary of Diabetes Self-Care Activities

Introduction

The aim of the second phase of the study was to explore the relationship between participant characteristics and self-management practices. As previously mentioned, the sample consisted of 210 T2DM participants who were recruited from three primary health centres in Almadinah, Saudi Arabia. The data were collected using a questionnaire about socio-demographic characteristics and T2DM history, as well as the A-SDSCA and the extensions to the main questionnaire. Only the main A-SDSCA questionnaire and medication sub-scales were employed in the bivariate and multivariate analyses.

Descriptive analysis

Prior to bivariate and multivariate analyses, descriptive statistics were calculated for the exposure and outcome variables of interest. Frequencies for binary and categorical exposure variables are presented in Table 4.4 and were described in the previous section. Means and standard deviations were calculated for items, sub-scales, and the overall diabetes self-management score form the A-SDSCA questionnaire. The distributions of these outcome variables were also examined for skewness and kurtosis. The medication sub-scale extension of the A-SDSCA was included in this analysis due to the importance of medication self-care on the overall self-management outcome. This was the only extension sub-scale that was included in the bivariate and multivariate analyses. Means and standard deviations of continuous variables and frequencies of binary variables were calculated for the remainder of the extension items.

The A-SDSCA. The results for binary variables based on clinical cut-offs are presented in the following section. As shown in Table 4.13, participants demonstrated low to medium levels of self-management, all below those recommended by the American Diabetes Association, 2008. For Items 1and 2, which asked about following an eating plan, the means of the responses were close to the mid-point on the scale of 1 - 7 (3.48 and 3.58 respectively).

For Items 3 and 4 on the exercise sub-scale, the results were mixed with a higher mean for length of time (3.34) than specific exercise (2.6). Blood glucose was assessed by Items 5 and 6. The relatively low means of 2.43 and 2.02 indicated that most participants did not undertaken blood glucose monitoring to any great extent. The means for foot-care, assessed with Items 7 and 8, were also in the medium range (3.7 and 3.3 respectively). The medication sub-scale, Items 17a and 17b, were calculated as one item (see Table 4.14). The participants' smoking status, recorded as Yes or No, indicated that only 27 participants (12.9%) were smokers at the time of data collection.

Table 4.13
The A-SDSCA items descriptive outcomes

	M	SD
Q1- Followed a healthy eating plan	3.48	2.13
Q2- Followed eating plan Over the past month	3.58	2.14
Q3- Participate in at least 30 min exercise	3.34	2.33
Q4- Participate in specific exercise session	2.63	2.32
Q5- Test your blood glucose	2.43	2.04
Q6- Test your blood sugar recommended	2.02	1.88
Q7- Check your feet	3.72	2.60
Q8- Inspect the inside of your shoes	3.34	2.66

The means for A-SDSCA sub-scales are presented in Table 4.14. The list of self-management activities from the least practiced to the most practiced was: blood glucose monitoring (Mean: 2.2 ± 1.9SD); exercise activities (Mean: 3.02 ±2 SD); foot-care activities (Mean: 3.49 ±2 SD); diet activities (Mean: 3.60 ±2 SD); and medication (Mean: 6.26 ±.60 SD). The overall scale mean was 3.72 ±1SD).

Table 4.14
The A-SDSCA sub-scales descriptive outcomes

			Skewness		Kurtosis	
	Mean	*SD*	*Statistic*	*Std. Error*	*Statistic*	*Std. Error*
Medication	6.26	0.593	-1.990-	.173	2.550	.344
Diet	3.60	1.705	-.275-	.168	-.392-	.334
Blood-Glucosemonitoring	2.24	1.900	.863	.169	-.018-	.337
Exercise	3.02	2.173	.472	.169	-.856-	.337
Foot Care	3.49	2.378	.184	.170	-.269-	.338
Overall	3.72	1.15	.301	.168	-.098	-.334

The descriptive analyses revealed that diet, blood glucose monitoring, exercise, and foot care sub-scales were all normally distributed (skewness and kurtosis). This was not the case with the medication sub-scale, which was negatively skewed. This result was expected because people with diabetes usually depend on medications to control their blood glucose level. Log transformation did not change the data distribution. Therefore, the original data were utilised for analysis. The overall scale mean was normally distributed.

The A-SDSCA extension. The A-SDSCA extension has nine items. Whereas the A-SDSCA subscales ask specifically about diabetes self-management, the extension questions, which have a number of embedded items, asking mainly about advice given by health-care providers. Table 4.15 presents frequencies for Item 12, which measured dietary recommendations. Table 4.15 shows that 91% of the participants indicated they were advised to follow a low-fat diet plan by their health-care providers. A complex carbohydrate diet was recommended for 73% of the participants and 66% were given information about losing weight. Diet recommendations in regards to high fibre food and fruits were provided for 71% and 49% of the participants, respectively. Almost half (45%) were given information about eating sweets; however, five participants (2%) reported they did not receive any diet recommendations.

Table 4.15
Extended diet sub-scale (Q12)

Q12.Which of the following has your health-care team advised you to do?*	Responses	
	Yes	*No*
	n. (%)	*n. (%)*
Follow a low-fat eating plan	189 (91)	19 (9)
Follow a complex carbohydrate diet	154 (73)	55 (27)
Reduce calories you eat to lose weight	138 (66)	71 (34)
Eat lots of food high in dietary fibre	150 (71)	59 (29)
Eat lots of fruits and vegetables	103 (49)	106 (51)
Eat very few sweets	95 (45)	114 (55)
Other diet advice	2 (1)	207 (99)
No advice about my diet	5 (2)	204 (98)

* *Incomplete data*

Similarly, Table 4.16 shows that the majority of participants (87%) were advised to engage in low-level exercise such as walking on daily basis. Overall, 39% of the participants were advised to extend the duration of exercise to at least 20 minutes three times a week by their health-care providers. Changing life style by incorporating physical activities in everyday live was recommended for 43% of the participants. However, 90% of participants received no recommendation to engage in a specific exercise. Furthermore, seven participants (3%) reported they did not receive advice that stressed the important of exercises in everyday self-management practices.

Table 4.16
Extended exercise sub-scale (Q13)

13- Which of the following has your health-care team advised you to do? *	Responses	
	Yes	*No*
	n. (%)	*n. (%)*
Get low level exercise (such as walking) on a daily basis.	182 (87)	27 (13)
Exercise continuously for at least 20 minutes at least 3 times a week.	81 (39)	128 (61)
Fit exercise into your daily routine (for example, take stairs instead of elevators, park a block away and walk, etc.)	89 (43)	120 (57)
Engage in a specific amount, type, duration and level of exercise.	21 (10)	188 (90)
Other	1 (.5)	209 (99.5)
I have not been given any advice about exercise by my health-care team.	7 (3)	202 (97)

* Incomplete data

Monitoring blood glucose at home was recommended for 95% of the participants while monitoring urine glucose was recommend for 44% (see Table 4.17). However, health professionals did not advise 3% of the sample participants to monitor blood glucose at home.

Table 4.17

Extended blood glucose testing sub-scale (Q14)

14- Which of the following has your health-care team advised you to do? *	Responses	
	Yes	*No*
	n. (%)	*n. (%)*
Test your blood glucose using a machine to read the results.	199 (95)	9 (5)
Test your urine for glucose.	91 (44)	11 (56)
Other	2 (1)	206 (99)
I have not been given any advice either about testing my blood or urine glucose level by my health-care team.	7 (3)	201 (97)

* *Incomplete data*

Controlling glucose blood using medication is a critical component of diabetes self-management. Table 4.18 shows that oral diabetes medications were recommended for most participants (81%). However, 20% required insulin injections to control their blood glucose levels. Of these, 37 (18%) had one to two insulin injections per day and four participants (2%) received three or more insulin injections per day. Only one participant did not use medication to control blood glucose level.

Table 4.18
Extended medication sub-scale (Q15)

15- Which of the following medications for your diabetes has your doctor prescribed?*	Responses	
	Yes.	*No*
	n. (%)	*n. (%)*
Insulin injection 1 or 2 times a day.	37 (18)	172 (82)
Insulin injection 3 or more times a day.	4 (2)	205 (98)
Diabetes pills to control my blood glucose level.	171 (82)	38 (18)
Other	1 (1)	208 (99)
I have not been prescribed insulin or pills for my diabetes	1 (1)	209 (99)

** Incomplete data*

Items 16 to 20 asked participants to respond according to a seven day interval scale. These items enquired about diet, medication, and foot-care. However, question 17 (a & b) was included as a medication sub-scale in the A-SDSCA questionnaire, therefore, it is not included in this section of the results. When asked to specify how many days of the week they spaced their carbohydrate intake evenly during the day, participants responded that they did this infrequently (mean 2.6 days per week) (see Table 4.19). Foot-care activities were practiced on average six days a week by washing, two days a week through soaking, and three days a week by drying between the toes after washing. The overall mean for the extended foot care scale indicated that, on average, foot care was practiced on four days of the week.

Table 4.19
Responses to questions (16-20)

Item	Mean	SD
Q16. Space carbohydrates evenly through the day	2.63	2.40
Q18. Wash your feet	6.00	1.00
Q19. Soak your feet	2.27	2.73
Q20. Dry between your toes after washing	2.72	2.88
Q18-19-20 (overall)	3.68	1.90

Binary cut-offs. To explore participants' self-management practices, self-care activities were transformed into two self-management categories: satisfactory and unsatisfactory practices. As Table 4.20 shows, blood glucose testing (n = 179, 85% ≤ 4 days/week) and exercise (n = 98, 47% ≤ 2 days/week) were the least practiced activities. On the other hand, medication ((n = 155, 75% = 7 days/week), diet (n = 149, 71% ≥ 3 days/week), and foot-care (n = 118, 56% ≥ 3 days/week) were optimally used self-care practices.

Table 4.20
Participants' self-care practices level as binary outcome

Scale	Category	No. (%)[1]
Diet	≤ 2 days/week	61 (29)
	≥ 3 days/week	149 (71)
Exercise[2]	≤ 2 days/week	98 (47)
	≥ 3 days/week	109 (52)
Blood glucose testing[2]	≤ 4 days/week	179 (85)
	≥ 5 days/week	28 (13)
Foot care[2]	≤ 2 days/week	87 (41)
	≥ 3 days/week	118 (56)
Medication[2]	≤ 6 days/week	52 (25)
	7 days/week	155 (75)

[1] *Percentage is calculated based on the sample size of 210 participants*
[2] *Incomplete response rates*

Outcomes of Bivariate analysis. Independent samples t-tests with two-tailed significance were used to investigate associations between participants' characteristics and their self-management activities as revealed by sub-scales means. Several significant differences were identified in the participants' self-management practices. Adherence to diabetes medications was, on average, the most thoroughly applied self-management practice among participants (see Table 4.21). A close exploration of associations between exposure variables and medication self-management practice indicated that smoking status was a statistically significant factor. Medication self-management practices were, on average, significantly better in the smokers than non-smokers groups (between group mean difference = 1.16; p = .013). Among the sample participants, the number of smokers was 27 (13% of the sample) who were predominantly younger people.

Table 4.21
Medication sub-scale

	Mean	Diff[1]	t -value	*p* -value
Age				
< 65	6.22			
≥ 65	6.40	-.173	-.58	-.561
Gender				
Male	6.24			
Female	6.27	-.03	-.13	.894
Formal education				
No formal education	6.26			
Formal educated	6.19	.07	.22	.820
Income				
≤ 50,000	6.19			
> 50,000	6.33	-.138	-.61	.540
T2DM duration				
< 8 years	6.00			
≥ 8 years	6.38	-.36	-1.4	.163
Blood Glucose				
Controlled	5.86			
Uncontrolled	6.30	-.44	-1.08	.286
Smoking status				
Smoking	6.40			
Not smoking	5.24	1.16	2.65[2]	.013

[1]*Difference between groups means* [2]*Equal variance not assumed*

Table 4. 22 shows that blood glucose monitoring was associated with gender, income, and blood glucose control. Male participants scored lower on glucose monitoring practice than female participants (Diff -.775; p = .003). Those who had a lower income tested blood glucose less often than participants who had a higher income (Diff -1.16; p = .000). In addition, participants whose blood glucose was controlled were more likely to monitor their blood glucose level than those who had uncontrolled blood glucose level (Diff .886; p = .021).

Table 4.22
Blood glucose monitoring sub-scale

	Mean	Diff[1]	t-value	*p*-value
Age				
< 65	2.22			
≥ 65	2.34	-.120	-.345	.730
Gender				
Male	1.84			
Female	2.62	-.775	-2.99[2]	.003
Formal education				
No formal education	2.20			
Formal educated	2.45	-.249	-.679	.498
Income				
≤ 50,000	1.72			
> 50,000	2.89	-1.16	-4.613	.000
T2DM duration				
< 8 years	2.27			
≥ 8 years	2.22	0.45	.161	.87
Blood Glucose				
Controlled	2.89			
Uncontrolled	2.09	.886	2.32	.021
Smoking status				
Smoking	2.27			
Not smoking	2.03	.235	.599	.550

[1]*Difference between groups means* [2]*Equal variance not assumed*

Dietary practices were significantly different between the genders, blood glucose control, and smoking groups. Table 4.23 shows female participants were more likely to adhereto an appropriate diet than male participants (Diff -1.03; p = .000). Those whose blood glucose was controlled also scored higher in dietary practice compared to those whose blood glucose was uncontrolled (Diff 1.07; p = .001). As with medications, smokers were more likely to adhere to an appropriate diet than non-smokers (Diff 1.29; p = .000).

Table 4.23
Diet sub-scale

	Mean	Diff[1]	t-value	*p*-value
Age				
< 65	3.63			
≥ 65	3.45	.189	.611	.542
Gender				
Male	3.08			
Female	4.11	-1.03	-4.60	.000
Formal education				
No formal education	3.64			
Formal educated	3.34	.304	.939	.349
Income				
≤ 50,000	3.43			
> 50,000	3.79	-.358	-1.52[2]	.130
T2DM duration				
< 8 years	3.66			
≥ 8 years	3.56	.93	.37	.376
Blood Glucose				
Controlled	4.51			
Uncontrolled	3.43	1.07	2.23	.001
Smoking status				
Smoking	3.76			
Not smoking	2.46	1.29	3.81	.000

[1]*Difference between groups means* [2]*Equal variance not assumed*

With regard to regular exercise, Table 4.24 shows that younger participants (<65 years of age) were, on average, more likely to exercise than older participants (mean 3.15 vs. mean 2.39). The difference between these means was almost statistically significant at $p < .05$ ($p = .063$). Those who had been diagnosed with T2DM for less than eight years were also more likely to undertake regular exercise than those who had been diagnosed for a longer period of time (Diff .806; $p = .011$).

Table 4.24
Exercise sub-scale

	Mean	Diff[1]	t-value	*p*-value
Age				
< 65	3.15			
≥ 65	2.39	.757	1.86	.063
Gender				
Male	2.80			
Female	3.22	-.41	-1.37[2]	.170
Formal education				
No formal education	2.93			
Formal educated	3.48	-.55	-1.31	.190
Income				
≤ 50,000	2.89			
> 50,000	3.18	-.289	-.950[2]	.343
T2DM duration				
< 8 years	3.54			
≥ 8 years	2.74	.806	2.57	.011
Blood Glucose				
Controlled	3.35			
Uncontrolled	2.95	.393	.910	.364
Smoking status				
Smoking	3.09			
Not smoking	2.50	.597	1.33	.184

[1]*Difference between groups means* [2]*Equal variance not assumed*

Finally, Table 4.25 shows there was a significant difference between foot care activities practiced by younger (< 65 years of age) than older participants (Diff 1.91; $p = .005$). Female participants were more likely to engage in regular foot care practices than males (Diff -2.63; $p = .000$). Interestingly, participants who had received no formal education were, on average, undertaking foot care practices at a higher level than those who were educated (Diff 1.02; $p = .027$). Likewise, participants who had been diagnosed with T2DM for less than eight years undertook

more foot care activities than those who had diabetes for a longer period of time (mean 3.91 vs. mean 3.28). The difference between these means was almost statistically significant at $p < .05$ ($p = .075$). As with medication and diet, smokers were more likely to practice foot care than non-smokers (Diff 1.59; $p = .001$).

Table 4.25
Foot care sub-scale

	Mean	Diff[1]	t-value	*p*-value
Age				
< 65	3.69			
≥ 65	2.50	1.91	2.81	.005
Gender				
Male	2.14			
Female	4.77	-2.63	-9.49	.000
Formal education				
No formal education	3.65			
Formal educated	2.62	1.02	2.22	.027
Income				
≤ 50,000	3.72			
> 50,000	3.20	.519	1.56	.120
T2DM duration				
< 8 years	3.91			
≥ 8 years	3.28	.627	1.78	.075
Blood Glucose				
Controlled	4.06			
Uncontrolled	3.43	.630	1.32	.187
Smoking status				
Smoking	3.69			
Not smoking	2.09	1.59	3.28	.001

[1]*Difference between groups means* [2]*Equal variance not assumed*

Multivariate analysis outcomes

The results of linear regression analysis, the independent relationships between the various participants' characteristics and their total self-management score are presented in Table 4.26. Participants' age, gender, income, level of

education, length of time since diagnosis, level of glucose control , and smoking habit accounted for 25% of the variability in the total self-management score (R^2 .251). Table 4.26 shows that women were much more likely than men to undertake appropriate diabetes self-management (β .321; *p* = .000) and smokers were much more likely than non-smokers (β -.192; *p* = .004).

Other statistically significant associations were between income and the level of glucose control. Participants with an income greater than 50,000 Saudi Riyals were more likely than those with a lower income to undertake appropriate diabetes self-care activities (β .129; *p* = .055). Those with an uncontrolled glucose level were more likely than those with controlled glucose not to undertake appropriate diabetes care activities (β -.122; *p* = .054). After adjusting for all other characteristics, Age, level of education and length of time since diagnosis had little impact on total self-management scores.

Table 4.26
General participants' self-management practicies model

Predictors	B	SE B	β	p-value
Age ≥ 65	-.256	.222	-.082	.251
Female	.753	.173	.321	.000
Income > 50,000	.305	.158	.129	.055
Formal education	-.067	.181	-.027	.712
Duration ≥ 8 years	-.128	.161	-.052	.429
Glucose Uncontrolled	-.403	.208	-.122	.054
Smoker	-.684	.237	-.192	.004

Note: F= 9.30 ,P= 000 ,R Square= .251

Linear regression was the last analysis undertaken in Phase II of the study. The next section presents the results of Phase II.

Phase III – Factors affecting people with T2DM self-management activities

Overview

The aim of the third phase of the study was to explore factors that affected T2DM self-management from the perspectives of T2DM participants and their health-care providers. In total, 24 T2DM participants and 12 health-care providers were recruited and individually interviewed in the study locations. Interview raw data were analysed using quantitative thematic analysis and guided by the Chronic Care Model (CCM), which was the theoretical framework of third phase. A detailed description of the outcomes is presented in the next sections.

Participants characteristics

The 24 T2DM participants were recruited from participants who participated in Phase II of the study. Males and females were equally represented. All participants in this group were Saudi nationals. The age was between 30 and 70 years, mean age of 51 years. The mean diabetes duration since T2DM diagnosis was approximately eight years (minimum 2 years; maximum 30 years). Overall, 14 (58%) participants had a yearly tax-free income of 25,000 Saudi Riyals (approximately US$6,600) or less, while the remainder (42%) had an income of approximately 50,000 Riyals. Four participants had no formal education, three attended primary school only, seven had completed high school at the end of year 10, four completed high school at the end of year 12, and four had a university education. Measurement of HbA1c level revealed a mean value of 9.7 %.

The second group of the participants was consisted of 12 health-care providers, six were chronic care clinic nurses (RN) and six were doctors (GPs). Male and females were equally represented among RNs and GPs. Seven participants were Saudis (6 RNs and 1 GP). Two non-Saudi GP's were Arab participants who spoke Arabic as their first language (1 Syrian and 1 Egyptian). The remaining three (2 Indians and 1 Pakistani) were able to understand most spoken Arabic, but they did not speak the language fluently.

Both RNs and GPs had on average of 13 years of general experience and an average of four years of specialized diabetes care experience. None of the participants had attended any formal specialized training in diabetes care. However, 11 of the 12 participants had undertaken continuing in-service education in general diabetes management. Two RNs had attended a one month diabetes education course. The remaining nine had attended courses lasting three days or less.

The quantitative thematic content analysis

General themes. Relevant statements made by participants were organised into sub-themes relevant to elements of the CCM components and general themes (CCM components). For example, statements about the "need for medications" were classified into "medication availability" and "general health-care". The quantitative thematic content analyses resulted in 365 statements organised into six general themes identified in the Chronic Care Model.

Table 4.27 shows that T2DM participants made a total of 233 statements in total (male 118; female 115) and health-care providers made 132 statements in total.

"Community" was the most frequently mentioned factor (100 statements, 27%) while "health system" was the least mentioned factor (38 statement, 10%). Details of identified themes that correspond to various Chronic Care Model components are presented in the following sections. Frequencies for statements pertaining to the sub-themes "health system"; "delivery system"; "decision making"; "clinical information system"; "self-management"; and "community" are presented in tables in following sections. Direct quotes from raw data are presented in Chapter 5 to illustrate specific points.

Table 4.27

Numbers of factors affecting self-management outcomes

Theme	**T2DM Participants**		**Providers**	**Total**
	M	*F*		*No (%)*
Health system	7	5	26	38 (10)
Delivery system	26	10	36	72 (20)
Decision making	15	4	22	41 (11)
Clinical Information System	20	18	12	50 (14)
Self-management	19	26	19	64 (18)
Community	28	55	17	100 (27)
Total	115	118	132	365 (100)

Sub-themes. Table 4.28 shows the frequencies for the sub-theme statements that come under the "health system" domain. "Facilitating care coordination within and across organizations" was the main concern for the participants (14 out of the 38

responses). With the exception of the care coordination theme, there was little agreement among T2DM participants and health-care providers about what factors are important. T2DM participants were most concerned about "medication availability" (5 statements) and "safety" (3 statements). Health-care providers were concerned about "supporting improvement activities" (5 statements), "promotion of comprehensive system change" (3 statements), "open and systematic handling of errors" (5 statements), and "providing incentives based on quality of care" (3 statements). Incentives in this context did not exclusively mean money; rather, it included recognition for effort and continuity of the physician in the same workplace.

Table 4.28

Health system related themes outcomes

Sub-theme	**T2DM participants**		**Providers**	**Row Total**
	M	*F*		
Support improvement	0	0	5	5
Promote comprehensive system change	0	0	3	8
Open and systematic handling of errors	0	0	5	13
Provide incentives based on quality of care	0	0	3	16
Facilitate care coordination across organizations	3	1	10	30
Medication availability	2	3	0	35
Safety	2	1	0	38
Cumulative column total	7	5	26	

Based on the participants' views, "delivery system" was an important factor that affected self-management. Table 4.29 shows that "distributing tasks among team

members" (27 statements) and "using planned interactions to support evidence-based care" (18 statements) were the most common concerns for participants with T2DM and health-care providers. Health-care providers identified case management service as a factor that could enhance self-management outcomes. However, health-care providers perceived "case management" as a means of improving communication with acute care organisations, rather than directly supporting T2DM participants' needs, such as self-management education. Interestingly, "the need to give care that T2DM participants understand and that fits with their cultural background" was important to T2DM participants but not health-care providers. Further details are presented in Chapter 5.

Table 4.29

Delivery system outcomes

Sub-theme	**T2DM participants**		**Providers**	**Row Total**
	M	*F*		
Distribute tasks among team members	10	5	12	27
Use planned interactions to support evidence-based care	7	0	11	45
Provide clinical case management services for complex patients	2	0	6	53
Ensure regular follow-up by the care team	4	0	7	64
Give care that patients understand and that fits with their cultural background	3	5	0	72
Cumulative column total	26	10	36	

Table 4.30 shows "decision-making" related themes. Two of the four themes were identified by health-care providers only while the remaining two themes were shared among participants. These themes were "embedding evidence-based

guidelines into daily clinical practice" (5 statements) and "using proven provider education methods" (7 statements). Abstracted data indicated that T2DM participants wanted urge health-care providers to "share evidence-based guidelines and information" with them in such a way that encourages their active participation. Overall, there were four "decision making" themes that were mentioned 41 times in the raw data.

Table 4.30

Decision making outcomes

Sub-theme	**T2DM participants**		**Providers**	**Row Total**
	M	*F*		
Embed evidence-based guidelines into daily clinical practice	0	0	5	5
Share evidence-based guidelines and information with patients to encourage their participation	8	2	1	16
Use proven provider education methods	0	0	7	23
Integrate specialist expertise and primary care	7	2	9	41
Cumulative column total	15	4	22	

The clinical information system domain encompassed five themes (see Table 4.31). Among them, "providing timely reminders" for participants and providers (21 statements); "facilitating individual patient care planning" (15 statements); and "sharing information with patients and providers to coordinate care" (10 statements), were the most identified themes. The need to "take proactive intervention" was not mentioned by health-care participants. The need to have a "clinical information system" that facilitate identifying T2DM subpopulations for the purpose of providing proactive care was identified only once by the providers' group.

Table 4.31

Clinical information system outcomes

Sub-theme	T2DM participants		Providers	Row Total
	M	*F*		
Provide timely reminders for providers and patients	8	8	5	21
Identify relevant subpopulations for proactive care	0	0	1	22
Facilitate individual patient care planning	7	5	3	37
Share information with patients and providers to coordinate care	4	5	1	47
Monitor performance of practice team and care system	1	0	2	50
Cumulative column total	20	18	12	

Self-management is the fifth domain of the Chronic Care Model that represents the core issue for this study. There were three sub-themes and 64 statements related to self-management (see Table 4.32). Table 4.32 shows that T2DM participants were concerned about “the need to emphasise the patient's central role in managing their health” (32 statements) and to “use effective self-management support strategies” (27 statements). However, health-care providers did not identify “the need to organize internal and community resources to support self-management outcomes”. This theme was identified by T2DM participants only (5 statements).

Table 4.32

Self-management outcomes

Sub-theme	T2DM participants		Providers	Row Total
	M	*F*		
Emphasize the patient's central role in managing their health	10	11	11	32
Use effective self-management support strategies	7	12	8	59
Organize internal and community resources	2	3	0	64
Cumulative column total	19	26	19	

As mentioned earlier, participants' comments were most frequently related to sub-themes within the "community" domain (see Table 4.33). Table 4.33 shows that of the 365 statements, 100 were community concerns. "Cultural factors", "partnerships with community organizations", and "effective community programs" were the subject of 23, 22, and 16 statements respectively. Environmental factors described as obstacles participants faced on a daily basis included blocked streets, continuous road work and lack of designated areas for walking near the participant's house. The remaining three themes in this domain were represented 13 statements. Interestingly, health-care providers were more concerned about "cultural", "family", and "environment" issues than T2DM participants.

Table 4.33

Community component outcomes

Sub-theme	T2DM participants		Providers	Row Total
	M	*F*		
Effective community programs	5	9	2	16
Partnerships with community organizations	6	9	7	38
Advocate for policies to improve patient care	3	5	5	51
Cultural	9	13	1	74
Family	3	9	1	87
Environment	2	10	1	100
Cumulative column total	28	55	17	

Interviews with health-care providers were concluded by asking them to recommend ways to improve self-management outcomes. Their recommendations or factors to be considered are presented in Figure 4.2. Although all mentioned recommendations that are critical to successful self-management, “improving the contents and delivery strategies of education programs”, “enhancing the patient-provider relationship”, and “improving the knowledge and understanding of health-care providers” were the most common recommendations, participants did not acknowledge their role in addressing these factors for official and systemic intervention. More importantly, recommendations are mainly under the control of health-care decision makers. However, health-care providers did not identify “unsupportive management” as a critical issue in this context (3 statements). Age was mentioned in this context as factor affecting patients’ ability to interact with health-providers advice. There is no intervention to modify age but health-providers may modify their advice to suite patient’s age. These recommendations are examined further in the discussion chapter.

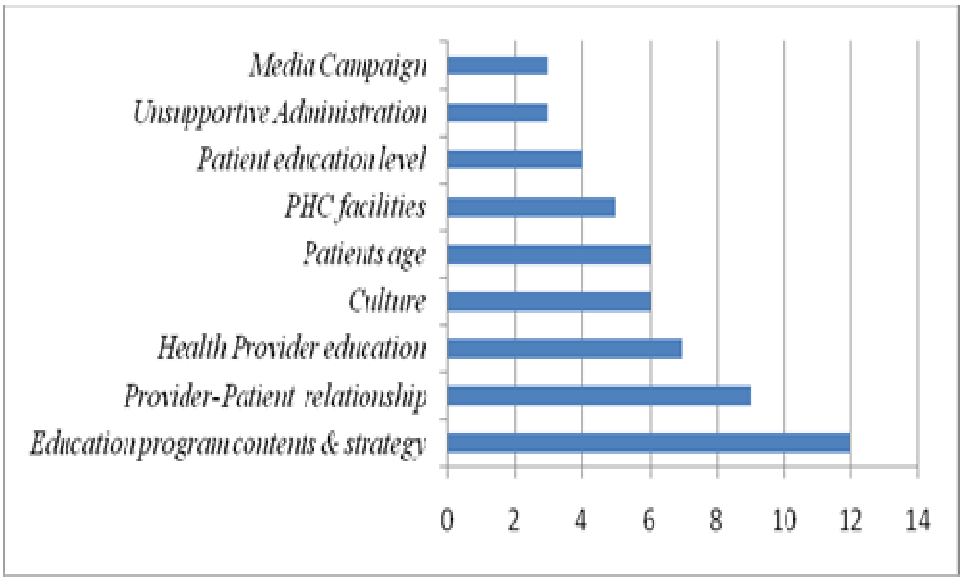

Figure 4.2 Health providers' recommendation to most needed improvement interventions to improve self-management outcomes.

CHAPTER 5 : DISCUSSION AND CONCLUSION

Introduction

This chapter highlights essential points made in previous chapters especially those linked to the study findings. The chapter consists of the following sections : the main findings with regard to the study questions; a discussion of the study sample and context; a discussion of the findings of Phase I, the A-SDSCA, with reference to the extant literature; a discussion of the findings of Phase II, diabetes self-management activities, with reference to the extant literature ; a discussion of the findings of Phase III, primary health-care support, with reference to the extant literature; the strengths and limitations of the study; implications for practice; and recommendations for future research.

Summary of the Main Findings

Primary Study Question

What factors affect the self-management practices for people with T2DM in Almadinah, Saudi Arabia?

The factors that affected the self-management practices of people with T2DM in Almadinah were classified as patient-related and non-patient-related. The patient-related factors assessed participants' self-management practices using the Arabic Summary of Diabetes Self-Care Activities questionnaire and showed female gender (.321, p = .000) and higher income (.129, p = .050) were positively

related_factors, while high blood glucose level (−.122, p = .050) and smoking (−.192, p = .004) were negatively related self-management factors. Overall, these factors accounted for 25% of the variation in everyday self-care practices.

Non-patient-related factors were multidimensional. The health-care system was the main origin of numerous factors that affected self-management outcomes. Examples of these factors are care coordination within or among organisations, availability of medications and safety. From the health-care providers' perspective, the limitations of the system, including lack of support to improve activities, promoting a comprehensive change in the system, and open systematic handling of errors and providing incentives based on the quality of care, appear to work against improving self-management outcomes. Although identifying why such limitations existed in Saudi health-care system was beyond the scope of the current study, it appeared there was a problem in health planning in term of managing chronic diseases. Lack of detailed plans and documented chronic disease care programs were both indicators of health planning limitations.

Similarly, several limitations in the design of the delivery system in primary health-care were noted. These limitations were inefficient distribution of tasks among team members, lack of planned interactions to support evidence-based care, inclusion of evidence-based guidelines into daily clinical practice, use of demonstrated provider education methods and sharing evidence-based information with patients to encourage their participation. Apparently, these limitations negatively affected the current self-management intervention. Further, the participants identified clinical information system-related factors such as

inability to provide timely reminders to providers and patients or to facilitate individual patient care planning affected self-management outcomes.

Other factors include community, family, environmental and culture-related factors. Community was a significant factor hindering self-management, based on issues such as the availability of effective community programmes, partnerships between primary health-care centres and community organisations and advocating for policies to improve patient care. Cultural factors and family-related factors were strongly evident in the current study. Environmental factors described as obstacles participants faced on a daily basis included blocked streets, continuous road work and lack of designated areas for walking near the participant's house.

The Study Sample and Context

The samples for the current study were collected from three primary health-care centres in Almadinah. These three centres comprise the main primary health-care facilities for this city, and they provide optimum primary health-care services including diabetes health-care that follow the Ministry of Health standards for self-management interventions. Therefore, these primary health-care centres represent public chronic diabetes management programs (Al-Ahmadi & Roland, 2005). One of the first findings of the study was the variations among the study locations despite all being main primary health-care centres (PHCC). The

parameters that varied were the number of patients, workforce strength and health-care provided. The number of workers varied considerably among the locations. Further, the number of workers in PHCC2 was 26, while that in PHCC3 was 46.

The scope of the project did not allow a complete analysis of the reasons for these variations. There could have been some administrative issues that led to the variations but these issues were not explored in the current study. Since the study was about self-management, the number of non-Arab physicians in the study locations was important. Significantly some non-Arab physicians did not speak Arabic clearly, which raises concerns about physician-patient communication. Diabetes management relies mainly on the patient's ability to follow the physician's advice (Lorig, 2003). Therefore, in cases where the physicians had limited or no ability to speak the patients' language, there is no guarantee that the patient understood the self-management advice and information provided.

Although all the participating centres operated a chronic disease clinic, non-specialist nurses managed these clinics. Health education was provided by nurses, who were not trained as health or diabetes educators. Further, the general consensus among health-care provider participants was that the Ministry of Health did not provide guidelines for diabetes self-management education other than a form that contains a table identifying the topics that should be discussed with patients. There were no detailed instructions on how to deliver these topics. Health-care providers at PHCC2 were proactive and developed their own self-

management guidelines. The structure of these guidelines was based mainly on their learning from the conferences they had attended. Therefore, there were variations among provided self-management interventions in participating health-care centre. It was interesting to note how health-care providers were proactive and tried to close the gap. However, it was not clear why top management of primary health-care did not noticed that and at least distribute available guidelines to unify standard of diabetes self-management interventions among PHCC's. It is worth exploring the role of top management in advancing primary health-care in future studies.

Discussion of Phase I

It was necessary to create an Arabic language instrument to measure diabetes self-management practices because none was available at the time the project began. Several English language instruments were available such as the Self-Report Measure of Compliance Scale (Cerkoney & Hart, 1980) and the Diabetes Regimen Adherence Questionnaire (Brownlee-Duffeck et al., 1987). The SDSCA (Toobert et al., 2000) was the preferred instrument for the study because it had acceptable psychometric properties, it was easy to use, and it measured specific domains of self-management. Most importantly, it takes only a few minutes to complete.

The instrument was chosen for the study in the beginning of 2008. The positive characteristics of the SDSCA motivated other researchers to use it. A

literature revealed that about 20 studies had used the instrument by mid-2010. Furthermore, the instrument has been translated into Spanish and Chinese (Vincent et al., 2008b; Xu et al., 2008). On that basis the researcher decided that the SDSCA (Toobert et al., 2000) was the most appropriate instrument to use to measure diabetes self-management practices for the current study. Its potential utilisation among Arab populations either in the Middle East or any other part of the world might need further validation because of differences in Arabic dialect and cultural variation such in case of Arabs who lives in the America and Australia.

The translation of the study instrument dealt with two languages from different linguistic groups. From a linguistic stand, the target language was Arabic, which is a Semitic language, while the source language was English, an Indo-European language. These languages differ from each other syntactically, morphologically and semantically (Elkateb et al., 2006). Bahameed (2008) directed researchers who plan to translate between Arabic and English to consider several factors that affect the quality of translation. These factors are: the conceptualisation of culture; emotiveness, where the intention of the original writer is hidden in the text; untranslatability, where no equal meaning to the original word is available in the translated language; and the translator.

Due to the possible change in context after translation, it was crucial to identify and follow a standard method to translate the SDSCA into Arabic. Birbili (2000) suggested that detailed information about each step of the translation process needs to be provided. To satisfy these requirements, this study adopted the

World Health Organization (WHO, 2008) steps of translation and adaptation of instruments. Detailed information on how this study processed the translation was explained in Chapter 3. Briefly, the process started with forward translation by an independent professional translator and ended with back translation by another independent professional translator. Two expert panels that included health professionals and patients with T2DM took part in the translation process.

The Arabic SDSCA version revealed higher reliability and validity scores than the original version. The mean inter-item correlation for the diet scale was the same for the original instrument and the Spanish version (.64), while the Chinese version had one item in the diet scale that did not allow comparisons between the Chinese and Arabic versions. The Arabic version has a score of .89 for the diet scale inter-item correlation. The average inter-item correlation increased from .47 for the original instrument, to .72 for the Spanish version, .73 for the Chinese version and .85 for the Arabic version.

The exercise scale inter-item correlation scores for the original, Spanish and Chinese versions were .63, .69 and .69, respectively, while the Arabic version's score was .83. Cronbach's alpha was the same for the Spanish and Chinese translated versions (.68), while it was .76 for the Arabic version. The test-retest score varied from .40 for the original instrument to .91 for the Arabic version.

With regard to factor analysis, the PCA revealed four components with eigenvalues exceeding its criteria in the parallel analysis, which supported

retaining these four factors. In comparison with the original instrument, the latter had three factors that explained 70–80% of the variance considering that the foot-care scale was not included in the original instrument when the factor analysis was performed. Similarly, the Spanish version had three components accounting for 61% of the SDSCA variance, while the Chinese version had five components accounting for 90.9% of SDSCA outcome scores. The method of rotation may affect the number of components identified. In the original and Spanish versions, Oblimin rotation was used. The original, Spanish and Chinese studies examined the Scree plot diagram in order to determine how many components are to be retained, while the current study used parallel analysis to precisely define those components.

To conclude, comparing the results of the Arabic SDSCA with the Chinese and Spanish versions, the Arabic version used in this study demonstrated greater reliability and validity. Further, it is anticipated that the form of Arabic language utilised in the A-SDSCA would facilitate utilisation of the instrument to serve all Arab-speaking populations regardless of nationality taking into account the potential need for further validation.

Discussion of Phase II

Low level of glycaemic control

HbA1c indicated that only 30 (14.7%) of participants had controlled blood glucose whereas 174 (85.2%) participants had an uncontrolled blood glucose.

Controlled was defined as HbA1c level equal to or below 7 % (ADA, 2008). In comparison to other Saudi studies, there were fewer individuals who had controlled blood glucose level. For example, Azab(2001) found 21% of the sample had excellent blood glucose control (FBG, 4–6 mmol/L). Further,Qari (2005) found 54% (108 participants) of the sample had controlled blood glucose control. The former study utilised the FBG level rather than HbA1c, which was used in the current study. In contrast, Qari (2005)used wide range of HbA1c levels (6 %–8 %) to identify controlled blood glucose, which enable those who had HbA1c levels above 7 % to be included exposing the result overestimation.

Overall A-SDSCA outcome

The self-management practices of participants were measured using the A-SDSCA measure. The mean of the medications sub-scale (mean, 6.26, SD = 1.6) was the highest among all the instrument sub-scales. Clearly, this score reflects a high level of dependence on medications. The fact that the study participants demonstrated low levels of compliance with most other self-management practices indicates that they had some challenges preventing them from undertaking recommended self-management practices in such a way that moderates their blood glucose levels and minimising the possibility of developing the undesirable complications of the disease. The fact that only 15% of participants had controlled glycaemic level is strong evidence supporting the need for effective diabetes self-management. The findings reflected serious limitations

in the way T2DM self-management is promoted and enhanced in the various study locations.

Participants reported that they did not practice healthful eating habits at all times. On average, they followed their healthful eating plan 3.48 days per week (SD = 2.1), which did not change significantly when participants reported their practice over one month (mean, 3.58, SD = 2.1). The diet scale mean in this study was 3.6 (SD = 1.7), which reflected how often participants adhered to their healthful diet practice on a weekly basis. Estimating the mean alone may not give a clear understanding of the situation, especially when the percentage of participants adopting a specific healthful practice is to be determined.

Only 12% of the participants reported adhering to optimal healthful eating practice (seven days a week). Low percentage may indicate how hard it is to maintain a healthful diet. However, self-management situation will be incomplete without clarifying the role that tradition plays in healthful eating habits among Saudi people. In Arab countries, social connections are very strong; therefore, people attend almost all social gatherings that they are invited to. Consequently, most people have little control over their diet because sharing traditional food with other people in the gatherings or even with the family is the only option (AlQuaiz & Tayel, 2009). One of the most well-known dishes prepared for social gatherings in Saudi Arabia is *kabsa*, which is made of rice and lamb. Kabsa is prepared by cooking the rice and the lamb together. Therefore, the cooked rice is full of animal (lamb, Camel) fat. This practice is similar to what Jordan and Jordan (2010) described about the strong connection between Filipino people and

rice as a carbohydrate source. In the Arab context, there is strong possibility that traditional, social, and cultural practice make it difficult for diabetes patients to maintain optimal diet practice. Moving in time from traditional to modern foods, Saudi Arabia has experienced an infestation of Western fast food chains such as McDonalds, Kentucky Fried Chicken, and Pizza Hut. Although the cuisine is quite different from that of the past, it is similar in its percentage of fat.

Exercise was another form of self-management measured in the study. The exercise scale mean was 3.02 (SD = 2.17); 17.4% of the participants indicated they exercised for at least 30 minutes (mean, 3.34; SD = 2.3) and 11.4% participated in specific forms of exercises during the last seven days of the study (mean, 2.6; SD = 2.3). Exercises rates were lower than those reported by a similar study in Asia such as Xu et al., (2010) who reported 40 % of Chinese participants kept up healthful exercise practices. In general, daily exercise is not widely practiced by the populations in the Gulf Cooperation Council countries (Mabry, Reeves, Eakin & Owen, 2009). There are numerous potential factors contributing to low physical exercise among the people, for example, hot weather, lack of available walking areas, and lack of active life style programs in general.

The Saudi percentage was even lower than that for the Korean population. Lee et al., (2009) reported that approximately 61% of Korean people with T2DM received specialised care, and 54% of those who visited a general practitioner were maintained recommended exercise practices. One of the possible reasons for poor exercise practices among the current study participants could be their age. Taking into account that 18% of the participants were over 65 years of age, they

may not be able to perform regular exercise due to poor health, or they do not have the assistance they need to practice. Although this appear to be an ageist statement, it average life-span in Saudi Arabia must be considered. According to the World Bank (2012), the life expectancy of a Saudi born in 2010 is 74 years, whereas a child born in Australia has an expected life-span of 82 years. This discrepancy is likely to have been greater 65 years ago; therefore, it is likely that 65 year olds in Saudi Arabia are further along in their life cycles than their Western counterparts. In other words, the 65 year old Saudi is older than the 65 year old Australian. Approximately 17% of the participants had retinopathy, which may have also been an obstacle for safe exercise. Aside from the patient characteristics, low exercise practices among T2DM participants could be due to the influence of culture. Saudi Arabian culture is unlike the Asian countries that have cultures immersed in activities, such as yoga and Tai Chi (Musaiger et al., 2011).

Blood glucose monitoring was assessed in Items 5 (mean, 2.4; SD = 2) and 6 (mean, 2; SD = 1.8). The overall scale mean was 2.2 (SD = 1.9) indicating that blood glucose monitoring was the least-practiced self-management activity. Different predisposing factors might influence this result. These factors may include, but are not limited to the participants' low level of literacy; their inability to manage blood glucose monitoring devices; their inability to afford monitoring devices and their disposable components such as providing blood sticks and their potential passive approach towards T2DM self-management. The latter is very important because Saudi health-care services are free for citizens. There is a general view among health professionals participants that patients may rely on

health-care providers to perform blood glucose monitoring and most other aspects of diabetes care. There is, however, no Saudi-based research to support this claim.

Foot-care practices was assessed in Items 7 (mean, 3.7; SD = 2.6) and 8 (mean, 3.3; SD = 2.6). The foot-care sub-scale overall mean was 3.4 (SD = 2.37), which was surprisingly low considering the study was conducted in a Muslim community, where participants wash their feet up to five times a day as a part of their preparation to pray. Apparently, health-care providers might need to take further step in explaining how to perform foot-care to people who have diabetes including the difference between washing for prayer and proper care of the feet.

Among the participants, only 27% reported checking their feet in the last seven days, indicating that they did not recognise their daily feet wash for prayers as a form of checking their feet. The other item in this sub-scale asked participants how many of the last seven days they had inspected the insides of their shoes. Participants' responses may also have been affected by Saudi culture because people in Saudi are accustomed to wearing sandals rather than shoes. Sandals do not need careful inspection because they are not closed around the foot. People can discover any foreign body or tear easily without the need for careful inspection. Therefore, participants may have reported low scores for both items in the foot-care sub-scale.

The overall mean of the A-SDSCA was 3.7 (SD = 1.15) which was lower than the mean score reported in American studies. For example, Rosland et al., (2009) reported that the overall reported mean of SDSCA self-management

compliance among men as 4.13 and that of women as 4.27. Several factors may have led to the difference between Rosland et al., and the current study including the context and culture of the patient-related factors and provider-related factors mentioned earlier.

As mentioned in Chapter 3, participants' level of self-management practices was based on the ADA diabetes care guidelines (2008) and a thresholds identified by Khattab et al., (2009). Khattab et al. (2009) study was conducted in Jordan, where the culture and context are similar to Saudi Arabia. Therefore, comparing the outcomes of the two studies could highlight commonalities among the T2DM population in the two Arab countries.

Whereas the results of the current study showed that 71% of Saudi participants followed their recommended diet less than three days/week, Khattab et al. (2009) found that approximately 81% of Jordanian T2DM patients did not follow their recommended diet plan. Similarly, 68% of the participants in the Jordanian study did not achieve the recommended physical exercise threshold compared to 47% expressing fewer than two 2 days/week) seen in the current study. The recommended physical exercise threshold was attained by 109 (52%) of the current study participants (total of 207 responses).

In addition, Khattab et al. (2009) reported that 38% of their Jordanian participants tested their blood glucose at home five days or more per week, whereas only 13.3% of the Saudi participants did so. However, comparisons between the two studies may not yield an accurate interpretation because

participants were classified based on whether they performed blood glucose testing for five days or more. Therefore, those who were advised by their health-care providers to perform blood glucose testing less than five times a week could be wrongly classified as not performing at the recommended standards. In the current study, there were 85.2% of participants reported performing blood glucose testing four days or less in a week, which indicate low performance as recommended by ADA 2008 medical diabetes care standards.

Compliance with medication was high in both studies. Khattab et al. (2009) reported that 91 % of the participants were taking their medications as recommended and 75 % of the participants in the current took their diabetes medications as recommended by their physician over the last seven days. In Western countries such as the US and Australia, people prefer to take medication for any health problem, which is easy, rather than change their own behaviour, which is much more difficult (Hayes et al., 2006; Dickinson et al., 1999; Murphy et al. 2003). It might also accords with the issue mentioned previously that Saudi people are likely to act passively and give responsibility for the management of their diabetes to the PHCCs whose services are free, rather than taking individual responsibility. This issue may need further exploration in future research. Most importantly, it will be important to know how Saudi patients' characteristics such as educational background, health literacy, and numeracy, and gender may increase or decrease dependence on the health provider as the decision maker in the care plan.

Socio-demographic predictors

Most participants in the second sample (81.9%) were younger than 65 years of age. For the purpose of this study, 65 years was chosen to represent the threshold of a patient's ability to practice self-management without significant help from others as explained earlier. There was no empirical evidence to support this assumption. The researcher chose the age grouping for statistical analysis of the current study data. Eighteen per cent of the participants fell into this category. In comparison with other Saudi studies, current study had participants of a similar age group. For example, the mean age of men and women in the study conducted by Abdelmoneim and Al-Homrany (2002) was 59.4 and 53.8, respectively.

Further, mean age of male participants in Elzubier's (2001) study was 54.6 ± 12.6, while participants in Al-Hussein's (2009) and Qari's (2005) studies had a mean of 50 ± 14 years. Therefore, the participants of the current study were similar in terms of age to those of previous Saudi diabetes studies. On the basis of previous comparisons between the current study and other Saudi studies in the field of diabetes health management, there were no significant differences between the sample's characteristics. Therefore, using the purposeful sampling approach did not greatly reduce the chances of drawing a representative sample.

In the current study, approximately 34% (n = 70) of the participants had no formal education, while 139 (66%) had various levels of formal education, ranging from primary school to university education. It should be noted that the absence of formal education does not necessarily mean that people were illiterate or innumerate. The percentage of participants who lacked formal education in the

current study was low in comparison with other Saudi studies. For example, 50.5 % of T2DM participants in Al-Khaldi and Khan (2002) had no formal education. Literacy was explored in the current study because it can negatively influence the patient's ability to follow through with his or her self-management plan (White et al., 2009), thus, affect his or her satisfaction with the treatment plan (Biderman et al., 2009).

Just over half of the participants (55%) had a low income. Based on the literature reviewed, none of the previous studies included income as a predictive variable within the Saudi context. A possible explanation for this limitation in previous studies could be that the public health-care system is free for all citizens. This privilege may somehow have encouraged researchers to eliminate income as a possible factor affecting diabetes self-management.

However, from a diabetes management perspective, Saudi health-care free services do not prevent income status from effecting on T2DM self-management outcomes. For example, people who have diabetes, in most cases, need to have regular blood glucose monitoring. Although the Saudi public health-care system provides free health services, it does not provide a blood glucose monitor for all T2DM patients who want to check their blood glucose level. Therefore, those who do not have adequate income and are not able to visit the health-care centre regularly will miss out on the opportunity to receive, what is considered in Western countries to be standard diabetes management.

Internationally, low income has been identified as a risk factor preventing the attainment of recommended self-management practices (Levine et al., 2009). Having low income restricts patients' ability to access health-care services and purchase specialised devices. Low income, or financial strain, also acts as a proxy measure of the experience of life-stress, which is associated with increased morbidity and mortality across the life-course (Commission on the Social Determinants of Health, 2008).

In the current study, bivariate analyses showed female were more likely to perform blood glucose monitoring. Blood glucose monitoring was negatively correlated with low income, which may highlight the need for the low-income population to be supported by services in the Saudi health-care system. Analysis of other self-management sub-scales revealed that more women, people with controlled blood glucose and smokers adhered to diet. Possible explanations for better dietary practices among women could be that they are more likely to take care of their diet than men (Anschutz et al., 2008). With regard to smokers in the current study, the number of smokers was 27 (13% of the sample) who were predominantly younger people. Therefore, they might not be involved in social gatherings to the same extent as older men, thus, they do not have to eat the unhealthful diet of rice and red meat that is offered during these events. Another possible explanation could be that smoking decreases their appetite to consume food (Mineur et al., 2011). However, previous possible explanations do not avoid the possibility that younger people would be more likely to eat at fast food restaurants.

Interestingly, women, people with no formal education and smokers showed higher self-management practices in different sub-scales. However, considering the study context and culture, these outcomes were expected by the researcher. In particular, women were expected to follow health providers' recommendations because they could be described as a dependent group (Shad, 2009). As mentioned earlier in the introduction and literature review chapters, the culture, social norms and religious commands encourage people to follow people who are in higher positions in terms of education and religious knowledge. Consequently, female participants and those who had no formal education were likely to follow their health-care providers' recommendations.

Health-care provider recommendations

Health-care providers' recommendations were measured through the extension of the A-SDSCA questionnaire. Although this part of the questionnaire was not validated after translation, the questions were employed to identify factors affecting self-management practices in T2DM people. Items 12, 13 and 14 of the A-SDSCA extension explored health-care providers' recommendations regarding diet, exercise and blood glucose testing, respectively.

Answering Item 12 of the questionnaire, 26% of the participants reported that health-care providers did not advise them to follow a complex carbohydrate diet. As mentioned earlier, *kabsa* which is made of rice and red meat is the main food of Saudi people. Thus, it seems that a considerable proportion of participants

are not told to change Kabsa cooking method by cooking the rice in water not to cook it together with the meat. Further, 54% of participants reported not receiving any advice about eating fewer sweets. These reports may actually reflect the quality of diabetes health education provided.

Regarding exercise, it was evident that recommendations fell short of meeting international standards of self-management education (ADA, 2008). The ADA (2008) recommends that health-care providers should advise their patients to exercise for at least 30 minutes three times a week. According to 61% of the participants, this advice was not given. More importantly, approximately 57% of the participants were not told to make exercise a part of their daily routine. The failure to deliver proper health education that enables patients to practice self-management activities may be considered as a major limitation to the current health education approach in primary health-care. Therefore, it is imperative to investigate health education and self-management programs in future research to verify these reported data. Moreover, it is also important to explore health providers' knowledge and competence to provide diabetes education.

The proportion of T2DM who did not receive any advice was lower in the current study than in other Saudi studies. For example, Al-Khaldi and Khan (2000) reported that 20% of diabetic patients did not receive health education. In the current study, the percentage of those who did not receive diet, exercise and blood glucose monitoring recommendations ranged between 2.4 and 3.3%. Consequently, the estimated percentage of participants who received health education in the current study is 96%. However, this high percentage does not

give any indication about the quality of recommendations provided. Further discussion about self-management interventions is provided in the discussion on Phase III.

Discussion of Phase III

Discussion of Phase III Methodology

The third phase of the study used quantitative thematic content analysis to explore factors affecting diabetes self-management from the perspectives of T2DM participants and health-care providers. Several methodological issues that arose in this phase will be highlighted in this section.

First, to confirm the reliability of A-SDSCA, the researcher and an independent health professional conducted quantitative thematic content analysis for five interviews that were randomly selected from the interview sample. The reliability of the quantitative thematic analysis showed acceptable properties.

Second, the use of the Chronic Care Model in this phase was supported by a strong rationale. For example, the model was designed to improve health-care system outcomes (Fiandt, 2006) and to guide re-designing health-care services (Coleman et al., 2009). Therefore, the researcher predicted potential benefits by utilising the model in this phase of the study. These benefits included attaining scientific outcomes based on the model as a coding system and exploring the Saudi primary health-care system from an international perspective.

Third, unlike previous studies, which were conducted to identify factors related to patients (Azab, 2001; Qari, 2005; Uddin et al., 2001), this phase of the study sought to identify factors that participants had no control over. The effect of cultural factors became apparent very early in this phase. For example, it was evident that invitation to participate in the individual interview at the end of the questionnaire did not encourage T2DM participants. Participants who took part in the interview were mainly invited verbally by the researcher and the research assistant. Not responding to written invitation may reflect Arabian culture, which discourages people from becoming involved in activities without first being personally invited. Another example was the researcher's inability to conduct individual interviews with female participants due to gender segregation in primary health-care centres. The researcher used to work in a general hospital that served the entire region and in his clinical experience he did not encounter any problem talking to female patients. A possible explanation for difference between primary care and hospital could be that the community culture was more strongly evident in primary health-care settings than in acute-care ones. Consequently, the assistance of a female researcher was crucial for this phase of the study.

Fourth, the involvement of parties most concerned with diabetes primary health-care (patients and providers) was expected to reveal different factors affecting self-management outcomes. Based on a review of the literature, no previous Saudi study had a similar sample composition nor had it explored different perspectives in the current study. Health-care participants were represented by general practitioners and nurses. Other health-care professionals were not included in the study due to time and budget constraints. Therefore, the

study utilised general practitioners and nurses for their significant inputs in T2DM patients' self-management outcomes. Future research may explore other health professional perspectives especially dietitians, social workers and pharmacists. Involving family members may add another significant dimension about their perspectives of diabetes self-management practices and the influence they make. As shown in a number of international studies (Rosland, 2009; Stone, 2005) families contribute a great deal to successful T2DM management.

Discussion of Phase III Outcomes

Utilised Chronic Care Model in the third phase facilitated systemic exploration about factors affecting T2DM self-management outcomes in Saudi Arabia, which is never used in previous Saudi studies. First, the findings indicated that the community presented a challenge to diabetes self-management. According to the participants, effective community programs were almost non-existence within the catchment of the health-care centres included in the study (16 statements). In fact, only one organisation, the Taibah Society, provides financial support to a limited number of patients to purchase needed materials, such as glucose meters. Patient utilisation of the services of the Taibah Society as charitable organisation depends on the physicians' personal relationships with the organisation's members. From the participants' perspective, primary health-care centres do not have partnerships with community organisations. Community organisations are great sources of self-management support but they require a partnership with health-care centres.

In general, the current study did not identify active community programmes providing interventions to support patients' self-management practices such as dietary consultation and peer-support. Taking into account that the study locations do not have multidisciplinary health-care team such as dieticians and professional diabetes self-management educators in conjunction with non-existence of supporting community programmes, there is reduced likelihood that people with T2DM will maintain their self-management practices. These issues were known to health providers "We [health-care providers] have no voice in setting diabetes management plans [on the national level], we know what works and what does not work". However, the international literature indicates that reducing diabetes health disparities will not be achieved without involving all parties in assessing and implementing health promotion plans (Giachello et al., 2003).

Participants also mentioned family issues, one participant explained his difficulty managing diet requirements as '...I eat with them [family members], thus no special diet for me, just eat and leave the table...'. Family support was identified as an essential part of successful persistent self-management outcomes (Burke et al., 2006; Rosland et al., 2009). Further, Fiandt (2006) included family support as one of the main topics to be covered through self-management education programs to enhance patient self-efficacy. And yet, T2DM services in Almadinah are targeted at individuals rather than families, which ignores the international trend to manage diabetes through different levels including: the patient, their family, their community, health organisations, and on the country level (Bodenheimer et al., 2002; Epping-Jordan et al., 2004).

Environmental factors such as blocked streets and road works in addition to unsafe designated areas for walking near people's homes, especially for women make it hard to people with T2DM to perform recommended physical activities. The social cognitive theory explains human behaviour as a result of human and environmental interactions (Bandura, 1977). Therefore, the above mentioned environmental barriers may not help enhancing participant's self-efficacy to practice walking as a form of self-management.

Second, the delivery system domain elicited 72 responses. Health-care providers reported their concern that general practitioners and nurses were taking care of every aspect of diabetes care in the absence of more specialised health-team members, which makes it impossible to implement the international recommendation where all health-care team members must actively participate in a chronically ill patient's management plan (Fiandt, 2006; Harris et al., 2005). Further, close examination of the workforce structure of the study locations showed that they do not have dietitians, social workers, diabetes specialists, case managers and professional chronic diseases health educators. This is a limitation in the delivery system for which the health-care providers are not accountable. Absence of specialised team members may reflect management's views of the efficiency of the health-care providers in the primary health team. Non-existence of multidisciplinary health-care team could lead to marginalisation of the missing members (Warm, 2007). If this is the reality, it may take a long time to improve Saudi primary health-care outcomes. Therefore, exploring different stakeholders' views worth exploration in future studies. One of the shortcomings of the current

study was the exclusion of health-care team members such as social workers and health educators from the study sample.

Within the delivery system domain, using planned interactions to support evidence-based care was a significant issue reported by the participants (18 statements). Updated guidelines were almost non-existent from the study locations. The participants reported they received guidelines for medically managing diabetes, but guidelines did not include self-management interventions. The limitations identified in the delivery system emphasises the need for further detailed exploration and evaluation of current interventions and their effects on patient outcomes, especially for those with chronic diseases such as diabetes. From an international perspective, incorporating self-management interventions is a crucial component of successful diabetes management (Norris et al., 2002; Warm, 2007). Therefore, it is imperative to restructure diabetes management to form holistic approach dealing with the disease and its' complications.

Third, in general, the findings within the self-management domain identified several issues that need further exploration and improvement. these include the need to emphasise the patients' central role in managing their health (32 statements) and the need to use effective self-management support strategies (27 statements). In contrast, it was a mistake to allow patients to have a central role in managing their own health. These providers believe that people with diabetes must simply follow their advice and recommendations. Changing health-care providers' paternalism in Saudi may need extensive work and time. Several strategies could be implemented to attain such change such as updating

curriculum of medicine schools to convey the message that patients has the right to decide what they want. In addition, incorporating clinical guidelines that stressed such point may produce quick improvements. According to the patients, the information they received from providers was largely about medical complications, such as gangrene and renal failure, which they regarded as negative.

The patients felt the negative approach puts them under great psychological pressure. For example, one T2DM participants stated '…health education is all about complications, as if I am not able to avoid them. Why do I need to stop enjoying my life, ...I am dying anyway'. Depression has a negative effect on self-management outcomes (Anderson et al., 2001; Brown et al., 2002; Jerant et al., 2005), and possible depression was associated with personal control, at least for some individuals in current study. Unfortunately current study did not include exploring depression among T2DM participants.

It is apparent that the biomedical model is dominant in the study sampling population. Unless the model is changed, at least in primary health-care settings, it is unlikely that efforts to manage chronic diseases such as diabetes will be successful (Anderson & Knickman, 2001; Bodenheimer et al., 2002a). It is imperative for program designers in Saudi Arabia to follow the international trend and adapt an empowerment model that fits into the Saudi context (Anderson and Knickman, 2001; Kravitz et al., 2003).

The study findings also revealed possible problems in health-care provider-patient communication, especially with the non-Arab health-care providers who are not fluent in Arabic. Even for Arab and Saudi health-care providers, the obstacle of poor communication may still exist. For example, one T2DM participant stated that '... doctors are busy and give repetitive instructions. Some of them don't listen to my complaints or even reply to my Salam [greeting]'. Other researchers have described communication limitations. For example, Jerant et al. (2005) explored patients' perceptions about barriers to active self-management. The researchers found that poor communication prevented effective utilisation of self-management interventions. Likewise, general practitioner-patient communication is positively correlated with controlled glycaemic level (Rose et al., 2009). The current study scope did not cover exploring level of practitioner-patients communication.

Physicians participating in the current study revealed the need to shorten their examination time, including the discussing self-management interventions, which consequently affected communication and their relationship with patients. They identified several underlying factors, for example, one physician stated that '... they [primary health-care management] are requesting me to consult all patients including those who have regular examination and emergency cases....do you think that I have the time and the ability to take care of chronic or diabetes patients'.

The effect of high workload on physicians was also evident in the feedback from one of the participating nurses, who stated ' ... some doctors just

write ‘same’ in the patient’s medical record and dispense medications’, this behaviour discourages patients to discuss their needs with their physician. Future research should investigate provider-patient communication barriers that limit health-care intervention outcomes in the Saudi Arabia.

Generally, published international recommendations emphasise the need for timely diabetes self-management interventions that consider behaviour change as the key outcome (ADA, 2008). The American Standards for Diabetes Self-management Education (Funnell et al., 2009) recommended the application of several requirements in the diabetes self-management education programme (DSME) structure, process and outcomes. For example, the DSME should be conducted by a group of stakeholders, including health-care professionals, people with diabetes and community members. The findings of the current study supported the need for more intensive exploration in self-management interventions and the development of appropriate policies and protocols at a local and national level. In comparison with international development in self-management interventions, Saudi health-care appeared to be in need for such interventions that enable people with T2DM to actively manage the disease. However, incorporating updated DSME in Saudi primary health-care settings is not an easy task. One of the major challenges that need to be dealt with is the dominance of medical interventions on the account of psychological and social ones. this is not a surprise taking into account marginalisation of health-care team members and dominance of medical doctors on health planning, management and diseases’ interventions.

Fourth, the clinical information system in the study locations was paper based, which includes diabetic patients' medical records, diabetes registries and a chronic diseases clinical logbook, all of which help appointment scheduling. Usually, patients have monthly appointments. Patient with T2DM who do not attend two consecutive appointments is called by the chronic-care clinic nurse and requested to visit the clinic to have their medical status checked. In addition, chronic-care clinic nurse sends a monthly record of newly diagnosed patients to the Ministry of Health update the National Diabetes Registry.

Based on this process, it could be concluded that the current information system in primary health-care meets several objectives such as identifying patients with diabetes and identifying individuals who need further or more advanced interventions. Whereas the use of a registration system was commonplace in the current study, Schmittdiel et al., (2005) found that only 47% of 1,040 surveyed American health organisations (hospitals & health centres) have at least one disease registry. Therefore, we could conclude that information system as a domain of the Chronic Care Model is implemented adequately in the study locations.

Fifth, in regard to decision making, the health-care providers reported limitations in integrating evidence-based guidelines into daily clinical practice and sharing these guidelines and information with patients. These concerns were somewhat similar to Al-Ahmadi and Roland (2005) study in Saudi Arabia. Although their study was undertaken more than six years ago, it is likely that these limitations persist, and the Saudi primary health-care system designers have

not yet overcome them. Delay in acknowledging and adapting health research recommendations could be potential area for future exploration.

Inadequate communication has negative consequences for both health-care providers and T2DM patients and their families. For example, one of the T2DM participants stated that '...previously, I went on daily walks for one month but nothing changed; thus, I stopped walking'. Unfortunately, it appeared that participant did not receive appropriate evidence-based advice, which would have encouraged him to effectively engage in daily exercise and maximised self-management practices. It is likely that many people with diabetes have the same experience; they do not understand the rationale for the suggested intervention and the evidence that it really does make a tangible difference. Therefore, health provider might be in need to learn how to deliver health-care messages. Another limitation in decision-making support health-care providers mentioned was the lack of ongoing professional education about diabetes management, including up-to-date self-management interventions. Health-care providers reported that the only opportunity for them to update their knowledge and skills was through symposiums and conferences.

These educational activities were mainly held on an annual basis, such as International Diabetes Day, however, attendance was not feasible for all due to staffing and funding constraints. Those who had previously attended these activities felt there was a gap between what was presented in these activities and everyday practices. For example, one health-care provider stated that '...theories are not applicable in reality; all lecturers were talking about a different world'.

Based on health providers' feedback, we could conclude that lecturers and presenters of current symposium do not relay on real diabetes cases rather than navigating medical text books.

It is important to note that the theory-practice gap is also evident in developed countries such as the US where about 20% of the health-care services provided are not evidence-based (Becher & Chassin, 2001). While providing evidence-based is clearly not an easy task, it is imperative to close the evident theory-practice gap in Saudi as much as possible by creating a documented curriculum incorporating updated evidence-based guidelines for diabetes management in primary health-care centres (Funnel et al., 2009).

The absence of updated evidence-based guidelines, the lack of ongoing educational activities, and the scarcity of integrated specialist expertise within primary health-care centres, were the main issues participants identified that hinder effective decision making. It is noteworthy that their involvement in the current stimulated some health-care providers to establish their own guidelines in their own study locations in an effort to close the evidence-practice. However, these uncoordinated efforts may lead to significant variations and serious disparities in the diabetes health-care services provided in primary health-care centres. To overcome variations and ensure self-management programs are promoted in a cost-effective and culturally acceptable manner, they should be evaluated periodically against an agreed standard (Comellas et al., 2010).

Sixth and finally, health-care providers' statements about the health-care system were most frequently reported (26 out of 38 statements). In contrast, T2DM participants, but not health providers, made statements about the disparities that exist in the Saudi primary health-care system as one participants stated, ' ...if the [health-care centre] pharmacy does not have aspirin, the pharmacist keeps telling you that they will have it tomorrow, but tomorrow may extend for two weeks'. This form of disparity in the Saudi primary health-care system is similar to Tunisia where Alberti et al., (2007b) found that the unavailability of medication hampered the optimum outcomes of medicine management among the diabetes population.

In summary, the majority of factors that affect diabetes self-management in the Saudi context are deeply embedded in the health-care system. Other challenges are community and health providers and patient-related factors. Taking into account the limitations in the Saudi primary health-care system and current international evidence-based recommendations interventions, it was evident that the health-care system is major challenge that negatively affects diabetes self-management outcomes.

Strengths and Limitations of the Study

Strengths

The study has a number of strengths. A major strength was the comprehensive translation and validation process used to assure the A-SDSCA instrument would yield accurate data. The acceptable psychometric property of the A-SDSCA means it can be used to assess the self-management practices of Arabs with T2DM of all nationalities including Arabic speakers in non-Arabic countries.

The use of the Chronic Care Model as the theoretical framework for the study introduced a valuable new approach to assessing the Saudi primary health-care system. Utilising the model has revealed a number of factors that have not been identified in Saudi Arabia before. In particular, the model highlighted the role of the health-care system in T2DM self-management outcomes, whereas previous Saudi studies were mainly concerned about patient-related factors. If the model was adopted by those leading the Saudi health-care system, it could guide future improvement initiatives.

Most importantly, disseminating the study result through peer-reviewed international publications or directly sending brief reports of the study outcomes to Almadinah primary health-care management could direct the attention of health-care planners, decision makers, and health-care providers towards factors that affect T2DM self-management outcomes in the Saudi primary health-care system. It is the first study in Saudi Arabia to explore factors affecting diabetes

self-management including the role of the Chronic Care Model domains. The study identified specific issues requiring immediate attention and further exploration. Furthermore, the study focused attention on the need to develop strategies to improve self-management practices and primary health-care services.

The study represents one step towards encouraging self-management research in Saudi Arabia, which could be translated into appropriate evidence-based policies and practices. Additionally, the study presents the first nursing contribution to diabetes self-management research in Saudi. It may encourage nurses and other health professionals to undertake similar initiatives, which could eventually lead to improvements in T2DM self-management outcomes.

Limitations

While the study could contribute to a better understanding of the factors affecting self-management outcomes for T2DM people in Saudi Arabia, it has a number of limitations. These limitations are the purposive sampling method and undertaking the study in three PHCCs, the low response rates, the cross-sectional study design, and using self-reported questionnaires.

First, purposive sampling was employed because it was consistent with the exploratory nature of the study (Schneider et al., 2003). Utilising the purposive sampling may have hampered the ability to generalise the study findings. However, comparing participant characteristics with those of participants in

related studies conducted in Saudi Arabia did not reveal any significant differences.

Second, the current study was undertaken in only three out of a total of 35 PHCCs. However, these three study locations were among four centres the Ministry of Health identified as the main health-care centres in Almadinah. Therefore, the factors identified in these PHCCs probably holds true, even for patients who attend smaller PHCC.

Third, given that two-thirds of those people who were invited to participate, refused to participate, it is possible that biased samples were obtained. The most commonly given reasons for not taking part in the study were: too busy, required to pick up children, not in the mood, and uncomfortable talking about health-care services. While these reasons sound legitimate, it is possible that those who did participate had better glycaemic control and better self-management practices than those who did not. Future studies should collect patient characteristics on those eligible, but refuse to participate, to understand better for whom the results can be generalised.

Non-response is often associated with general non-compliance (Anderson et al. 2009). If that was the case, the bias would have led to the underestimation of the degree of poor glycaemic control and poor self-management. Having said that, as discussed eariler, the characteristics of the samples that were obtained were very similar to those obtained in other Saudi studies and there is little indication that they were a socio-economically advantaged group. Most importantly, there

was no indication that people declined to participate because they were illiterate. In fact, many people requested that the questions be read to them and that the researcher complete the questionnaire.

Four, the exploratory cross-sectional study design did not allow the cause and effect relationships between socio-demographic factors and self-management activities to be examined. It is plausible, for example, that poor glycaemic control could cause a person to have a low income due to their inability to work, rather than a low income causing poor glycaemic control. A more thorough examination of patient, community, and health-care system characteristics with regard to T2DM self-management would require data to be collected over a period of time. Better still, randomised controlled trials could be implemented to show that specific interventions improve management practices and glycaemic control.

Five, the data collection instrument was a self-reported questionnaire that is inherently susceptible to a positive response bias (Pearson et al., 2005). The risk of response was minimised in the study instrument asking participants to report their self-management activities within the last seven days. Therefore, the requested information was easy to remember.

Implications for Practice

The study has implications for various aspects of diabetes self-management practice in Saudi Arabia. More specifically:

1. A-SDSCA is valid and reliable and can be used in research as well as clinical practice to measure improvements in self-management. Emerging evidence from the study regarding factors affecting self-management outcomes could be used to serve as a starting point for more research in the field.

2. The study indicated that the majority of participants who have T2DM had poor glycaemic control. Taking into account the high prevalence of T2DM in the Saudi Kingdom, uncontrolled blood glucose represent a devastating loss to all parties.

3. Given that relatively high rate of medication taking, there is evidence that poor glycaemic control is caused by poor self-management rather than the lack of appropriate medication. Therefore, attention towards developing evidence-based interventions to promote other self-management practices is a priority.

4. There is evidence that poor self-management occurs largely because of factors beyond the control of the individual such as social and cultural factors and the limitations of primary healthcare services. Working to improve community, environmental and cultural factors is a critical step to enhance participants' self-management outcomes, especially those of women, who seem to be more affected by these factors. Furthermore, the limitations in current self-management interventions could lead to significant disparities, which will affect a large

proportion of people with T2DM, especially those who visit small health-care centres.

5. There are tremendous opportunities to improve T2DM self-management in Saudi and increase the proportion of people who achieve good glycaemic control (HbA1c ≤7 %), thereby reducing complications and costs, by a) implementing population health measures such as social marketing to change societal attitudes to diet and physical activity, and b) searching and testing new approaches to empower people with T2DM in lieu of the predominant medical model. Both opportunities are suggested for future research.

Recommendations for Future Research

The current exploratory study directed attention towards numerous issues that need further investigation. Future studies should be designed to overcome patient hesitation to take part in health service research. Previous published studies have mainly depended on medical records data. In the current study, it was apparent that participants, especially women with T2DM, were reluctant to participate in the individual interviews. The researcher recommends employing a female research assistant to conduct interviews if the proposed study design includes women. Men, however, should be personally invited to encourage them to take part in individual interviews. Audio taping should be avoided as far as possible because it makes participants uncomfortable and unwilling to express

their concerns. in general, future studies should aim to encourage people with diabetes to express their needs.

The following recommendations address specific issues identified in the current study:

1. Generally, diabetes self-management approaches in Saudi Arabia need further exploration. Despite the number of Saudi published studies, there is a scarcity of studies investigating self-management. Moreover, the contribution of nurses and other team members is almost absent. Health-team members, especially nurses, should contribute to improving diabetes care. Examples of issues that could take priority are supporting patients to play an active role in managing their treatment plan, exploring effective self-management strategies and learning to utilise the Ministry of Health and community resources to serve diabetic patients better.

2. The study raised numerous issues about the health-care system and related issues that need to be investigated in future research. From the primary health-care system standpoint, issues such as supporting improvement strategies, promoting comprehensive system change, open and systematic handling of errors, facilitating care coordination within and among organisations and patients' concerns including availability and safety of medications, need extensive exploration.

3. Health-care providers showed keen interest in improving health-care outcomes. Supporting these interests via research is crucial to improve the outcomes. Future research ideas include establishing evidence-based guidelines and integrating

them into daily clinical practice, developing provider education methods, integrating specialist expertise in primary care, epidemiological studies to identify relevant sub-populations most in need of proactive care and designing interventions that distribute tasks among team members.

4. Exploring the incidence of depression among people who have diabetes and its effects on self-management outcomes, which was outside the scope of the current study, did not involve depression as a covariate factor. The need to adapt and validate instruments to assess the incidence of depression in the Saudi population should take priority in future self-management studies. Adapting instruments could close the evidence-practice gap in Saudi studies, where the psychometric properties of utilised instruments are not clearly identified.

5. In order to capture all self-management practices, the current study included a medication sub-scale that was not been validated. Re-designing the sub-scale in a similar manner to a diet scale (general diet questions) could improve its reliability and validity.

Summary and conclusion

The study highlighted numerous factors that affect diabetes self-management for people in Saudi Arabia who have T2DM and visited primary health-care centres in Almadinah, Saudi Arabia. It appears that international self-management recommendations developed by the American Diabetes Association

(ADA, 2008) were not applied in any of the study locations. The study revealed that a variety of factors such as the health-care system, the characteristics of the communities, Saudi culture and the characteristics of the T2DM patients, themselves, influenced self-care outcomes.

It was clear that simply taking medication is not the answer and that the extremely high prevalence of poor glycaemic control is due to factors beyond the control of most individuals. It is unlikely that people will achieve optimal self-care outcomes without extensive changes in the way T2DM is managed within the health-care system which is under control of health-care decision makers in Saudi Arabia.

Deploying relevant international T2DM self-management recommendations and undertaking more in-depth research to identify ways to generate better self-management outcomes within the Saudi Arabian social and cultural context should be a high priority. The A-SDSCA can make a significant contribution to T2DM research in all Arabic speaking countries. Furthermore, it is the sincere wish of the researcher that the A-SDSCA will lead to great improvements in T2DM self-management practices that will, in turn, lead to great improvements in glycaemic control and better health outcomes for T2DM patients and their families in Saudi Arabia.

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APPENDICES

Appendix A. The Summary of Diabetes Self-Care Activities (SDSCA)

The questions below ask you about your diabetes self-care activities during the past
7 days. Please circle the appropriate answers that describe your activities during the past 7 days. If you were sick during the past 7 days, please think back to the last 7 days that you were not sick.

Diet

1- How many of the last SEVEN DAYS have you followed a healthful eating plan?
0 1 2 3 4 5 6 7

2- On average, over the past month, how many DAYS PER WEEK have you followed your eating plan?
0 1 2 3 4 5 6 7

3- On how many of the last SEVEN DAYS did you eat five or more servings of fruits and vegetables?
0 1 2 3 4 5 6 7

4- On how many of the last SEVEN DAYS did you eat high fat foods such as red meat or full-fat dairy products?
0 1 2 3 4 5 6 7

Exercise

5- On how many of the last SEVEN DAYS did you participate in at least 30 minutes of continuous physical activity including walking?
0 1 2 3 4 5 6 7

6- On how many of the last SEVEN DAYS did you participate in a specific exercise session (such as swimming, walking, biking) other than what you do around the house or as part of your work?
0 1 2 3 4 5 6 7

Blood Sugar Testing

7- On how many of the last SEVEN DAYS did you test your blood sugar?
0 1 2 3 4 5 6 7

8- On how many of the last SEVEN DAYS did you test your blood sugar the number of times recommended by your health-care provider?

0 1 2 3 4 5 6 7

Foot Care

9- On how many of the last SEVEN DAYS did you check your feet?

0 1 2 3 4 5 6 7

10- On how many of the last SEVEN DAYS did you inspect the inside of your shoes?

0 1 2 3 4 5 6 7

Smoking

11- Have you smoked a cigarette—even one puff—during the past SEVEN DAYS?

0. No 1. Yes. If yes, how many cigarettes did you smoke on an average day?

Number of cigarettes:

Self-Care Recommendations

12- Which of the following has your health-care team (doctor, nurse, dietitian, or diabetes educator) advised you to do?

Please check all that apply:

□ a. Follow a low-fat eating plan
□ b. Follow a complex carbohydrate diet
□ c. Reduce the number of calories you eat to lose weight
□ d. Eat lots of food high in dietary fiber
□ e. Eat lots (at least 5 servings per day) of fruits and vegetables
□ f. Eat very few sweets (for example: desserts, non-diet sodas, candy bars)
□ g. Other (specify):
□ h. I have not been given any advice about my diet by my health-care team.

13- Which of the following has your health-care team (doctor, nurse, dietitian or diabetes educator) advised you to do?

Please check all that apply:

□ a. Get low level exercise (such as walking) on a daily basis.
□ b. Exercise continuously for a least 20 minutes at least 3 times a week.
□ c. Fit exercise into your daily routine (for example, take stairs instead of elevators, park a block away and walk, etc.)
□ d. Engage in a specific amount, type, duration and level of exercise.
□ e. Other (specify):
□ f. I have not been given any advice about exercise by my health-care team.

14- Which of the following has your health-care team (doctor, nurse, dietitian, or diabetes educator) advised you to do?

Please check all that apply:

□ a. Test your blood sugar using a drop of blood from your finger and a color chart.
□ b. Test your blood sugar using a machine to read the results.

□ c. Test your urine for sugar.
□ d. Other (specify):
□ e. I have not been given any advice either about testing my blood or urine sugar level by my health-care team.

15- Which of the following medications for your diabetes has your doctor prescribed?
Please check all that apply.
□ a. An insulin shot 1 or 2 times a day.
□ b. An insulin shot 3 or more times a day.
□ c. Diabetes pills to control my blood sugar level.
□ d. Other (specify):
□ e. I have not been prescribed either insulin or pills for my diabetes.

Diet
16- On how many of the last SEVEN DAYS did you space carbohydrates evenly through the day?
0 1 2 3 4 5 6 7

Medications
17- On how many of the last SEVEN DAYS did you take your recommended insulin injections?
0 1 2 3 4 5 6 7
OR
17- On how many of the last SEVEN DAYS did you take your recommended number of diabetes pills?
0 1 2 3 4 5 6 7

Foot Care
18- On how many of the last SEVEN DAYS did you wash your feet?
0 1 2 3 4 5 6 7

19- On how many of the last SEVEN DAYS did you soak your feet?
0 1 2 3 4 5 6 7

20- On how many of the last SEVEN DAYS did you dry between your toes after washing?
0 1 2 3 4 5 6 7

Smoking
21- At your last doctor's visit, did anyone ask about your smoking status?
0. No 1. Yes

22- If you smoke, at your last doctor's visit, did anyone counsel you about stopping smoking or offer to refer you to a stop-smoking program?
0. No 1. Yes 2. Do not smoke

23- When did you last smoke a cigarette?
□ More than two years ago or never smoked
□ One to two years ago
□ Four to twelve months ago
□ One to three months ago
□ Within the last month
□ Today

Appendix B. Diabetes patient's card

المملكة العربية السعودية
وزارة الصحة
مديرية الشئون الصحية بالمدينة المنورة
مركز صحي :

بطاقة مرضى الأمراض المزمنة

سكري ☐ ضغط ☐ ربو ☐

اسم المريض :

رقم الملف الطبي

الوظيفة — هاتف عمل

رقم الحفيظة — منزل

لن يتم صرف العلاج إلا لحاملي هذه البطاقة(باستثناء الحالات الطارئة)

إذا كان لديك أي استفسار عن استعمال دوائك فلا تتردد بالأتصال على

الهاتف :
أثناء الدوام الرسمي

يجب حفظ الأدوية بعيدا عن متناول الأطفال

مطابع صحة المدينة

التاريخ	اسم الدواء	الجرعة والتركيز	كمية الدواء	الموعد القادم	ختم الصيدلية

التاريخ	اسم الدواء	الجرعة والتركيز	كمية الدواء	الموعد القادم	ختم الصيدلية

Appendix C. Diabetes Patient's Education Checklist

اسم المريض: رقم الملف :

Diabetic educational checklist **قائمة التثقيف الصحي**

يكتب تاريخ الزيارة التي تم خلالها كل جزء من القائمة مع توقيع من قام بالتثقيف

The date and signature of the educator should be written in each involved visit

قائمة التثقيف	الزيارة (١)	الزيارة (٢)	الزيارة (٣)	الزيارة (٤)	الزيارة (٥)	الزيارة (٦)
معنى داء السكري Meaning of diabetes mellitus						
إعطاء كرت السكري والتنبيه على أهمية المتابعة Supply of diabetic card and insisting importance of regular follow-up						
شرح خواص الأدوية (مثل التخزين ، الأعراض الجانبية ، ...) Explanation of drug properties (e.g. storage, side effects, ... etc.)						
شرح أعراض هبوط وارتفاع السكري والتعامل معها Difference in symptoms between hypo and hyperglycemia, and how to do with each						
شرح الغذاء السليم Education about the recommended diet						
شرح أهمية زيارة الطبيب عند حدوث اعتلالات Importance of seeking medical advice						
أهمية العناية بالقدمين وكيفية عمل ذلك Importance of foot care & how to do it						
خطورة التدخين (للمدخنين) Smoking cessation counseling (for smokers)						
أهمية الرياضة البدنية ووصف المناسب منها للمريض Importance of exercise and the prescription of the proper exercise						
أهمية فحص البول بالأشرطة في المنزل (كل المرضى) Importance of home urine examination for all patients						
أهمية فحص الدم للسكري بالجهاز المنزلي (لمن يمتلكه) Importance of home glucometric tests (for those who can afford glucometer)						
مراجعة ومناقشة سجل القياسات المعمولة في المنزل Review and discussion about the recorded home test						
أمور أخرى (مثل السفر ، القيادة ،....) Other events (e.g. travel, drive, ..)						

Appendix D. The World Health Organization's (WHO) steps of translation and adaptation of instruments

Process of translation and adaptation of instruments

The aim of this process is to achieve different language versions of the English instrument that are conceptually equivalent in each of the target countries/cultures. That is, the instrument should be equally natural and acceptable and should practically perform in the same way. The focus is on cross-cultural and conceptual, rather than on linguistic/literal equivalence. A well-established method to achieve this goal is to use forward-translations and back-translations. This method has been refined in the course of several WHO studies to result in the following guidelines.

Implementation of this method includes the following steps:

- Forward translation
- Expert panel Back-translation
- Pre-testing and cognitive interviewing
- Final version

1. Forward translation

One translator, preferably a health professional, familiar with terminology of the area covered by the instrument and with interview skills should be given this task. The translator should be knowledgeable of the English-speaking culture but his/her mother tongue should be the primary language of the target culture.

Instructions should be given in the approach to translating, emphasizing conceptual rather than literal translations, as well as the need to use natural and acceptable language for the broadest audience. The following general guidelines should be considered in this process:

- Translators should always aim at the conceptual equivalent of a word or phrase, not a word-for-word translation, i.e. not a literal translation. They should consider the definition of the original term and attempt to translate it in the most relevant way.
- Translators should strive to be simple, clear and concise in formulating a question. Fewer words are better. Long sentences with many clauses should be avoided.
- The target language should aim for the most common audience. Translators should avoid addressing professional audiences such as those in medicine or any other professional group. They should consider the typical respondent for the instrument being translated and what the respondent will understand when s/he hears the question.
- Translators should avoid the use of any jargon. For example, they should not use:
    - technical terms that cannot be understood clearly; and

    - colloquialism, idioms or vernacular terms that cannot be understood by common people in everyday life.
- Translators should consider issues of gender and age applicability and avoid any terms that might be considered offensive to the target population.

2. Expert panel

A bilingual (in English and the target language for translation) expert panel should be convened by a designated editor-in-chief. The goal in this step is to identify and resolve the inadequate expressions/concepts of the translation, as well as any discrepancies between the forward translation and the existing or comparable previous versions of the questions if any. The expert panel may question some words or expressions and suggest alternatives. Experts should be given any materials that can help them to be consistent with previous translations. Principal investigators and/or project collaborators will be responsible for providing such materials. The number of experts in the panel may vary. In general, the panel should include the original translator, experts in health, as well as experts with experience in instrument development and translation.

The result of this process will produce a complete translated version of the questionnaire.

3. Back-translation

Using the same approach as that outlined in the first step, the instrument will then be translated back to English by an independent translator, whose mother tongue is English and who has no knowledge of the questionnaire. Back-translation will be limited to selected items that will be identified in two ways. The first will be items selected by the WHO based on those terms / concepts that are key to the instrument or those that are suspected to be particularly sensitive to translation problems across cultures. These items will be distributed when the English version of the instrument is distributed. The second will consist of other items that are added on as participating countries identify words or phrases that are problematic. These additional items must be submitted to WHO for review and approval.

As in the initial translation, emphasis in the back-translation should be on conceptual and cultural equivalence and not linguistic equivalence. Discrepancies should be discussed with the editor-in-chief and further work (forward translations, discussion by the bilingual expert panel, etc.) should be iterated as many times as needed until a satisfactory version is reached.

Particularly problematic words or phrases that do not completely capture the concept addressed by the original item should be brought to the attention of WHO.

4. Pre-testing and cognitive interviewing

It is necessary to pre-test the instrument on the target population. Each module or section will be fully tested using the methodologies outlined below.

- Pre-test respondents should include individuals representative of those who will be administered the questionnaire. For this study, dependent opioid users should be used to test the translated instruments, although such users could be drawn from sources other than those used to recruit study participants – preferably persons who would not otherwise be eligible for the main study.
- Pre-test respondents should number 10 minimum for each section. They should represent males and females from all age groups (18 years of age and older) and different socioeconomic groups.
- Pre-test respondents should be administered the instrument and be systematically debriefed. This debriefing should ask respondents what they thought the question was asking, whether they could repeat the question in their own words, what came to their mind when they heard a particular phrase or term. It should also ask them to explain how they choose their answer. These questions should be repeated for each item.
- The answers to these questions should be compared to the respondent's actual responses to the instrument for consistency.
- Respondents should also be asked about any word they did not understand as well as any word or expression that they found unacceptable or offensive.
- Finally, when alternative words or expressions exist for one item or expression, the pre-test respondent should be asked to choose which of the alternatives conforms better to their usual language.
- This information is best accomplished by in-depth personal interviews although the organization of a focus group may be an alternative.
- It is very important that these interviews be conducted by an experienced interviewer.

A written report of the pre-testing exercise, together with selected information regarding the participating individuals should also be provided.

5. Final version

The final version of the instrument in the target language should be the result of all the iterations described above. It is important that a serial number (e.g. 1.0) be given to each version. Instructions for providing the electronic version of the final translated instrument to WHO will be provided.

6. Documentation

All the cultural adaptation procedures should be traceable through the appropriate documents. These include, at the least:

- initial forward version;
- a summary of recommendations by the expert panel;
- the back-translation;
- a summary of problems found during the pre-testing of the instrument and the modifications proposed; and
- the final version.

It is also necessary to describe the samples used in this process (i.e. the composition of the expert panel and the pre-test respondent samples). For the latter, the number of individuals as well as their basic characteristics should be described, as appropriate

Appendix E. Arabic_SDSCA_1

Version : 1.0

ملخص لانشطة العناية الشخصية لمرضى السكري:

الحمية :

١ - كم عدد المرات التي اتبعت فيها خطة أكل صحي في السبعة أيام الماضية؟

٢ - وفي متوسط الشهر الماضي كم عدد الأيام خلال الأسبوع التي اتبعت فيها خطتك الغذائية ؟

٣ - كم عدد المرات التي أكلت فيها خمسة أنواع أو أكثر من الطعام المفيد من الفواكه والخضروات في السبعة أيام الماضية؟

٤ - كم عدد المرات التي أكلت فيها طعام يحتوي على دهنيات عالية مثل اللحم الأحمر ومنتجات الألبان كاملة الدسم في السبعة أيام الماضية؟

تمرين :

٥ - كم عدد المرات التي شاركت فيها في أنشطة بدنية لمدة ٣٠ دقيقة على الأقل في السبعة أيام الماضية؟ (الدقائق الكلية للأنشطة بما فيها المشي)

٦ - كم عدد المرات التي شاركت فيها في جلسة تدريب معينة في السبعة أيام الماضية مثل (السباحة، المشي، قيادة الدراجات) عدا تلك التي تقوم بها في محيط منزلك أو التي تكون جزءا من عملك؟

فحص السكري في الدم :

٧ - كم عدد المرات التي فحصت فيها السكري في الدم في السبعة أيام الماضية؟

٨ - كم عدد المرات التي فحصت فيها السكري في الدم في السبعة أيام الماضية حسب توصية مشرفك في الرعاية الصحية؟

العناية بالقدم :

٩ - كم عدد المرات التي فحصت فيها قدميك في السبعة أيام الماضية؟

١٠ - كم عدد المرات التي فتشت فيها حذائك من الداخل في السبعة أيام الماضية؟

التدخين :

١١ - هل دخنت السجائر - حتى ولو نفخة واحدة - في السبعة أيام الماضية؟

O لا ١ - نعم وإذا كان نعم كم متوسط عدد السجائر التي تدخنها في اليوم ؟

توصية الرعاية الشخصية :

١٢ - أيهما مما يلي هو فريق رعايتك الصحية (طبيب ، ممرض ، مسئول التغذية ،أو مشرف السكري) الذي نصحك بان تعمل ؟

الرجاء التأشير على كل ما هو مطلوب تطبيقه:

أ- إتباع طريقة أكل قليلة الدهن.

ب- إتباع حمية غذائية مركبة من الكاربوهايدريتات.

ت- تقليل عد السعرات الحرارية التي تأكلها لتخفيض الوزن.

ث- تأكل طعام ذو حمية غذائية غنية بالألياف.

ج- تأكل كثرا من الخضروات والفواكه (على الأقل خمسة أنواع مفيدة يوميا).

ح- تأكل قليلا من الحلوى (الحلوى في نهاية الطعام ، صودا عديمة الحمية ، و قطع الحلوى المسكرة).

خ- أخري (حدد).

د- لم أتلقى أية نصيحة حول حميتي الغذائية من قبل فريق رعايتي الصحية.

١٣ - أيهما مما يلي هو فريق رعايتك الصحية (طبيب ، ممرض ، مسئول التغذية ،أو مشرف السكري) الذي نصحك بان تعمل ؟

الرجاء التأشير على كل ما هو مطلوب تطبيقه:

أ- ممارسة مستوى تمرين منخفض (مثل المشي) على أساس يومي.

ب- تمرين مستمر لمدة ٢٠ دقيقة على الأقل ٣ مرات أسبوعيا.

ت- تمرين لياقة في روتينك اليومي(مثلا استخدم الدرج بدلا عن المصعد ، أوقف سيارتك بعيدا ثم امشي

ث- الارتباط بنوع أو عدد أو مدة معينة من مستوى التمرين.
ج- أخرى (حدد).
ح- لم أتلقى أية نصيحة حول التمرين من قبل فريق رعايتي الصحية.

١٤- أيهما مما يلي هو فريق رعايتك الصحية (طبيب ، ممرض ، مسئول التغذية ،أو مشرف السكري) الذي نصحك بان تعمل ؟

الرجاء التأشير على كل ما هو مطلوب تطبيقه:

أ- فحص سكري الدم باستخدام نقطة من دم إصبعك واستخدام المخطط الملون.
ب- فحص سكري الدم باستخدام الجهاز لمعرفة النتيجة.
ت- فحص البول للسكري.
ث- أخرى (حدد).
ج- لم أتلقى أية نصيحة حول فحص سكري البول أو سكري الدم من قبل فريق رعايتي الصحية.

١٥- أيهما مما يلي من الأدوية هو ما وصفه لك طبيبك لاستخدامه لمرضك السكري)

الرجاء التأشير على كل ما هو مطلوب تطبيقه:

أ- حقنة أنسولين مرة الي مرتين يوميا.
ب- حقنة أنسولين ٣ مرات أو أكثر يوميا.
ت- حبوب سكري لضبط مستوى سكري الدم.
ث- أخرى (حدد).
ج- لم أتلقى من فريق رعايتي الصحية أية وصفة سواء حقن أنسولين أو حبوب لمرضي السكري.

الحمية :

١٦- كم عدد المرات التي تناولت فيها الكاربوهايدريتات خلال اليوم في السبعة أيام الماضية؟

المعالجة :

١٧-كم عدد المرات التي أوصيت بها بأخذ حقن أنسولين في السبعة أيام الماضية؟

أو

١٧- كم عدد المرات التي أوصيت بها بأخذ حبوب سكري في السبعة أيام الماضية؟

العناية بالقدم :

١٨- كم عدد المرات التي غسلت فيها قدميك في السبعة أيام الماضية؟
١٩- كم عدد المرات التي نقعت فيها الماء على قدميك في السبعة أيام الماضية؟
٢٠- كم عدد المرات التي جففت فيها بين أصابع قدميك بعد الغسيل في السبعة أيام الماضية؟

التدخين :

٢١- عند أخر زيارة لطبيبك ، هل سالك احد ما عن وضعك في التدخين ؟

O لا ١- نعم.

٢٢- إذا كنت تدخن عند آخر زيارة لطبيبك هل استشارك احد في الإقلاع عن التدخين أو أشار عليك ببرنامج الإقلاع عن التدخين؟

O لا ١- نعم. ٢- لا أدخن

٢٣- متى آخر مرة دخنت فيها سجائر؟

* أكثر من سنتين مضت أو لم أدخن إطلاقا.
* من سنة إلى سنتين مضت.
* من أربعة إلى اثنا عشر شهرا مضت.
* من شهر إلى ثلاثة أشهر مضت.
* خلال الشهر الماضي.
* اليوم.

Appendix F. Arabic-SDSCA_2

Version : 2:

هذا الاستبيان هو للأشخاص الذين يعانون من داء السكري من النوع (٢) فقط .أشكركم على الأخذ من وقتكم لانجاز هذا الاستبيان ، الذي يحتاج إلى دقائق قليلة لملء بياناته. سيتم التعامل مع المعلومات المسجلة بكل ثقة ودقة . لغرض من هذا الاستبيان هو أن ننظر إلى العوامل التي تؤثر في الرعاية الذاتية لمرضى السكري . عن طريق ملء هذا الاستبيان، فانك توافق على المشاركة في هذا البحث.

Demographic

موجز الأنشطة [redacted] لرعاية السكري

الأسئلة الواردة أدناه تسألك عن أنشطتك [redacted] رعاية السكري خلال ٧ أيام ماضية.
لو كنت مريضاً خلال ٧ أيام الماضية، يرجى العودة [redacted] التفكير [redacted] آخر ٧ أيام لم تكن مريضاً بها.

الحمية							
خلال السبعة أيام الماضية، كم عدد الأيام التي اتبعت خطة صحية للأكل؟	١	٢	٣	٤	٥	٦	٧
خلال الشهر الماضي، في المتوسط، كم عدد الأيام في الأسبوع التي اتبعت فيها خطة الأكل الخاص بك؟	١	٢	٣	٤	٥	٦	٧
خلال السبعة أيام الماضية، كم عدد الأيام التي أكلت فيها خمس [redacted] أو أكثر من الفاكهة والخضار؟	١	٢	٣	٤	٥	٦	٧
خلال السبعة أيام الماضية، كم عدد الأيام التي أكلت فيها أغذية عالية الدهون مثل [redacted] أو كامل الدسم و[redacted]؟	١	٢	٣	٤	٥	٦	٧
ممارسة الرياضة							
خلال السبعة أيام الماضية، كم عدد الأيام التي شاركت فيها في ما لا يقل عن ٣٠ دقيقة من النشاط البدني؟ (دقائق نشاط مستمر ، بما في ذلك المشي).	١	٢	٣	٤	٥	٦	٧
خلال السبعة أيام الماضية، كم عدد الأيام التي شاركت فيها في ممارسة نشاط رياضي محدد (مثل السباحة أو المشي، [redacted]). لا يشمل الأنشطة [redacted] المنزل أو كجزء من عملك؟	١	٢	٣	٤	٥	٦	٧
فحص نسبة السكر في الدم							
خلال السبعة أيام الماضية، كم عدد الأيام التي اختبرت فيها [redacted] السكر في دمك؟	١	٢	٣	٤	٥	٦	٧
خلال السبعة أيام الماضية، كم عدد الأيام التي اختبرت فيها [redacted] السكر في دمك بعدد المرات التي أوصى بها [redacted]؟	١	٢	٣	٤	٥	٦	٧
رعاية القدم							
خلال السبعة أيام الماضية، كم عدد الأيام التي فحصت فيها قدميك ؟	١	٢	٣	٤	٥	٦	٧
خلال السبعة أيام الماضية، كم عدد الأيام التي قمت فيها [redacted] داخل الأحذية الخاصة بك؟	١	٢	٣	٤	٥	٦	٧

التدخين		
خلال السبعة أيام الماضية، هل دخنت السجائر (حتى ولو [redacted] واحدة)؟	☐	لا
	☐	نعم ، إذا نعم ، كم سيجارة دخنت [redacted] في اليوم؟ عدد السجائر: _____
توصيات الرعاية الذاتية		
أي من الأمور التالية قام [redacted] (طبيب ، ممرضة ، الأخصائي في علم الغذاء ، مثقف داء السكري) بنصيحتك بفعله ؟ يرجى التأشير أمام كل ما ينطبق:		
	☐	إتباع خطة أكل منخفض الدهون
	☐	إتباع نظام [redacted]

خفض عدد السعرات الحرارية التي تأكلها كي تفقد الوزن	☐	
أكل الكثير من الأغذية الغنية بالألياف [redacted]	☐	
أكل الكثير (على الأقل [redacted] يوميا) من الفواكه والخضروات	☐	
أكل عدد قليل جدا من الحلويات ([redacted] ، [redacted])	☐	
أخرى (حدد): _____	☐	
أنا لم أتلقى أي نصيحة بشأن النظام الغذائي من فريق الرعاية الصحية	☐	

أي من الأمور التالية قام فريق الرعاية الصحية الخاص بك (طبيب، ممرضة، الأخصائي في علم الغذاء، مثقف داء السكري) بنصيحتك بفعله ؟ يرجى التأشير أمام كل ما ينطبق:		
عمل تمارين [redacted] (مثل المشي) بشكل يومي	☐	
التمرين بصورة مستمرة على الأقل لمدة ٢٠ دقيقة ولمدة ٣ مرات في الأسبوع	☐	
إدخال التمارين في ممارسة الأعمال الروتينية اليومية (على سبيل المثال ، الصعود بالسلالم بدلا من المصاعد، إيقاف السيارة على بعد والمشي إلى [redacted])	☐	
الالتزام [redacted].	☐	
أخرى (حدد):	☐	
أنا لم أتلقى أي نصيحة بشأن التمارين من فريق الرعاية الصحية	☐	

أي من الأمور التالية قام فريق الرعاية الصحية الخاص بك (طبيب، ممرضة، الأخصائي في علم الغذاء، مثقف داء السكري) بنصيحتك بفعله ؟ يرجى التأشير أمام كل ما ينطبق:		
اختبار السكر في دمك باستخدام نقطة دم من الأصبع وجدول بالألوان	☐	
اختبار السكر في دمك باستخدام آلة لقراءة النتائج	☐	
اختبار البول للسكر	☐	
أخرى (حدد) : _____	☐	
أنا لم أتلقى أي نصيحة بشأن التمارين من فريق الرعاية الصحية	☐	

أي من الأدوية الخاصة بالسكري التالية قد وصفه الطبيب لك؟ يرجى التأشير أمام كل ما ينطبق:			
حقنة أنسولين ١ أو ٢ مرات في اليوم	☐		
حقنة أنسولين ٣ مرات أو أكثر في اليوم	☐		
حبوب السكري للسيطرة على مستوى السكر في الدم	☐		
أخرى (حدد) : _____	☐		
أنا لم يوصف لي الأنسولين أو الحبوب لمرض السكري	☐		

الحمية	
خلال السبعة أيام الماضية، كم عدد الأيام التي أخذت فيها كمية [redacted] خلال اليوم؟	١ ٢ ٣ ٤ ٥ ٦ ٧
الأدوية	
خلال السبعة أيام الماضية، كم عدد الأيام التي أخذت فيها أدوية [redacted] الموصى بها؟	١ ٢ ٣ ٤ ٥ ٦ ٧
أو	
خلال السبعة أيام الماضية، كم عدد الأيام التي أخذت فيها حقن الأنسولين الموصى بها؟	[redacted] ١ ٢ ٣ ٤ ٥ ٦ ٧
خلال السبعة أيام الماضية، كم عدد الأيام التي أخذت فيها حبوب السكري الموصى بها؟	[redacted] ١ ٢ ٣ ٤ ٥ ٦ ٧
رعاية القدم	
خلال السبعة أيام الماضية، كم عدد الأيام التي قمت فيها بغسل قدميك؟	١ ٢ ٣ ٤ ٥ ٦ ٧
خلال السبعة أيام الماضية، كم عدد الأيام التي قمت فيها بنقع قدميك؟	١ ٢ ٣ ٤ ٥ ٦ ٧
خلال السبعة أيام الماضية، كم عدد الأيام التي قمت فيها بالتجفيف بين أصابع قدميك بعد الغسيل؟	١ ٢ ٣ ٤ ٥ ٦ ٧
التدخين	
خلال زيارتك الأخيرة للطبيب، هل سألك أي شخص عن التدخين؟	
☐ لا	
☐ نعم	
أذا كنت مدخن، خلال زيارتك الأخيرة للطبيب، هل قام أي شخص بمشورتك لإيقاف التدخين أو قدم لك عرضاً بالإحالة إلى برنامج مكافحة التدخين؟	
☐ لا	
☐ نعم	
☐ غير مدخن	
متى دخنت السجائر آخر مرة؟	
☐ منذ أكثر من عامين ، أو لم تدخن أبداً	
☐ قبل سنة أو سنتين	
☐ منذ ٤-١٢ شهر ماضية	
☐ منذ ١-٣ شهر ماضية	
☐ خلال الشهر الماضي	
☐ اليوم	

Appendix G. The content validity questionnaire

السلام عليكم ورحمة الله وبركاته
أشكرك على قبول المشاركة في تصحيح أستبانة قياس معدل انشطة العناية الشخصية لمرضى السكري من النوع الثاني.
ارجو عدم التردد بالاتصال بالباحث في حالة وجود استفسار .
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المعلومات الشخصية

الأسم/ الجنس/ ذكر ـ مرأة الوظيفة/ التخصص/
عدد سنوات الخبرة/ مكان العمل/ هل تعمل في تقديم الرعاية الصحية لمرضى السكري/ نعم- لا اذا كانت الاجابة بنعم, فكم عدد سنوات الخبرة/

Content validity index **مؤشر صحة المحتويات**

التعليمات: الرجاء وضع دائرة حول الاجابة التي تراها مناسبة وذلك بناءاً على التعليمات الموجودة في الجدول. يمكنك كتابة ملاحظاتك او ما تنصح به ان يعمل وذلك في خانة الملاحظات التابعة لكل محور.

ملاحظات	الوضوح	ملاحظات	تمثيل السؤال للمحور الذي يمثله	السؤال
	1- السؤال غير واضح تماماً. 2- السؤال يحتاج الى تصحيح كبير. 3- السؤال يحتاج الى تعديل بسيط. 4- السؤال واضح.		1- السؤال لا يمثل المحور. 2- السؤال يحتاج الى تصحيح كبير. 3- السؤال يحتاج الى تعديل بسيط. 4- السؤال يمثل المحور.	
	1 2 3 4		1 2 3 4	1-كم عدد الأيام التي اتبعت فيها خطة أكل صحي في السبعة ايام الماضية
	1 2 3 4		1 2 3 4	2-في متوسط الشهر الماضي, كم عدد الأيام خلال الأسبوع التي اتبعت خطتك الغذائية
	1 2 3 4		1 2 3 4	3- كم عدد الأيام التي أكلت فيها خمسة انواع أو أكثر من الطعام المفيد من الفواكه والخضروات في السبعة ايام الماضية
	1 2 3 4		1 2 3 4	4- كم عدد الأيام التي أكلت فيها طعام يحتوي على دهنيات عالية مثل اللحم الأحمر ومنتجات الألبان كاملة الدسم في السبعة ايام الماضية
	1 2 3 4		1 2 3 4	5- كم عدد الأيام التي شاركت فيها في أنشطة بدنية لمدة 30 دقيقة على الأقل في السبعة ايام الماضية (الدقائق الكلية للأنشطة بما فيها المشي)
	1 2 3 4		1 2 3 4	6- كم عدد الأيام التي شاركت فيها في جلسة تدريب معينة في السبعة ايام الماضية مثل (السباحة, المشي, قيادة الدراجات) عدا تلك التي تقوم بها في محيط منزلك أو اللتي تكون جزءاً من عملك
	1 2 3 4		1 2 3 4	7- كم عدد الأيام التي فحصت فيها السكري في الدم في السبعة ايام الماضية
	1 2 3 4		1 2 3 4	8- كم عدد الأيام التي فحصت فيها السكري في الدم في السبعة

ايام الماضية حسب توصية مشرفك في الرعاية الصحية				
9- كم عدد الأيام التي فحصت فيها قدميك في السبعة ايام الماضية	1 2 3 4		1 2 3 4	
10- كم عدد الأيام التي فتشت فيها حذائك من الداخل في السبعة ايام الماضية	1 2 3 4		1 2 3 4	
11- هل دخنت السجائر ـ حتى ولو نفخة واحدة ـفي السبعة ايام الماضية	1 2 3 4		1 2 3 4	
12- ايهما مما يلي نصحك فريق رعايتك الصحية (طبيب, ممرض, مسئول التغذية, مثقف السكري) بأن تعمل الرجاء التأشير على كل ما هو مطلوب تطبيقه:				
أ- إتباع طريقة أكل قليلة الدهن	1 2 3 4		1 2 3 4	
ب- إتباع حمية غذائية مركبة من الكاربوهيدرات	1 2 3 4		1 2 3 4	
ت- تقليل عدد السعرات الحرارية التي تأكلها لتخفيض الوزن	1 2 3 4		1 2 3 4	
ث- تأكل طعام ذو حميةغذائية غنية بالألياف	1 2 3 4		1 2 3 4	
ج- تأكل كثيراً من الفواكه والخضروات (على الأقل خمسة انواع مفيدة يومياً)	1 2 3 4		1 2 3 4	
ح- تأكل قليلاً من الحلوى (الحلوى في نهاية الطعام, صودا عديمة الحمية, قطع الحلوى المكسرة)	1 2 3 4		1 2 3 4	
خ- أخرى (حدد)	1 2 3 4		1 2 3 4	

13- ايهما مما يلي نصحك فريق رعايتك الصحية (طبيب, ممرض, مسئول التغذية, مثقف السكري) بأن تعمل الرجاء التأشير على كل ما هو مطلوب تطبيقه: أ- ممارسة مستوى تمرين منخفض (مثل المشي) على اساس يومي ب- تمرين مستمر لمدة 20 دقيقة 3 مرات اسبوعياً ت- تمرين لياقة في روتينك اليومي (مثلاً استخدم الدرج بدلاً عن المصعد, أوقف سيارتك بعيداً ثم أمشي تلك المسافة..الخ) ث- الأرتباط بنوع أو عدد أو مدة معينة من مستوى التمرين ج- أخرى (حدد) ح- لم أتلقى أية نصيحة حول التمرين من قبل فريق رعايتي الصحية	1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4		1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4	
14- ايهما مما يلي نصحك فريق رعايتك الصحية (طبيب, ممرض, مسئول التغذية, مثقف السكري) بأن تعمل الرجاء التأشير على كل ما هو مطلوب تطبيقه: أ- فحص سكري الدم باستخدام نقطة من دم إصبعك واستخدام المخطط الملون ب- فحص سكري الدم باستخدام الجهاز لمعرفة النتيجة	1 2 3 4 1 2 3 4		1 2 3 4 1 2 3 4	

ت- فحص البول السكري ث- أخرى (حدد) ج- لم أتلقى أية نصيحة حول فحص سكري البول أو سكري الدم من قبل فريق رعايتي الصحية	1 2 3 4 1 2 3 4 1 2 3 4		1 2 3 4 1 2 3 4 1 2 3 4	
15- أيهما من الأدوية هو ما وصفه لك طبيبك لأستخدامه لمرضك السكري. الرجاء التأشير على كل ما هو مطلوب تطبيقه. أ- حقنة أنسولين مرة الى مرتين يومياً ب- حقنة أنسولين 3 مرات أو أكثر يومياً ت- حبوب سكري لضبط مستوى سكري الدم ث- أخرى (حدد) ج- لم اتلقى من فريق رعايتي الصحية أية وصفة سواء حقن أنسولين أو حبوب لمرضي السكري	1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4		1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4	
16- كم عدد الأيام التي تناولت فيها الكاربوهيدرات خلال اليوم في السبعة أيام الماضية	1 2 3 4		1 2 3 4	
17- كم عدد الأيام التي اخذت فيها حقنة السكري الموصى بهاخلال اليوم في السبعة أيام الماضية	1 2 3 4		1 2 3 4	
A17- كم عدد الأيام التي تناولت فيها الكاربوهيدرات خلال اليوم في السبعة أيام الماضية	1 2 3 4		1 2 3 4	
18- كم عدد الأيام التي غسلت فيها قدميك في السبعة أيام الماضية	1 2 3 4		1 2 3 4	
19- كم عدد الأيام التي نقعت فيها الماء على قدميك في السبعة أيام الماضية	1 2 3 4		1 2 3 4	

20- كم عدد الأيام التي جففت فيها بين أصابع قدميك في السبعة أيام الماضية	1 2 3 4		1 2 3 4	
21- عند آخر زيارة لطبيبك, هل سألك أحد ما عن وضعك في التدخين	1 2 3 4		1 2 3 4	
22- إذا كنت تدخن, عند آخر زيارة لطبيبك هل استشارك احد في الأقلاع عن التدخين أو أشار عليك ببرنمج الأقلاع عن التدخين	1 2 3 4		1 2 3 4	
23- متى آخر مرة دخنت فيها سجائر: أ- أكثر من سنتين مضت أو لم ادخن إطلاقاً ب- من سنة الى سنتين مضت ت- من اربعه الى إثناعشر شهراً مضت ث- من شهر الى ثلاثة اشهر مضت ج- خلال الشهر الماضي ح- اليوم	1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4		1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4	

Appendix H. Arabic_SDSCA_3

Version: 3.0

1

إستبيان موجز الأنشطة الشخصية لرعاية السكري

السلام عليكم ورحمة الله وبركاته

أشكرك على المشاركة في هذه الدراسة والأخذ من وقتكم لتعبئة هذا الأستبيان. تهدف هذه الدراسة الى معرفة العوامل المؤثرة على العناية الشخصية لمرضى السكري من النوع الثاني علماً انه سيتم التعامل مع جميع المعلومات بسرية تامة. تعبئة هذا الأستبيان يعتبر موافقة على المشاركة في الدراسة.

شكراً لك,,,

معلومات عامة

العمر (بالسنوات)	□26-45	□46-65	□66 أو أكثر			
الجنس	□ ذكر	□ أنثى				
مستوى التعليم	□ غير متعلم	□ إبتدائي	□ كفاءة	□ثانوي	□ جامعي	□ تعليم عالي
الفترة منذ إصابتك بالسكري (بالسنوات)	□ أقل من سنتين	□2-4	□5-7	□8-10	□أكثر من 10 سنوات	

الإستبيان

الأسئلة الواردة أدناه تهدف الى معرفة أنشطتك الشخصية للعناية بالسكري خلال السبعة أيام الماضية. إذا كنت مريضاً خلال السبعة أيام الماضية, الرجاء العودة في التفكير الى آخر سبعة أيام لم تكن مريضاً بها إعتماداً على هذا اليوم كنهاية للفترة التي قررت تسجيلها. الرجاء وضع دائرة على الإجابة الصحيحة.

قسم التغذية

1	• خلال السبعة أيام الماضية, كم عدد الأيام التي اتبعت فيها خطة . غذاء صحي؟	7 6 5 4 3 2 1
2	بالنسبة الى الشهر الماضي, كم عدد الأيام خلال الأسبوع التي اتبعت خطتك الغذائية ؟	7 6 5 4 3 2 1
3	•خلال السبعة أيام الماضية, كم عدد الأيام التي أكلت فيها خمسة أو أكثر من الفواكه والخضروات؟	7 6 5 4 3 2 1
4	خلال السبعة أيام الماضية, كم عدد الأيام التي أكلت فيها طعام يحتوي على دهون عالية مثل اللحوم الحمراء (مثل لحوم المواشي) ومنتجات الألبان كاملة الدسم؟	7 6 5 4 3 2 1

قسم الرياضة

5	خلال السبعة أيام الماضية, كم عدد الأيام التي مارست فيها في أنشطة بدنيةبصفة عامة لمدة 30 دقيقة على الأقل (مجموع الدقائق الكلية للأنشطة بما فيها المشي)	7 6 5 4 3 2 1

6	خلال السبعة أيام الماضية, كم عدد الأيام التي مارست فيها في جلسة تمرين رياضي محدد (السباحة, المشي ...الخ) عدا تلك التي تقوم بها في محيط منزلك أو اللتي تكون جزءاً من عملك؟	7 6 5 4 3 2 1

قسم فحص سكر الدم

7	خلال السبعة أيام الماضية, كم عدد الأيام التي فحصت فيها سكر الدم؟	7 6 5 4 3 2 1
8	خلال السبعة أيام الماضية, كم عدد الأيام التي فحصت فيها سكر الدم حسب العدد المذكور في تعليمات طبيبك؟	7 6 5 4 3 2 1

قسم العناية بالقدم

9	خلال السبعة أيام الماضية, كم عدد الأيام التي فحصت فيها قدميك؟	7 6 5 4 3 2 1
10	خلال السبعة أيام الماضية, كم عدد الأيام التي فحصت فيها حذائك من الداخل (للتأكد من عدم وجود اشياء تسبب الجروح مثل قطع في الحذاء أو نتوءات)؟	7 6 5 4 3 2 1

قسم التدخين

11	خلال السبعة أيام الماضية, , هل دخنت (السجائر – الشيشة – المعسل) حتى ولو لمرة واحدة ؟	□ لا □ نعم, كم سيجارة دخنت بمعدل يومي عدد السجائر:_____

قسم النصائح الطبية للعناية الشخصية

12 أي مما يلي نصحك الفريق الطبي بمركز الرعاية الصحية (طبيب, ممرض, أخصائي التغذية, مثقف السكري) بأن تعمل:

- أ- إتباع نظام أكل قليل الدسم □ اتباع حمية غذائية ملائمة للدسم
- ب- إتباع حمية غذائية من الكاربوهيدرات المركبة (مثل الأرز والمكرونه) □
- ت- تقليل عدد السعرات الحرارية التي تأكلها لتخفيض الوزن □
- ث- تأكل طعام غني بالألياف (مثل الخضروات) □ تناول اطعمة غنية بالالياف
- ج- تأكل كثيراً من الفواكه والخضروات (على الأقل خمسة يومياً) □
- ح- تأكل قليلاً من الحلوى (مثل تحلية بعد الطعام) □ تناول كميات قليلة من الحلويات
- خ- أخرى (حدد) □
- د- لم أتلقى أية نصيحة حول التغذية من قبل فريق رعايتي الصحية □

13 أي مما يلي نصحك الفريق الطبي بمركز الرعاية الصحية (طبيب, ممرض, أخصائي التغذية, مثقف السكري) بأن تعمل:

- أ- ممارسة تمرين بسيط (مثل المشي) على اساس يومي □ ممارسة تمارين رياضية بسيطة (مثل المشي) على الاقل يوميا
- ب- تمرين مستمر لمدة 20 دقيقة 3 مرات اسبوعياً □ تمرين مستمر
- ت- تمرين لياقة في عاداتك اليومية (مثلاً استخدم الدرج بدلاً عن المصعد, أوقف سيارتك بعيداً ثم أمشي تلك المسافة..الخ) □
- ث- الأرتباط بنوع أو عدد أو مدة معينة من مستوى التمرين □
- ج- أخرى (حدد) □
- ح- لم أتلقى أية نصيحة حول التمرين من قبل فريق رعايتي الصحية □

14 أي مما يلي نصحك الفريق الطبي بمركز الرعاية الصحية (طبيب, ممرض, أخصائي التغذية, مثقف السكري) بأن تعمل: X شطبه

أ- فحص سكر الدم باستخدام الجهاز لمعرفة النتيجة ☐
ب- فحص البول السكري ☐
ت- أخرى (حدد) ☐
ث- لم أتلقى أية نصيحة حول فحص سكري البول أو سكري الدم من قبل فريق رعايتي الصحية ☐

15 ما هي الأدوية التي وصفها لك طبيبك للسكري:

أ- حقنة أنسولين مرة الى مرتين يومياً ☐
ب- حقنة أنسولين 3 مرات أو أكثر يومياً ☐
ت- حبوب سكري لضبط مستوى سكري الدم ☐
ث- أخرى (حدد) ☐
ج- لم اتلقى من فريق رعايتي الصحية أية وصفة سواء حقن أنسولين أو حبوب لمرضى السكري ☐

قسم التغذية

16 خلال السبعة أيام الماضية, كم عدد الأيام التي تناولت فيها كمية النشويات ~~خلال اليوم بالتساوي (في وجباتك الغذائية)~~ ؟ 7 6 5 4 3 2 1

اليومية خلال اليوم بالتساوي (كمية متساوية من النشويات في الوجبات الغذائية اذا سمح وصفاتك الغذائية)

قسم العلاج

17 أجب على أحد هذه الأسئلة:

خلال السبعة أيام الماضية, كم عدد الأيام التي اخذت فيها حقنة الأنسولين الموصى بهاخلال اليوم؟ 7 6 5 4 3 2 1

خلال السبعة أيام الماضية, كم عدد الأيام التي تناولت فيها حبوب السكر خلال اليوم؟

العناية بالقدم

18 خلال السبعة أيام الماضية, كم عدد الأيام التي غسلت فيها قدميك؟ 7 6 5 4 3 2 1

19 خلال السبعة أيام الماضية, كم عدد الأيام التي نقعت فيها قدميك في الماء ؟ 7 6 5 4 3 2 1

20 خلال السبعة أيام الماضية, كم عدد الأيام التي جففت فيها بين أصابع قدميك بعد الغسيل؟ 7 6 5 4 3 2 1

قسم التدخين

عما إذا كنت مدخن

21 عند آخر زيارة لطبيبك, هل سألك أحد ما عن التدخين؟ □ نعم □ لا

22 إذا كنت تدخن, عند آخر زيارة لطبيبك هل نصحك احد في الأقلاع عن التدخين أو أشار عليك ببرنامج الأقلاع عن التدخين؟ □ نعم □ لا

23 متى آخر مرة دخنت فيها سجائر:

أ- أكثر من سنتين مضت أو لم ادخن إطلاقاً □

ب- من سنة الى سنتين مضت □

ت- من اربعه الى إثناعشر شهراً مضت □

ث- من شهر الى ثلاثة اشهر مضت □

ج- خلال الشهر الماضي □

ح- اليوم □

هل ترغب في المشاركة في المقابلات الشخصية التي يجريها الباحث, في حالة موافقتك, أرجو الأتصال بالباحث حيث ستجد أرقام الأتصال موجودة في نموذج معلومات المشاركين المرافقة لهذا الإستبيان.

Appendix I. Back-translation

Version :4.0

1

QUESTIONNAIRE OF PERSONAL ACTIVITIES OF DIABETICS

Greetings ...

I thank you for your participation in this study, and finding the time to fill the blanks of this questionnaire. This study aims to identify effecting factors on the personal care of diabetics II. Be informed that all information are considered confidential. Moreover, filling this questionnaire is deemed as an approval upon participating in this study.

General Information

Age (Years) ☐ 26-45 ☐ 46-65 ☐ 66 or more

Gender ☐ Male ☐ Female

Education Level ☐ Uneducated ☐ Elementary ☐ Intermediate ☐ Secondary ☐ Undergraduate ☐ Postgraduate

income

Period since diagnosed with diabetes (years) ☐ Less than two years ☐ 2-4 ☐ 5-7 ☐ 8-10 ☐ More than 10 years

Other disease ☐ heart ☐ Hypertension ☐ kidney ☐ Eye

Questionnaire

The below stated questions aim to identify your personal activities in order to take good care of your diabetes throughout the last seven days. If you were ill during the last seven days. Please think back to the last seven days – if you weren't ill – as if from this day as an end of those seven days that you've decided to register. Then, put a mark on the correct answer.

Nutrition

1.	During the last seven days; For How Many Days Did You Follow a Healthy Diet?	0	1	2	3	4	5	6	7
2.	How Well Did You Follow Your Diet During The Last Month? (Rate of Days in The Week).	0	1	2	3	4	5	6	7
3.	During The Last Week; For How Many Days Did You Have Five or More Fruit & Vegetable Shares ?	0	1	2	3	4	5	6	7
4.	During The Last Week; For How Many Days Did You Have High Fatty Meals, E.g. Red Meet? (Like Cattle) & Full Fat Diaries.	0	1	2	3	4	5	6	7

Sport

5.	During The Last Seven Days; For How Many Days Did You Practice Physical Activities in General for at least 30 min? (Total Minutes of Activities Including walking)	0	1	2	3	4	5	6	7

The Professional For Certified Translation L. No. 408

6.	During the last seven days; For How Many Days Did You Practice a Strict Training Exercise Session (Swimming, Walking .. etc)? exclude activities that are performed around your home or at your job.	1	2	3	4	5	6

Blood Sugar Testing

7.	During the last seven days; For How Many Days Did You Test your Blood Sugar Levels ?	1	2	3	4	5	6
8.	During the last seven days; For How Many Days Did You Test your Blood Sugar Levels According to Your Physician's Instructions?	1	2	3	4	5	6

Foot Care

9.	During the last seven days; For How Many Days Did Inspected your Feet?	1	2	3	4	5	6
10.	During the last seven days; For How Many Days Did You check the interior of your shoes (to insure that there are no materials that could cause any cuts to your feet).	1	2	3	4	5	6

Smoking

11. During the last seven days; Did you smoke any cigarettes, Shishah, Mia'ssil) ? (even once). ☐ NO ☐ YES, Daily Smoked Cigarettes .....

Medical Recommendations for Self-Care

12. Which of the following recommendations were given to you at the healthcare center by (Physician, Nurse, Nutritionist, Diabetes Educator).

A. To Follow a low-fat diet ☐
B. To Follow a complex carbohydrate diet (e.g. rice & macaroni) ☐
C. To Reduce calories that you eat to loose weight ☐
D. To Eat a Fiber Rich Foods (Vegetables) ☐
E. To Eat a lot of Fruits & Vegetables (At least five a day) ☐
F. To eat small amounts of sweets (desert) ☐
G. Other (Specify) ☐
H. Didn't Receive any Nutrition Tips or Recommendations by my health care provider. ☐

13.

A. To Practice a Simple Physical Training Course (Walking) Daily ☐
B. To Practice Continuous Exercise for 20 min for 3 times a week. ☐
C. To Practice Fitness Exercises as a Daily Habit (e.g., Use The Stairs instead of elevator, or to park far and walk the distance .. etc.) ☐
D. To adhere to a certain type or period of training level. ☐
E. Other (Specify) ☐
F. Didn't Receive any Exercise Tips or Recommendations by my health care provider. ☐

14.

A. To Check the blood sugar level by the equipment to know the result. ☐

B. To examine the urine for sugar levels. ☐

C. Other (specify) ☐

D. Didn't Receive any sugar levels test in blood or urine Recommends or Tips by my health care provider. ☐

15. What are the medications that were described for you by your Physician?

A. An Insulin Shot (Once or Twice per Day) ☐

B. An Insulin Shot (Three Times or more per Day) ☐

C. Diabetes Pills to Control Blood Sugar Level ☐

D. Other (Specify) ☐

E. Didn't Receive neither insulin shots or Pills medications for diabetes. ☐

Nutrition

16. During the last seven days; For How Many Days Did You eat an equal amount of amyloidal along the day (in Breakfast, Lunch and Dinner, or through the rest of your daily meals) 1 2 3 4 5 6 7

Medications

17. Answer one of these questions ?

During the last seven days; For How Many times did you receive the recommended insulin shot per day? 1 2 3 4 5 6 7

During the last seven days; For How Many times did you take the diabetes pills daily?

Foot Care

18. During the last seven days; For How Many days did you wash your feet? 1 2 3 4 5 6 7

19. During the last seven days; For How Many Days did you soaked your feet in water ? 1 2 3 4 5 6 7

20. During the last seven days; For How Many Days did you dried your toes after washing them ? 1 2 3 4 5 6 7

Smoking

21. At your last visit to your physician; did anyone ask you if you were a smoker ? ☐ Yes ☐ No

22. If you were a smoker; during your last visit to your physician, did anyone recommended quitting or admitting to a smoke quitting program ? ☐ Yes ☐ No

23. When was the last time you smoked a cigarette ?

A. For more than two years or never smoked ever. ☐
B. From 1 to 2 years ago ☐
C. From 4 to 12 months ago ☐
D. From 1 to 3 months ago ☐
E. During last month ☐
F. Today ☐

Would you like to participate in the interviews conducted by the researcher ?
In case of approval, please contact the researcher on 0555313015

Appendix J. Arabic-SDSCA questionnaire (final version)

Final version (A-SDSCA)

ملخص الأستبيان

No.	Question	الأجابة	السؤال	التسلسل
	Diet		الـتـغـذيــة	
1	During the last seven days, for how many days did you follow a healthful diet?	0-1-2-3-4-5-6-7	• خلال السبعة أيام الماضية, كم عدد الأيام التي اتبعت فيها نظام غذاء صحي؟	1
2	How well did you follow your diet during the last month (rate of days in the week)	0-1-2-3-4-5-6-7	• ما مدى إتباعك لنظامك الغذائي خلال الشهر الماضي (كم معدل عدد الأيام خلال الأسبوع) ؟	2
	Exercise		الـريــاضــة	
3	During the last seven days, for how many days did you practice physical activities in general for at least 30 minutes?(Total minutes of activities including walking)	0-1-2-3-4-5-6-7	• خلال السبعة أيام الماضية, كم عدد الأيام التي مارست فيها في أنشطة بدنيةبصفة عامة لمدة 30 دقيقة على الأقل (مجموع الدقائق الكلية للأنشطة بما فيها المشي)	3
4	During the last seven days, for how many days did you practice a strict training exercise session (such as swimming, walking ...etc) exclude activities that are performed around your house or at your work?	0-1-2-3-4-5-6-7	خلال السبعة أيام الماضية, كم عدد الأيام التي مارست فيها في جلسة تمرين رياضي محدد (السباحة, المشي ...الخ) عدا تلك التي تقوم بها في محيط منزلك أو اللتي تكون جزءاً من عملك؟	4
	Blood Sugar Testing		فـحـص سـكـر الـدم	
5	During the last seven days, for how many days did you test your blood sugar level?	0-1-2-3-4-5-6-7	خلال السبعة أيام الماضية, كم عدد الأيام التي فحصت فيها سكر الدم؟	5
6	During the last seven days, for how many days did you test your blood sugar level according to your physician's instructions?	0-1-2-3-4-5-6-7	خلال السبعة أيام الماضية, كم عدد الأيام التي فحصت فيها سكر الدم حسب العدد المذكور في تعليمات طبيبك؟	6

	Foot Care		**الـعـنـايـة بـالـقـدم**	
7	During the last seven days, for how many days did you check your feet?	0-1-2-3-4-5-6-7	خلال السبعة أيام الماضية, كم عدد الأيام التي فحصت فيها قدميك؟	7
8	During the last seven days, for how many days did you check the interior of your shoes (to insure that there are no materials that could cause any injury to your feet)?	0-1-2-3-4-5-6-7	خلال السبعة أيام الماضية, كم عدد الأيام التي فحصت فيها حذائك من الداخل (للتأكد من عدم وجود اشياء تسبب الجروح مثل قطع في الحذاء أو نتوءات)؟	8

Appendix K. The study instrument

إستبيان موجز الأنشطة الشخصية لرعاية السكري

السلام عليكم ورحمة الله وبركاته

أشكرك على المشاركة في هذه الدراسة والأخذ من وقتكم لتعبئة هذا الأستبيان. تهدف هذه الدراسة الى معرفة العوامل المؤثرة على العناية الشخصية لمرضى السكري من النوع الثاني علماً انه سيتم التعامل مع جميع المعلومات بسرية تامة. تعبئة هذا الأستبيان يعتبر موافقة على المشاركة في الدراسة.

شكراً لك,,,

معلومات عامة

العمر (بالسنوات)	□26-45	□46-65	□66 أو أكثر			
الجنس	□ ذكر	□ أنثى				
مستوى الدخل المادي	□25,000 أو أقل	□ 50,000 أو أقل	□ 75,000 أو أقل	□100,000 أو أقل	□ أكثر من 100,000	
مستوى التعليم	□ غير متعلم	□ إبتدائي	□ كفاءة	□ثانوي	□ جامعي	□ تعليم عالي
الفترة منذ إصابتك بالسكري (بالسنوات)	□ أقل من سنتين	□2-4	□5-7	□8-10	□أكثر من 10 سنوات	
هل يوجد لديك امراض	□ قلب	□ ضغط	□ كلى	□ عيون		

الإستبيان

الأسئلة الواردة أدناه تهدف الى معرفة أنشطتك الشخصية للعناية بالسكري خلال السبعة أيام الماضية. إذا كنت مريضاً خلال السبعة أيام الماضية, الرجاء العودة بالذاكرة الى آخر سبعة أيام لم تكن مريضاً بها إعتماداً على هذا اليوم كنهاية للفترة التي قررت تسجيلها. الرجاء وضع دائرة على الإجابة الصحيحة.

قسم التغذية

خلال السبعة أيام الماضية, كم عدد الأيام التي اتبعت فيها خطة غذاء صحي؟	0 1 2 3 4 5 6 7
بالنسبة الى الشهر الماضي, كم عدد الأيام خلال الأسبوع التي اتبعت خطتك الغذائية ؟	0 1 2 3 4 5 6 7

قسم الرياضة

خلال السبعة أيام الماضية, كم عدد الأيام التي مارست فيها في أنشطة بدنيةبصفة عامة لمدة 30 دقيقة على الأقل (مجموع الدقائق الكلية للأنشطة بما فيها المشي)	0 1 2 3 4 5 6 7
خلال السبعة أيام الماضية, كم عدد الأيام التي مارست فيها في جلسة تمرين رياضي محدد (السباحة, المشي ...الخ) عدا تلك التي تقوم بها في محيط منزلك أو اللتي تكون جزءاً من عملك؟	0 1 2 3 4 5 6 7

قسم فحص سكر الدم

خلال السبعة أيام الماضية, كم عدد الأيام التي فحصت فيها سكر الدم؟ 0 1 2 3 4 5 6 7

خلال السبعة أيام الماضية, كم عدد الأيام التي فحصت فيها سكر الدم حسب العدد المذكور في تعليمات طبيبك؟ 0 1 2 3 4 5 6 7

قسم العناية بالقدم

خلال السبعة أيام الماضية, كم عدد الأيام التي فحصت فيها قدميك؟ 0 1 2 3 4 5 6 7

خلال السبعة أيام الماضية, كم عدد الأيام التي فحصت فيها حذائك من الداخل (للتأكد من عدم وجود اشياء تسبب الجروح مثل قطع في الحذاء أو نتوءات)؟ 0 1 2 3 4 5 6 7

قسم التدخين

خلال السبعة أيام الماضية, , هل دخنت (السجائر – الشيشة – المعسل) حتى ولو لمرة واحدة ؟ □ لا □ نعم, كم سيجارة دخنت بمعدل يومي

عدد السجائر:_____

قسم النصائح الطبية للعناية الشخصية

- أي مما يلي نصحك الفريق الطبي بمركز الرعاية الصحية (طبيب, ممرض, أخصائي التغذية, مثقف السكري) بأن تعمل:

أ-إتباع حمية غذائية قليلة الدسم □

ب-إتباع حمية غذائية من النشويات المركبة (مثل الأرز والمكرونه) □

ت-تقليل عدد السعرات الحرارية التي تأكلها لتخفيض الوزن □

ث-تناول أطعمة غنية بالألياف (مثل الخضروات) □

ج-تأكل كثيراً من الفواكه والخضروات (على الأقل خمسة يومياً) □

ح-تناول كميات قليلةً من الحلوى (مثل تحلية بعد الطعام) □

خ-أخرى (حدد) □

د-لم أتلقى أية نصيحة حول التغذية من قبل فريق رعايتي الصحية □

-

أ-ممارسة تمارين رياضية بسيطة (مثل المشي) بشكل يومي □

ب-ممارسة تمارين مستمرة لمدة 20 دقيقة 3 مرات اسبوعياً □

ت-ممارسة تمارين لياقة في عاداتك اليومية (مثلاً □

استخدم الدرج بدلاً عن المصعد, أوقف سيارتك بعيداً ثم أمشي تلك المسافة..الخ)

ج-الأرتباط بنوع أو عدد أو مدة معينة من مستوى التمرين ☐

ح-أخرى (حدد) ☐

خ-لم أتلقى أية نصيحة حول التمرين من قبل فريق رعايتي الصحية ☐

-

أ-فحص سكر الدم باستخدام الجهاز لمعرفة النتيجة ☐

ب-فحص البول السكري ☐

ح-أخرى (حدد) ☐

ح-لم أتلقى أية نصيحة حول فحص سكري البول أو سكري الدم من قبل فريق رعايتي الصحية ☐

- ما هي الأدوية التي وصفها لك طبيبك للسكري:
-

أ-حقنة أنسولين مرة الى مرتين يومياً ☐

ب-حقنة أنسولين 3 مرات أو أكثر يومياً ☐

ت-حبوب سكري لضبط مستوى سكري الدم ☐

ث-أخرى (حدد) ☐

ح-لم اتلقى من فريق رعايتي الصحية أية وصفة سواء حقن أنسولين أو حبوب لمرضي السكري ☐

قسم التغذية

- خلال السبعة أيام الماضية, كم عدد الأيام التي تناولت فيها كمية النشويات اليومية خلال اليوم بالتساوي (كمية متساوية من النشويات في الفطور والغداء والعشاء أو باقي وجباتك الغذائية) ؟ 7 6 5 4 3 2 1 0

قسم العلاج

- أجب على أحد هذه الأسئلة:

خلال السبعة أيام الماضية, كم عدد الأيام التي اخذت فيها حقنة الأنسولين الموصى بهاخلال اليوم؟

خلال السبعة أيام الماضية, كم عدد الأيام التي تناولت فيها حبوب السكر خلال اليوم؟ 7 6 5 4 3 2 1 0

العناية بالقدم

- خلال السبعة أيام الماضية, كم عدد الأيام التي غسلت فيها قدميك؟ 0 1 2 3 4 5 6 7
- خلال السبعة أيام الماضية, كم عدد الأيام التي نقعت فيها قدميك في الماء ؟ 0 1 2 3 4 5 6 7
- خلال السبعة أيام الماضية, كم عدد الأيام التي جففت فيها بين أصابع قدميك بعد الغسيل؟ 0 1 2 3 4 5 6 7

قسم التدخين

- عند آخر زيارة لطبيبك, هل سألك أحد عما إذا مدخن؟ □ نعم □ لا
- إذا كنت تدخن, عند آخر زيارة لطبيبك, هل نصحك احد في الأقلاع عن التدخين أو أشار عليك ببرنامج الأقلاع عن التدخين؟ □ نعم □ لا
- متى آخر مرة دخنت فيها سجائر:
  - أ- أكثر من سنتين مضت أو لم ادخن إطلاقاً □
  - ب- من سنة الى سنتين مضت □
  - ت- من اربعه الى إثناعشر شهراً مضت □
  - ث- من شهر الى ثلاثة اشهر مضت □
  - ج- خلال الشهر الماضي □
  - ح- اليوم □

هل ترغب في المشاركة في المقابلات الشخصية التي يجريها الباحث, في حالة موافقتك, أرجو الأتصال بالباحث /خالد الجهني على الرقم

Appendix L. The schedule of the individual interview questions

Interview questions

Diabetic's participants interview Questions

1- On how many of the last 7 days did you participate in at least 30 minutes of *physical activity*? (This question will cover exercise; medication; diet; foot care; blood sugar testing)
1.1- Could you please describe what you do in this physical activity?
1.2- What factors do you think could affect your self-management outcome in this?
1.3- What do diabetes patients needs to keep their optimum level in performing physical activity?

2- Is there anything you want to comment on or add to this conversation?

Health professionals' interview Questions

1- What role does self-management play in improving patient's outcome?
2- Do you provide diabetes self-management education for people with T2DM? Yes- no
2.1- Could you please describe self-management education program for me?
3- Do all people with T2DM receive the same educational intervention? Yes- no
4- Do all health-care professionals participate in self-management education program?
5- What influences health professionals views about self-management?
6- What factors do you think could affect self-management outcome?
7- How could we improve self-management?

Appendix M. The coding system

جدول تكويد المعلومات

الكود		الكود الفرعي/ الوصف
النظام الصحي (خلق مؤسسات وثقافة وآليات تعزز الرعاية الآمنة بجودة عاليه)	1	دعم التطوير بوضوح ابتداء من المدراء
	2	دعم استراتيجيات التغيير الكامل للنظام الصحي
	3	تشجيع التعامل مع الأخطاء ودعم الجودة النوعية لتحسين النظام الصحي
	4	تقديم مكافآت اعتماداً على جودة الرعاية المقدمة
	5	إيجاد توافق لتسهيل تنسيق الرعاية بين المؤسسات
تصميم نظام تقديم الرعاية (التأكد من تقديم رعاية سريرية ودعم رعاية ذاتية فاعلة ومؤثرة)	1	تحديد الأدوار وتوزيع المهام بين أعضاء الفريق
	2	أستخدام الخطط لدعم الرعاية المبنية على البراهين
	3	إيجاد ادارة حالات علاجية للحالات المعقدة
	4	التاكد من وجود متابعة منظمة من قبل فريق الرعاية
	5	تقديم عناية يفهمها المريض وتتناسب مع خلفيتة الثقافية
دعم "أتخاذ" القرارات (تعزيز الرعاية السريرية المتوافقة مع الأدلة العلمية وما يفضله المريض)	1	طمر "إدخال" أدلة العمل المبنية على البراهين داخل الممارسات السريرية اليومية
	2	مشاركة الأدلة المبنية على البراهين والمعلومات مع المرضى لتشجيع مشاركتهم
	3	إستخدام طرق معتمدة لتعليم مقدمي الرعاية الصحية
	4	دمج الخبرات الطبية المتخصصة (أخصائي السكري) مع الرعاية الصحية الأولية
نظام المعلومات السريرية (تنظيم معلومات المريض ومعلومات السكان لتسهيل رعاية فعالة ومؤثرة)	1	إيجاد منبه مؤقت لمقدم الرعاية والمريض
	2	تحديد المجموعات التي تحتاج الى رعاية إستباقية
	3	تسهيل خطط الرعاية الشخصية للمرضى
	4	مشاركة المعلومات بين مقدمي الرعاية والمرضى لتنسيق الرعاية
	5	ملاحظة آداء فريق الرعاية ونظام الرعاية الصحية
دعم الرعاية الذاتية (تقوية وتحضير المرضى لمتابعة صحتهم ورعايتهم الصحية)	1	التاكيد على دور المرضى الرئيسي في متابعة حالتهم الصحية
	2	إستخدام إستراتيجيات دعم الرعاية الذاتية والتي تشمل التقييم, تحديد الأهداف, خطة العمل, حل المشاكل والمتابعة
	3	تنظيم الموارد الداخلية (في النظام الصحي) وموارد المجتمع لتقديم دعم مستمر للرعاية الذاتية للمرضى
المجتمع (تحريك موارد المجتمع للوفاء باحتياجات المرضى)	1	تشجيع المرضى للمشاركة في برامج المجتمع الفعالة
	2	تشكيل تعاون مع مؤسسات المجتمع لدعم وتطوير التدخلات لسد ثغرات الخدمات المحتاجة او المطلوبة
	3	المدافعة عن السياسات التي تحسن رعاية المريض
	4	عوامل ثقافية
	5	عوامل عائلية
	6	عوامل بيئية

Appendix N. Interview codes exemplar

Theme	Subtheme	Providers	Patients	
			Male	Female
Health system	Support improvement	We receive instructions only		
	Promote comprehensive system change	Doctors do not have permanent assignment in P.H.C centre, most of our career we are moving between PHC centres in different places		
	Open and systematic handling of errors	Those who visit us just look after monthly census. I will be in trouble if it is not complete The most important thing is to fill-in the statistics form, no body care for what you did clinically...paper is everything for those who work in the administration. I don't know why not to decrease this workload.		
	Facilitate care coordination within and across organizations	Roughly, we receive feedback for 10% of our referred patients	They gave me medication but did not guide me on how to deal with diabetes. Similarly, when I shift my medical record here, they did not ask me about diabetes management	
	Medication availability		-if the pharmacy do not have aspirin, the pharmacist keep telling they will bring it tomorrow and tomorrow may extend for two weeks	

Appendix O. The study recruitment posters

أنت مدعو للمشاركة!

- هل يوجد لديك النوع الثاني من السكري.
- هل أنت مستعد لمشاركتنا خبرتك في تعاملك مع المرض.
- هل تريد وضع اقتراحات لتحسين خدمات مرضى السكري.
- هل تريد أن تكون جزءاً من البحث العلمي.

نحن نرحب بك للانضمام إلى بحث (احتياجات مرضى السكري من النوع الثاني في الرعاية الصحية بمنطقة المدينة المنورة) .

سوف نطلب منك تعبئة الاستبيان كما يمكنك الانضمام إلى الجلسات التشاوريه مع الباحث لتسجيل اقتراحاتك ووجهة نظرك في التعامل مع مرضى السكري.

لراحتك:

- سيقوم الباحث شرح خطوات البحث.
- ستتعرف على كيفية تعبئة لاستبيان .
- يسعدنا تلقي استفساراتكم طوال مدة البحث.
- إذا أحببت المشاركة في الجلسة التشاوريه مع الباحث, يمكنك اختيار الوقت والمكان المناسب لك.
- للتفاصيل, احصل على نشرة معلومات البحث أو اتصل بالباحث.

لمزيد من المعلومات, الرجاء الاتصال بالباحث / خالد الجهني على الهاتف رقم0555313015

هذه الدراسة معتمدة من:

1. لجنة أخلاقيات البحث العلمي للتعامل مع البشر بجامعة كيرتن الأسترالية.
2. المديرية العامة للشئون الصحية بمنطقة المدينة لمنورة.

Appendix P. The participants' information sheets

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Arabic Participant information sheet and consent

معلومات للمشاركين ونموذج الموافقة

معلومات المشاركين

نموذج 1 بتاريخ 2008-08-03

الموقع : الرعاية الصحية الأولية بمنطقة المدينة المنورة, المملكة العربية السعودية.

اسم البحث: العوامل المؤثرة في الرعاية الذاتية لمرضى النوع الثاني للسكري في المدينة , المملكة العربية السعودية

الباحث: خالد الجهني

جامعة كيرتن للتقنية

==========

تحتوي هذه الورقة على معلومات عن هذا البحث والهدف منها هو شرح خطوات البحث بصورة واضحة قبل ان تتخذ القرار في المشاركة او لا في هذا البحث. الهدف من البحث هو التعرف على العوامل المؤثرة في الرعاية الذاتية لمرضى السكري من النوع الثاني في المدينة المنورة .

المشاركة في البحث تتكون من تعبئة الأستبيان والمشاركة في مقابلة مع الباحث حيث سيطرح الباحث بعض الأسئلة. تستغرق المقابلة حوالي الساعة وستكون هذه المقابلة مسجلة. *خلال المقابلة, سيسجل الباحث بعض المعلومات العامة عن المشاركين مثل العمر والجنس والمستوى التعليمي ومدة الأصابة بالسكري. بالنسبة للمشاركين من الفريق الصحي ستكون المعلومات العامة متركزة حول عدد سنوات الخبرة بالأضافة الى الأسئلة السابقة.*

النقاط المطلوب معرفتها من خلال البحث هي التعرف على نقاط القوة أو الضعف في النظام الصحي علماً أنه لا توجد مخاطر من جراء انضمامكم لهذه الدراسة.

المحافظة على سرية المعلومات

للمحافظة على السرية وعدم التعرف على هوية المشاركين في البحث، لن يتم تسجيل الأسماء . سيسجل الباحث المعلومات العامة للمشاركين على ورقة صغيرة قبل بداية التسجيل. الأسماء المكتوبة بالورقة

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ستخضع لعملية تكويد بحيث لا يتم التعرف عليها الا عن طريق الباحث فقط وستكون جميع المعلومات المأخوذة ستخضع للسرية التامة وستحفظ في مكتب الباحث فيما ستنشر النتائج العامة فقط بعد انتهاء البحث. سوف يتم ارسال نتائج البحث الى جامعة كيرتن الأسترالية كما ستنشر في المجلات العلمية. سيتيح الباحث للمهتمين من المشاركين الفرصة للأطلاع على نتائج البحث.

تعتبرالمشاركة في البحث تطوعية ولن يتم دفع مبالغ مادية للمشاركين وفي حالة عدم رغبتك بالمشاركة أو غيرت رأيك في احد مراحل البحث، يمكنك اخبار الباحث بذلك والأنسحاب من البحث. قرارك في المشاركة من عدمة لن يؤثر على علاقتك بالفريق الصحي او بالمركز الصحي الذي تراجع فيه. سيتواجد الباحث في المركز الصحي ويمكنك سؤاله عن أي شيء اذا اردت.

هذه الدراسة تخضع للقانون الوطني الأسترالي للأبحاث التي تتعامل مع البشر (جون1999) والصادر من هيئة الأبحاث الطبية الأسترالية. هذا القانون وضع لحماية المشاركين في الأبحاث. هذا بالأضافة الى ان جامعة كيرتن الأسترالية قامت بالموافقة على هذه الدراسة (موافقة رقم_____). في حالة رغبتك الحصول على معلومات اضافية، ارجو عدم التردد بالأتصال بالباحث على جوال رقم 0555313015 وبريد اليكرتوني k.aljohani@pgrad.curtin.edu.au أو بالمشرف على الدراسة الدكتور بوول سنايدر على البريد الأليكتروني P.Snider@email.curtin.edu.au أو الأتصال بادارة البحوث بجامعة كيرتن على الرقم +61 8 92662784.

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نموذج موافقة

نموذج 1 بتاريخ 03-08-2008

الموقع : الرعاية الصحية الأولية بمنطقة المدينة المنورة, المملكة العربية السعودية.

اسم البحث: العوامل المؤثرة في الرعاية الذاتية لمرضى النوع الثاني السكري في المدينة , المملكة العربية السعودية

الباحث: خالد الجهني

جامعة كيرتن التقنية

أقر انا الموقع اسمي ادناه بأنني قرأت وفهمت نموذج تعليمات المشاركين المؤرخ في 2008/08/03

أن الدراسة هي بغرض البحث العلمي.

أنني اوافق وبحرية على المشاركة بناء على المعلومات المقدمة في نموذج تعليمات المشاركين.

أعلم بأن هناك تسجيل للمقابلات وانه لا يوجد تسجيل للأسماء .

انه سيتم منحي صورة من معلومات المشاركين ونموذج الموافقة.

ان الباحث وافق على عدم كشف هويتي وأن المعلومات سوف تكون للنشر العلمي الا في حالة طلب القانون ذلك.

اوافق على استخدام حديث المقابلة الشخصية للأقتباس منه.

أسم المشارك/..... التوقيع/..... التاريخ/.....

أسم الشاهد /..... التوقيع/..... التاريخ/.....

اقرار الباحث: أنني وضحت للمشارك شفهياً الخطوات الموجودة في البحث وان المشارك قد فهم وادرك ذلك.

أسم الباحث/ خالد الجهني التوقيع/..... التاريخ/.....

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Appendix Q. Curtin University Human Research Ethics Committee protocol approval

memorandum

To	Paul Snider, Nursing & Midwifery
From	A/Professor Stephan Millett, Chair, Human Research Ethics Committee
Subject	Protocol Approval **HR 16/2009**
Date	23 March 2009
Copy	Khalid A. Aljohani (2/11 Norton Street, North Perth, 6151) Graduate Studies Officer, Faculty of Health Sciences

Curtin University of Technology
Office of Research and Development

Human Research Ethics Committee

TELEPHONE 9266 2784
FACSIMILE 9266 3793
EMAIL hrec@curtin.edu.au

Thank you for your application submitted to the Human Research Ethics Committee (HREC) for the project titled *"Factors affecting the self-management practices of people with type 2 diabetes in Almadinah, Saudi Arabia"*. Your application has been reviewed by the HREC and is **approved**.

- You are authorised to commence your research as stated in your proposal.
- The approval number for your project is **HR 16/2009**. *Please quote this number in any future correspondence.*
- Approval of this project is for a period of twelve months **03-03-2009** to **03-03-2010**. To renew this approval a completed Form B (attached) must be submitted before the expiry date **03-03-2010**.
- If you are a Higher Degree by Research student, data collection must not begin before your Application for Candidacy is approved by your Divisional Graduate Studies Committee.
- The following standard statement **must be** included in the information sheet to participants:

  This study has been approved by the Curtin University Human Research Ethics Committee (Approval Number HR 16/2009). The Committee is comprised of members of the public, academics, lawyers, doctors and pastoral carers. Its main role is to protect participants. If needed, verification of approval can be obtained either by writing to the Curtin University Human Research Ethics Committee, c/- Office of Research and Development, Curtin University of Technology, GPO Box U1987, Perth, 6845 or by telephoning 9266 2784 or by emailing hrec@curtin.edu.au.

Applicants should note the following:

It is the policy of the HREC to conduct random audits on a percentage of approved projects. These audits may be conducted at any time after the project starts. In cases where the HREC considers that there may be a risk of adverse events, or where participants may be especially vulnerable, the HREC may request the chief investigator to provide an outcomes report, including information on follow-up of participants.

The attached **FORM B** should be completed and returned to the Secretary, HREC, C/- Office of Research & Development:
When the project has finished, or

- If at any time during the twelve months changes/amendments occur, or
- If a serious or unexpected adverse event occurs, or
- 14 days prior to the expiry date if renewal is required.
- An application for renewal may be made with a Form B three years running, after which a new application form (Form A), providing comprehensive details, must be submitted.

Regards,

A/Professor Stephan Millett
Chair Human Research Ethics Committee

Appendix R. Almadinah Region Directorate of Health Affairs approval

FROM : AL-ZAMAN BOOK SHOP FAX NO. : 00966 4 8383226 Aug. 30 2008 12:38PM P1

THE KINGDOM OF SAUDI ARABIA
MINISTRY OF HEALTH
General Directorate of Health Affairs
In Madinah Area
Administration of Primary Health Care
Technical Affairs

المملكة العربية السعودية
وزارة الصحة
المديرية العامة للشئون الصحية
بمنطقة المدينة المنورة
إدارة الرعاية الصحية الأولية
اداره شئون المراكز الصحية

To whom it may concern,

This to certify that primary health care division, Almadinah Region Directorate of Health Affairs, Kingdom of Saudi Arabia, has approved Mr. Aljohani research titled

"Type two diabetes patients' needs in the Saudi primary health care system: A multiple-case study design"

Mr. Aljohani will be given the access to materials and related resources he needs for this study. Initial arrangement with study locations has been made to facilitate this study development.

Please do not hesitate to contact me if you require any additional information.

Dr. Abdullah M. Aljohani

MD. Consultant, Family Medicine 30/8/2008

Assistant Director General of primary Health Care

Almadinah Almonawarah

Kingdom of Saudi Arabia

Tel: +966 4 8370600

Fax: +966 4 8360596

ترجمه

إلى من يهمه الأمر/ تشهد إدارة الرعاية الأولية في صحة المدينة المنورة بالمملكة العربية السعودية بأنها قد وافقت على إجراء بحث السيد الجهني بعنوان
(احتياجات مرضى السكري من النوع الثاني في نظام الرعاية الصحية الأولية بالمملكة العربية السعودية: تصميم الحالات المتعددة) .
سيعطى السيد الجهني الحق في مصادر المعلومات والدعم الذي يحتاجه لعمل الدراسة.

د. عبدالله الجهني
مساعد المدير العام للرعاية الصحية الأولية بمنطقة المدينة المنورة
(توقيع)

الرقم / التاريخ / / ١٤هـ المشفوعات /

Appendix S. Factor analyses detailed output

Varimax rotation component matrix (all items included)

Rotated Component Matrix[a]

	Component			
	1	2	3	4
Q.2 Over the past month, how many days p/week have you followed eating plan?	.865			
Q.1 How many of the last seven days have you followed a healthful eating plan?	.861			
Q.4 How many of the last seven days did you eat high fat foods?	-.651			
Q.7 On how many of the last seven days did you test your blood sugar?		.937		
Q.8 How many of the last seven days did you test your blood sugar recommended		.921		
Q.10 On how many of the last seven days did you inspect the inside of your shoes?			.864	
Q.9 On how many of the last seven days did you check your feet?			.828	
Q.3 How many of the last seven days did you eat five or more servings fruit/veg			.546	
Q.5 How many of the last seven days did you participate in at least 30 min exercise?				.917
Q.6 How many of the last seven days did you participate in specific exercise session?				.896

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 5 iterations.

Varimax rotation component matrix (excluding item 3 and reversed item 4)

Rotated Component Matrix[a]

	Component			
	1	2	3	4
Over the past month, how many days p/week have you followed eating plan?	.884			
How many of the last seven days have you followed a healthful eating plan?	.873			
How many of the last seven days did you eat high fat foods?	.601			
On how many of the last seven days did you test your blood sugar?		.930		
How many of the last seven days did you test your blood sugar recommended		.914		
How many of the last seven days did you participate in at least 30 min exercise?			.918	
How many of the last seven days did you participate in specific exercise session?			.912	
On how many of the last seven days did you inspect the inside of your shoes?				.881
On how many of the last seven days did you check your feet?				.862

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 5 iterations.

Pattern matrix Oblimin rotation

Pattern Matrix[a]

	Component			
	1	2	3	4
Over the past month, how many days p/week have you followed eating plan?	.916			
How many of the last seven days have you followed a healthful eating plan?	.885			
How many of the last seven days did you eat high fat foods?	.573	.444		
On how many of the last seven days did you test your blood sugar?		-.919-		
How many of the last seven days did you test your blood sugar recommended		-.898-		
How many of the last seven days did you participate in at least 30 min exercise?			.930	
How many of the last seven days did you participate in specific exercise session?			.920	
On how many of the last seven days did you inspect the inside of your shoes?				.900
On how many of the last seven days did you check your feet?				.886

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.

a. Rotation converged in 7 iterations.

Structure matrix with Oblimin rotation

Structure Matrix

	Component			
	1	2	3	4
How many of the last seven days have you followed a healthful eating plan?	.912			.335
Over the past month, how many days p/week have you followed eating plan?	.906			
How many of the last seven days did you eat high fat foods?	.607	.377		.389
On how many of the last seven days did you test your blood sugar?		-.935-		
How many of the last seven days did you test your blood sugar recommended		-.923-		
How many of the last seven days did you participate in at least 30 min exercise?			.927	
How many of the last seven days did you participate in specific exercise session?			.924	
On how many of the last seven days did you inspect the inside of your shoes?	.319			.904
On how many of the last seven days did you check your feet?				.880

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.