Exploring Health Education Delivered to Patients with Acute Coronary Syndrome and Type 2 Diabetes Mellitus Admitted to a Shanghai Hospital

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A thesis submitted in total fulfilment of the requirements

of the degree of Doctor of Philosophy (Ph.D.)

School of Nursing, Midwifery and Paramedicine

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Candidate's Statement of Authorship and Sources

This thesis contains no material published elsewhere or extracted in whole or in part from a thesis by which I have qualified for or been awarded another degree or diploma.

No parts of this thesis have been submitted towards the award of any other degree or diploma in any other tertiary institution.

No other person's work has been used without due acknowledgment in the main text of the thesis.

All research procedures reported in the thesis received the approval of the relevant ethics or safety committees (where required).

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Contribution to Jointly Published Work

It is acknowledged that I received support, advice and guidance from a supervisory team and was supported by other staff at Australian Catholic University for my Ph.D. research training.

For the published manuscripts relating to this thesis I have contributed to the conception and design of the study, recruited participants and collected data, completed data analysis and interpretation, wrote the first drafts of the manuscripts and approved final versions for publication.

It is acknowledged that while my supervisors contributed in part to the papers included in this thesis, they provided support with conception and design of study, data analysis, and interpretation of data and critical review of the manuscripts and approved final versions for publication.

It is acknowledged that all co-authors of jointly published papers included in this thesis gave their consent for the inclusion of each publication in this thesis and that the co-authors accept my contribution to the publication as so described in the statement of contribution to jointly published work by others. All other work included in this thesis, not part of published papers or those accepted for publication are entirely my own work, except where duly acknowledged.

My contribution and the contribution of co-authors to each of the publications included in this thesis are detailed in the following sections.

Publications or Submitted Papers by the Candidate

This thesis includes a number of published or submitted manuscripts. To date, three papers have been published and one has been submitted to a journal for consideration. The details of these publications are outlined below.

Chapter 2 – Literature Review: Umbrella Review

Liu, X. L., Shi, Y., Willis, K., Wu, C-J (Jo)., & Johnson, M. (2017). Health education for patients with acute coronary syndrome and type 2 diabetes mellitus: an umbrella review of systematic reviews and meta-analyses. BMJ Open, 7(10), e016857.

Chapter 4 – Study 1: A Qualitative Study of Health Professionals

Liu, X. L., Willis, K., Wu, C. J. J., Shi, Y., & Johnson, M. (2018a). 'Better to save one life than build a seven-storied pagoda': a qualitative study of health education for patients with acute coronary syndrome and type 2 diabetes mellitus in Shanghai, China. BMJ Open, 8(8), e019351.

Chapter 5 – Study 2(a): A Quantitative Study of Patients

Liu, X. L., Wu, C. J., Willis, K., Shi, Y., & Johnson, M. (2018b). The impact of inpatient education on self-management for patients with acute coronary syndrome and type 2 diabetes mellitus: a cross-sectional study in China. Health Education Research, 33(5), 389-401.

Chapter 6 – Study 2(b): A Mixed Methods Study of Patients

Liu, X. L., Willis, K., Wu, C-J (Jo)., Fulbrook, P., Shi, Y., & Johnson, M. (2018c). Preparing Chinese patients to manage their diabetes and heart disease at home: a mixed methods study. Manuscript submitted for publication in Health & Social Care in the Community.

Statement of Contribution to Jointly Published Work – Chapter 2

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Acronyms and Abbreviations

AADE	Association of American Diabetes Educators
ACS	Acute Coronary Syndrome
ADA	American Diabetes Association
BMI	Body Mass Index
BP	Blood Pressure
CAD	Coronary Artery Disease
C-ACSRI	Chinese version of Acute Coronary Syndrome Response Index
CCU	Coronary Care Unit
C-DKS	Chinese version of Diabetes Knowledge Scale
C-DMSES	Chinese version of Diabetes Management Self-efficacy Scale
CDSMP	Cardiac-Diabetes Self-management Program
CHD	Coronary Heart Disease
CR	Cardiac Rehabilitation
CVD	Cardiovascular Diseases
DSME	Diabetes Self-management Education
DSMES	Diabetes Self-management Education and Support
GP	General Practitioner
HbA1c	Glycosylated Haemoglobin
HBM	Health Belief Model
HDL-c	High-density Lipoprotein Cholesterol

KR20	Kuder-Richardson 20
LDL-c	Low-density Lipoprotein Cholesterol
MI	Myocardial Infarction
Non-STEMI	Non ST-segment Elevation Myocardial Infarction
SCT	Social Cognitive Theory
SLT	Social Learning Theory
STEMI	ST-segment Elevation Myocardial Infarction
T2DM	Type 2 Diabetes Mellitus
UA	Unstable Angina
VAS	Visual Analogue Scale
WHO	World Health Organization

Definition of Terms

Acute Coronary Syndrome (ACS) is defined as "a spectrum of conditions compatible with acute myocardial ischemia and/or infarction due to an abrupt reduction in coronary blood flow" (Amsterdam et al., 2014, p. 2650). Unstable angina (UA), Non ST-segment elevation myocardial infarction (Non-STEMI), and ST-segment elevation myocardial infarction (STEMI) are referred to as ACS (Medagama, Bandara, De Silva, & Galgomuwa, 2015).

Comorbidity is the existence of two or more medical conditions both occurring as a primary condition or disease (Valderas, Starfield, Sibbald, Salisbury, & Roland, 2009). In the current research project, comorbidity means two or more medical disorders or conditions that exist simultaneously and interdependently of each other in the same person (Capobianco, 2013).

Diabetes Education is to support individuals experiencing diabetes with behavioural changes, health decision-making and their coping with health consequences, while promoting positive cooperation among health professionals and individuals with diabetes to gain better health outcomes and quality of life (Haas et al., 2013).

Diabetes Self-management Education and Support (DSMES) "is the ongoing process of facilitating the knowledge, skills, and ability necessary for prediabetes and diabetes self-care, as well as activities that assist a person in implementing and sustaining the behaviours needed to manage his or her condition on an ongoing basis, beyond or outside of formal self-management training" (Beck et al., 2017, p. 1).

Health Behaviour is defined as "those personal attributes such as beliefs, expectations, motives, values, perceptions, and other cognitive elements; personality characteristics, including affective and emotional states and traits; and overt behaviour patterns, actions, and habits that relate to health maintenance, to health restoration, and to health improvement" (Glanz, Rimer, & Viswanath, 2015, p. 10).

Health Education is “any combination of learning experiences designed to help individuals and communities improve their health, by increasing their knowledge or influencing their attitudes” (WHO, 2013, p.1).

Mixed Methods Study is “the type of research in which a researcher or team of researchers combines elements of qualitative and quantitative research approaches (e.g., use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques) for the broad purposes of breadth and depth of understanding and corroboration” (Johnson, Onwuegbuzie, & Turner, 2007, p. 123).

Self-efficacy is defined as the person’s belief in their own capability to take the actions required to achieve the desired goals (Bandura, 1977).

Self-management is defined as “the individual’s ability to manage the symptoms, treatment, physical and psychosocial consequences and life style changes inherent in living with a chronic condition” (Barlow, Wright, Sheasby, Turner, & Hainsworth, 2002, p. 178).

Structured Education Program is “a planned and graded programme that is comprehensive in scope, flexible in content, responsive to an individual’s clinical and psychological needs, and adaptable to his or her educational and cultural background” (National Institute for Health and Care Excellence [NICE], 2015, p. 5).

Type 2 Diabetes Mellitus (T2DM) is a chronic and progressive metabolic condition. Hyperglycemia results from a deficiency in insulin resistance and insulin secretion (American Diabetes Association [ADA], 2010). If the hyperglycemia of T2DM remains unmanaged damage to human organs such as the heart, kidneys, nerves, eyes, and blood vessels may result (ADA, 2014).

Unstructured Education Programs are defined as educational programs with no planned topics or curriculum and no mandated length of training time (NICE, 2015).

Abstract

Introduction

Patients with both acute coronary syndrome (ACS) and type 2 diabetes mellitus (T2DM) are the focus of this thesis. Together these conditions represent a substantial burden of illness within Western and now Eastern countries. Patients presenting with multiple conditions are frequently encountered within clinical practice, with often poorer clinical outcomes than those with a single condition. The challenge of delivering health education is substantial when patients experience two or more health conditions. Within China, health education is provided principally during the acute admission period, often for ACS. In this unique cultural setting, there has been little research about the delivery by health professionals of health education to patients with both ACS and T2DM.

Aims

The aims of this research are to gain an understanding of the current health education delivered by health care professionals and received by patients with ACS and T2DM within Shanghai. In particular the impact of such education on patients' behavioural change, clinical outcomes, and self-efficacy and self-management was examined.

Methods

An umbrella systematic review was conducted including 51 eligible reviews (15 for ACS and 36 for T2DM). This was followed by a qualitative study of 15 health professionals' experience of delivering health education to this patient group (Study 1). Finally, a mixed methods study of patients, including a cross-sectional survey (n = 160), patient health care record audit of clinical outcomes (n = 160), and two interviews with patients at discharge and at follow-up (n = 21) in the community, was conducted. The study setting was a coronary care unit (CCU) within a major referral hospital within Shanghai, China. Data were collected from July 2016 to March 2017.

Perceived health education received was measured using a visual analogue scale (VAS) ranging from 1 (little or no education) to 100 (comprehensive education) in the survey for patients. The

survey for patients was followed by a semi-structured interview before discharge and a telephone-based follow-up interview up to four weeks after discharge from hospital. Twenty-one of the 160 patients completed the survey and participated in the two semi-structured interviews.

Findings and Results

The umbrella review within this thesis assessed the outcomes of various aspects of the delivery of health education-related interventions relevant to high risk patients with ACS and T2DM. The content, intensity (10 educational contact hours), preferred educators, and range of delivery modes for content were outlined.

Study 1: The experience of health professionals (nine registered nurses and six physicians), was recorded digitally within semi-structured interviews conducted within the CCU setting. Major themes identified from the qualitative study of health professionals included: Health education is an essential embedded component of treatment from admission to discharge into the community; Health education comprises varied teaching approaches and strategies to facilitate behavioural change; and identification of barriers and required resources to deliver effective health education.

Study 2a: A total of 160 patients were included in the survey (Study 2a). The mean age was 66.29 years (SD 11.66 years). ACS symptom management (measured by Chinese version of the Acute Coronary Syndrome Response Index, C-ASCRI), diabetes management self-efficacy (measured by Chinese version of Diabetes Management Self efficacy Scale, C-DMSES) and fasting blood glucose on discharge differed for the limited and sufficient education group (P <0.05). Based on the multiple regression analyses, increasing scores for the C-ASCRI and C-DMSES could be explained by higher scores for perceived health education, explaining 34 % of the variance in the C-ACSRI scores, $F = 42.32$, $P < 0.0001$ and 27% of the variance in the C-DMSES scores, $F = 19.72$, $P < 0.0001$.

Study 2b: A subset of participants who completed the survey also participated in the two interviews. Most of the patients who attended the interviews (n = 17 of 21) did not perceive

they had sufficient education or abilities to manage both conditions. Most participants (n = 16 of 21), reported low self-efficacy in managing ACS symptoms. Major themes identified: Self-managing ACS and T2DM was a complex interplay between individual self-efficacy, and knowledge and skills about how to manage the conditions within changing priorities; social environment was integral to lifestyle and behavioural change: developing good habits; managing multiple health conditions requires systems harmony in body and mind.

Conclusions

Surviving the initial symptoms and providing immediate treatment is the first step in recovery for patients with ACS and T2DM. Health education is an essential component of the management of these patients, and the content and focus was responsive to the recovery stage of the patient. Teaching and supporting strategies appropriate for the inpatient phase, pre-discharge to transition to the community phase are required.

Inpatient education was beneficial but not sufficient to deliver confidence to manage either diabetes or ACS at home. An unhealthy lifestyle was embedded within social roles and norms, but social activities, such as square dancing, was a positive socially influenced behaviour. Culturally-appropriate education for Chinese people with ACS and T2DM, should consider the need to maintain mind and body harmony. Family members should be involved in formal education. The use of the term “Three Brothers” could also be used to deliver information and pathophysiology relating to the risk factors of the three conditions, but also to influence familial behaviours. A balanced approach to the use of traditional Chinese medicine and Western medicine is recommended. Community-based education that delivers messages on the seriousness of the hidden effects of smoking and high sugar diets or diabetes on cardiovascular health is urgently needed. A national approach to reducing smoking rates is urgently needed within Chinese communities.

This series of studies has provided details on the content required, the preferred educators, the timing of education, the teaching strategies as well as the theoretical orientation for potential high intensity education for individuals with ACS and T2DM living in Shanghai, China.

Chapter 1 Introduction

1.1 Overview

Acute coronary syndrome (ACS) and type 2 diabetes mellitus (T2DM) represent a substantial burden of illness within both Western and Eastern countries. Diabetes is independently associated with mortality among patients with ACS (Ahmed, Davis, & Laskey, 2014; Li et al., 2016). Data from 2012 showed that among Chinese people with T2DM the incidence of ACS was 19.7% and ACS-related mortality was 4.9% (Duan et al., 2015). Mortality is significantly higher among patients with both conditions than patients with ACS alone. For example, the mortality for patients with ST segment elevation myocardial infarction (STEMI) and diabetes was 8.5% compared to 5.4% of those experiencing STEMI only (Donahoe et al., 2007). Moreover, ACS patients with diabetes have a 50% increase in long-term mortality compared with ACS patients without diabetes (Gholap et al., 2017).

Globally, the increasing presentation of both of these conditions within individuals provides new challenges for health systems, health professionals, and sufferers (Koch, Wakefield, & Wakefield, 2015). Multiple health conditions exacerbate the limitations caused by one chronic condition, affecting individuals' roles and relationships and resulting in physical, psychological and social disruption (Sells et al., 2009). Individuals with multiple health conditions require complex disease management to support the "whole person". It is claimed that health education and support for self-management is particularly helpful for people struggling to manage their multiple conditions (O'Brien, Wyke, Guthrie, Watt, & Mercer, 2011).

Patients with ACS and T2DM, the focus of this thesis, are often overwhelmed by having to manage both conditions (Tanash, Fitzsimons, Coates, & Deaton, 2017). The challenge is substantial and encompasses several regimens that patients can implement to improve their health status (Tanash et al., 2017). Patients with both ACS and T2DM may need more or different health information related to two conditions as opposed to those having either condition alone (Kasteleyn et al., 2014).

Health education has been traditionally recognized as a key component of phase one (inpatient phase) cardiac rehabilitation (CR) programs within Western health systems, playing a key role in disease management for ACS in the acute care setting (Hall, Murphy, & Scanlon, 2017). As a critical element of care for ACS patients, health education addresses knowledge deficits, the importance of lifestyle changes and adherence to cardio-protective medicine (Chew et al., 2016; Hoving, Visser, Mullen, & van den Borne, 2010). Health education during the acute episode of ACS is regarded as essential (Meng et al., 2014). The in-hospital period after an ACS event is recognized as a "teachable moment" for health education programs (McBride, Emmons, & Lipkus, 2003, p. 156). A comprehensive and individualised health education approach is recommended to ensure that patients (after an ACS event) receive appropriate health information at the time of discharge (Chew et al., 2016).

T2DM is a group of complex, chronic metabolic diseases superimposed on a strong genetic predisposition and triggered by unhealthy lifestyle factors, such as low physical activity and obesity (Huang et al., 2017). Diabetes self-management education (DSME) and support is proposed as the cornerstone of care and management for all people with diabetes (Powers et al., 2017). Diabetes education interventions have been shown to significantly improve glycaemic control and self-management ability among T2DM patients (Egede, Williams, Voronca, Gebregziabher, & Lynch, 2017). Health education, related to increasing exercise activity, healthy diet, and weight loss in overweight people, is of benefit in treating and delaying the progress of T2DM in high risk populations (Schwarz, Greaves, Lindström, Yates, & Davies, 2012). Diabetes education programs are provided in a variety of settings; the most popular being clinical locations, primary care, community or the home environment (He et al., 2017; Liu, Shi, Willis, Wu, & Johnson, 2017; Zhao, Suhonen, Koskinen, & Leino-Kilpi, 2017).

China, the setting for this thesis, has a health system that is centralised to the acute hospital sector (Barber, Borowitz, Bekedam, & Ma, 2013). Contemporary reforms have focused on reconstructing the primary care system to shift utilization of health care services from hospitals to primary care facilities (Barber et al., 2013). The results of these recent reforms in China aimed at improving access, quality and efficiency of primary care, are unclear (Bhattacharyya,

Delu, Wong, & Bowen, 2011). The acute in-hospital period for patients with ACS and T2DM is the focus for this series of studies, as it may provide the best opportunity to deliver effective health education to such patients within Chinese acute care settings.

In China, very little is known about the current situation of health education for patients with ACS and T2DM. Nor is there any information on how to best provide cardiac education and diabetes education for these patients. Although it would seem that simply using the information from either disease would be sufficient, the experience or application of health education for this comorbid group may not be appropriate. Hence, this thesis presents two major perspectives, one from the perspective of the health care professional and the other from the perspective of the patient, thereby addressing gaps identified in the literature. The focus of this research is on the delivery of health education to patients with ACS andT2DM admitted to a large hospital in Shanghai.

1.2 Patients with ACS and T2DM

Globally, in 2008, about 13% or 7.2 million deaths were caused by coronary artery disease (CAD) (Finegold, Asaria, & Francis, 2013). In China, in 2014, cardiovascular disease (CVD) was the leading cause of death and accounted for 44.6% and 42.5% of all deaths in rural areas and urban areas, respectively (Chen et al., 2017). The mortality rate of Chinese patients with coronary heart disease (CHD) increased from 2002 (was 39.56 per 100,000 and 27.57 per 100,000 in urban and rural areas, respectively) to 2014 (was 107.5 per 100,000 and 105.37 per 100,000 in urban and rural areas, respectively) (Chen et al., 2017). ACS refers to “a spectrum of conditions compatible with acute myocardial ischemia and/or infarction due to an abrupt reduction in coronary blood flow” (Amsterdam et al., 2014, p. 2650). ACS often occurs as one of three consequences: STEMI, Non ST-segment elevation myocardial infarction (Non-STEMI), or unstable angina (UA) (Medagama et al., 2015).

T2DM is a common long-term, progressive and preventable metabolic condition (Nolan, Damm, & Prentki, 2011). In 2013, among Chinese adults, the estimated overall prevalence of prediabetes was 35.7%, and that for diabetes was 10.9% (Wang et al., 2017). The mean hospital length of stay was 11.7 days (median: 10 days) among Chinese people with T2DM and

hospitalization expenses posed a heavy burden on the Chinese health system (Chen, Liu, Tan, & Zhao, 2017). About 20 to 25% of patients with ACS are reported to also have diabetes (predominantly T2DM) (Conaway, O'Keefe, Reid, & Spertus, 2005; Kahn & Wheatcroft, 2012). This figure for Chinese people was 19.7% in 2012 (Duan et al., 2015). Patients with ACS and T2DM have higher hospital readmission rates and poorer quality of life compared to ACS patients without diabetes (Bannier et al., 2015). Patients with these two conditions have concerns in the areas of self-efficacy and confidence in health professionals, as well as experiencing hopelessness and fatigue (Wu & Chang, 2008). This may be due to ACS patients with diabetes having a poorer prognosis, with decreased activity, less participation in daily life activities and negative impacts on their quality of life (Steg et al., 2012).

Patients with multiple conditions report difficulty and confusion integrating numerous self-management behaviours for different health conditions (Beverly, Wray, Chiu, & Weinger, 2011; Vanstone et al., 2013), and co-morbidities can create a cascade of crises due to increasing health challenges (Sells et al., 2009). When discharged from hospital, this can cause confusion and uncertainty regarding disease management priorities and strategies for patients with comorbid disease (Liddy et al., 2014). Due to the acute life-threatening and unexpected nature of ACS, the self-management and recovery trajectory of ACS may be a complex process for patients with both ACS and T2DM (Guo & Harris, 2016). With the growing number of patients likely to experience multiple conditions it is essential to understand and develop self-management strategies to navigate and control their multiple health problems.

Although the current literature is rich in studies on ACS or T2DM, very little research has been conducted with patients experiencing both conditions. Generally, research has focused on the treatment of each disease as a separate condition; confirming that each has a major and often debilitating impact on those experiencing them. Few studies have been completed on the combined burden of ACS and T2DM symptoms, thus this dual context presents new challenges to health care delivery. This thesis focuses on the key aspects of health education and the behavioural changes needed, to meet the challenge of lessening the impact of these debilitating conditions on Chinese individuals and patients recently admitted to hospital.

1.3 Health education for ACS and T2DM

Health education is defined by the World Health Organization (WHO, 2013) as "any combination of learning experiences designed to help individuals and communities improve their health, by increasing their knowledge or influencing their attitudes" (p.1). It is often undertaken by interpersonal communication, between health professionals and patients (Hoving et al., 2010). Health education should positively influence the individual's and community's health behaviour as well as the working and living environments that influence their health status (WHO, 2012). As such, the purpose of health education is not only to increase knowledge about health behaviour but also to develop skills to address economic, environmental and social determinants of health (WHO, 2012). Health education is important for encouraging patients with chronic diseases to be more engaged in health promotion and is critical to facilitate self-management of their health conditions (Funnell, 2010).

ACS and T2DM are often associated with similar or related risk factors including low physical activity, obesity, smoking, and high sugar and fat intake (Lakerveld et al., 2008). Health education has been reported to be a critical element of care for patients with ACS and T2DM, addressing lack of knowledge and pursuing lifestyle changes (Tanash et al., 2017). The central premise of health education for patients with ACS and T2DM is that educating patients or individuals will enhance functionality, relieve symptoms, reduce physiological and psychological complications, and improve quality of life through adoption of long-term behavioural and lifestyle changes (Kasteleyn et al., 2014; Tanash et al., 2017).

Previous systematic reviews have summarised the experiences of patients with ACS in self-management and reported that self-management is the essential part of patients' recovery process, particularly during the initial discharge period to home (Guo & Harris, 2016). Unfortunately, for patients with T2DM who experienced their first ACS event, tailored health education and support during the period after discharge was limited (Kasteleyn et al., 2014). During the initial recovery period following hospital discharge, information on the combination of these two conditions, recommendations on sexual activity, clarification of confusion

regarding physical exercise and diet, as well as medication use and adverse effects was lacking (Kasteleyn et al., 2014).

Health education for persons with ACS has been mainly focused on cardiovascular risk factors and early access to health professionals, and these programs have used individual education sessions based on face-to-face or telephone based format (Anderson et al., 2017). Askham et al. (2010) highlighted the need to provide multimodal forms of health education, discharge planning, planning for contingencies and facilitation of essential resources of support for individuals following an ACS event. Several studies have reported that ACS patient education was always delivered by nurses (Cohen et al., 2014; Jorstad et al., 2013; Mooney et al., 2014).

Diabetes self-management education (DSME) refers to all educational programs that deliver the knowledge and self-management skills and ability related to diabetes (Powers et al., 2017). Diabetes self-management support (DSMS) includes all the support that is required for sustaining and implementing coping behaviours and skills needed to self-care on an ongoing basis (Powers et al., 2017). The main aspects of DSME include empowerment of the individual to change their lifestyle, manage aspects of the treatment of diabetes, increase physical activity and maintain an appropriate diet, and follow a process of periodic medical checks and educational sessions (Powers et al., 2017). Health professionals should enable people with diabetes to manage their conditions autonomously and individuals should actively participate in the educational process (Coppola, Sasso, Bagnasco, Giustina, & Gazzaruso, 2016).

However, the ideal characteristics of a comprehensive health educational program for T2DM in clinical practice have not been clarified, such as contact time, educational topics, use of educational technology, number of educational sessions and frequency and role of diabetes educators (Coppola et al., 2016). Many of the systematic reviews summarized the evidence of health education for T2DM based on different formats, such as culturally-based (Attridge, Creamer, Ramsden, Cannings-John, & Hawthorne, 2014), individually-based (Duke, Colagiuri, & Colagiuri, 2009), group based (Steinsbekk, Rygg, Lisulo, Rise, & Fretheim, 2012) and computer-based (Pal et al., 2010) health education. Importantly, recommendations regarding the most appropriate education for Chinese people with T2DM are lacking. Diabetes education based on

a cultural approach was found to be an effective way to enhance diabetes self-care skills among Chinese Americans (Sun, Tsoh, Saw, Chan, & Cheng, 2012).

The health behaviour of individuals can be adjusted and promoted through health education, which is more likely to benefit participants when it is guided by a health behavioural theory (Davis, Campbell, Hildon, Hobbs, & Michie, 2015). Health behavioral theories applicable to health education offer targets and the methods for accomplishing and changing health behaviours. These include, but are not limited to, influencing attitudes, awareness, knowledge, intention, self-efficacy and social influences (Glanz et al., 2015). Michie et al. (2014) described 83 theories of behaviour change to inform the design of behaviour change interventions, and reported that the most often used theories were social cognitive theory (SCT), the health belief model (HBM) and the transtheoretical model or stages of change. Most of the widely used theories, such as SCT and HBM, that were used to explain or predict behaviour change focused on beliefs rather than habit or emotions (Michie et al 2014). Previous pilot studies reported that the cardiac-diabetes self-management programs (CDSMP), based on SCT, improved knowledge, self-efficacy and self-management behaviours among T2DM patients following an ACS event in the intervention group (Tanash et al., 2017; Wu, Chang, Courtney, & Kostner, 2012; Wu & Chang, 2014; Wu, Chang, & McDowell, 2009). There is clear potential in the use of behavioural theories to direct educational programs.

1.4 Health behaviour and behavioural change

Health behaviour is defined as “those personal attributes such as beliefs, expectations, motives, values, perceptions, and other cognitive elements; personality characteristics, including affective and emotional states and traits; and overt behaviour patterns, actions, and habits that relate to health maintenance, to health restoration, and to health improvement” (Glanz et al., 2015, p. 10). Multiple fields and professions including health education, public health, psychology, social work, and various health medical specialties focus on health behaviour and behavioural change (Sallis, Owen, & Fisher, 2015). The scope and strategies of health behavioural change have broadened dramatically, including the settings (where provided) and audiences (who are the recipients) (Glanz et al., 2015). Increasingly there is emphasis on health

professionals implementing behavioral change strategies that take into account an understanding of the recipients, including their attitudes, beliefs, cultural context, health, past behaviours, skills, social characteristics and values (Maher et al., 2014).

Health behavioural change strategies have been applied to a range of health behaviours: such as improving engagement with protective behaviours (e.g., exercising), improving effective use of health care services (e.g., improving uptake and maintenance of medication regimes), improving effective self-management of health conditions (e.g., promoting self-monitoring blood glucose levels), preventing and stopping patients engaging in health harmful behaviours (e.g., smoking), and "switching from more harmful to less harmful forms of a behaviour (e.g., reducing excessive drinking) " (Michie, West, Sheals, & Godinho, 2018, p.213).

Health behavioural change strategies for persons with chronic diseases are used to modify behaviours that increase the severity of symptoms or disease, as well as to change or maintain behaviours to improve wellness and self-management (Coleman & Pasternak, 2012). Individuals with chronic illness and disability have a greater likelihood of exhibiting multiple risk factors requiring behavioural change (Schwarzer, Lippke, & Luszczynska, 2011). For CVD risk factors, previous studies reported that the clustering of risk factors or unhealthy behaviours was quite prevalent, such as 45% of adults with two unhealthy behaviours and 12% of adults with three unhealthy behaviours (e.g., low level of physical activity, overweight, smoking and risky drinking) (Berra, 2010).

Self-management behaviours for persons with chronic disease are especially important, as they are often the only person responsible for managing their health condition on a day-to-day basis over the length of the illness (Ray Marks & Allegrante, 2005; Nolte, Elsworth, Newman, & Osborne, 2013). Self-management supports individuals to take actions in managing their chronic condition by making decisions and performing self-selected actions, which can have a profound effect on their disease trajectory, health outcomes and well-being (Schulman-Green et al., 2012). The treatment of T2DM largely depends on the individual's everyday self-management by lifestyle changes and effective use of medication to normalize blood glucose,

often combined with blood pressure-lowering cholesterol-lowering and triglycerides-lowering medication (American Diabetes Association, 2016).

T2DM is associated with unhealthy behaviours such as high-fat diets, smoking and alcohol abuse (Miller, Weinhold, & Nagaraja, 2016). Behavioural changes can be related to multiple levels of T2DM, such as the onset of diabetes and diabetes prevention (e.g., lifestyle change), diabetes management (e.g., diabetes self-management) and quality of life (e.g., increase emotional and social function) (Fisher et al., 2011). The challenge for health professionals is to support patients with T2DM to adopt and maintain recommended health behaviors (e.g., diabetes self-management) in order to sustain a healthy status. Being active, healthy coping, healthy eating, decreasing risks, problem solving, self-monitoring and taking medication are all recommended by the Association of American Diabetes Educators (Funnell et al., 2009).

Behavioural change is complex and involves an individual's awareness, knowledge and desire, and skills to effect the behavioural changes. Barriers to effective behavioural change include age, cultural beliefs, comorbidities, language and literacy level, psychological states and socioeconomic status (Berra, 2010). Effective health behavioural change depends on behavioural change strategies and marshaling the most appropriate theory for a given situation (Glanz et al., 2015). "Theories can help to specify key determinants of the target behaviors and behavior change strategies required to arrive at the desired health outcomes, which can then be translated into specific behavioral techniques or strategies that patients can learn to apply in their daily life." (van Vugt, de Wit, Cleijne, & Snoek, 2013, p.1).

Some behavioural change techniques, such as self-monitoring of behaviour and goal setting, have been found to be helpful for health behavioural changes (e.g., healthy eating and physical activity) (e.g., healthy eating and physical activity) (Samdal, Eide, Barth, Williams, & Meland, 2017). Two behavioural change techniques – "prompt self-monitoring of behavioral outcome" and "plan social support or social change" – are associated with positive influences in both physical activity self-efficacy and behavior (Olander et al., 2013, p. 4). One systematic review reported that behavioural change techniques such as "action planning", "behavioral practice or rehearsal", "demonstration of the behavior" and "instruction on how to perform a behavior"

have been found to be associated with over 0.3 % reduction in HbA1c among individuals with T2DM (Cradock et al., 2017, p. 9). In this systematic review, only three of the 13 included trials mentioned the use of a theory or model to develop the interventions or the authors provided little explanation of how these techniques were applied (Cradock et al., 2017).

1.5 Health behavioural theories for health education

Many theories have been applied to enhance the potential impact of health education programs to improve health status by promoting behavioural modifications and encouraging compliance with treatment regimens (Nutbeam, Harris, & Wise, 2010; Syx, 2008). Although it is recognized that knowledge does not always lead to behavioural change or improved health outcomes, behavioural theories generally demonstrate that information is a necessary element of health behavioural change and clinical or psychosocial outcomes (Glanz et al., 2015). Behavioural change cannot be explained by acquisition of knowledge alone and several psychosocial constructs (such as self-efficacy) have been found to influence or mediate knowledge and behavior, and therefore clinical or psychosocial outcomes (Glanz et al., 2015).

Health behavioural theories describe why and how individuals act; the approaches people do or do not take, in relation to their compliance with advice or suggestions from healthcare professionals (Riley et al., 2011). The impetus for the work in SCT, evolved initially from gaps in understanding being apparent within the Social Learning Theory (SLT) (Bandura & Walters, 1977) in particular that there is a gap between knowing and changing behavior. The common health behavioural theories or models found in the literature are the HBM and SCT (Glanz et al., 2015), which have some content overlap. However, behavioural change is complex; no theory or model covers all aspects of behavioural change and each theory has its limitations. SCT and HBM are compared in Table 1 to highlight the differences and similarities in these key theories (Glanz et al., 2015).

Table 1. Comparison of the elements of the HBM and SCT

Theory or model	Key constructs or elements	Contributions and limitations
HBM	Perceived susceptibility, perceived severity, perceived benefits and barriers to engaging in a behaviour, cues to action, and self-efficacy.	The HBM is a model focused on cognitions with consideration of person factors (emotional and overlook social-economic status and cultural factors). Precise directions of relationships among HBM constructs are less defined.
SCT	1) Personal cognitive factors: Self-efficacy, outcome expectations and knowledge; 2) Physical and social environment: observational learning, normative beliefs, social support and barriers and opportunities; 3) Support behavioural factors: behavioural skills, intention, reinforcement and punishment.	The SCT provides essential building blocks, or constructs, for understanding the development of human behaviour with less focus on biological aspects influencing behaviours.

Note: SCT =social cognitive theory; HBM= health belief model.

(1) Health belief model (HBM)

The health belief model (HBM) is one of the most widely used theories in health behavioural change and has been a guiding conceptual framework for health care interventions since the 1950s (Becker & Maiman, 1975). The HBM contained the following key elements — "perceived susceptibility and severity, perceived barriers and benefits, social support (cues to action), and self-efficacy" — that predict whether and why people will take action to prevent, detect, or control health conditions (Janz & Becker, 1984, p.2). This provides a link between people's attitudes and behaviour. Based on HBM, patients must believe that: (1) they are susceptible to a disease (perceived susceptibility), (2) the health threat (disease) has serious consequences (perceived severity), (3) adopting the behaviour will reduce their risk of the health threat, (4) benefits outweigh the barriers to adopting the behaviour, and (5) a cue to action exists, such as self-management behaviour (Rosenstock, 1974).

HBM has also been used as a theoretical framework to develop culturally tailored diabetes education program (Ahmad, Ramadas, Kia Fatt, & Md Zain, 2014). Video educational programs related to risk factors based on the HBM significantly increased knowledge and attitudes of ACS patients after discharge (Abbaszadeh, Borhani, & Asadi, 2011). In addition, one study aimed to determine whether T2DM patients who do not exercise regularly possess different health beliefs than those who maintain a regular exercise regimen (Koch, 2002). This study reported a strong association between perceived barriers to exercise and health behaviours (Koch, 2002).

However, little is known about the relationships among HBM constructs, such as whether they all directly predict behaviour or whether some beliefs mediate the relationships to behaviour and if a person's action is always driven by perceived susceptibility and perceived severity (Glanz et al., 2015). The HBM is closely related to SCT but different. SCT, according to Bandura, has made at least two contributions to explanations of health behaviour that were not included in the HBM (Rosenstock, Strecher, & Becker, 1988). First, Bandura introduced self-efficacy as an important unique concept, and also four sources of information that could increase self-efficacy — "mastery experiences, social modeling, social persuasion, physical and emotional states" (Bandura, 2004b, p.622-623). Self-efficacy has been found to explain diabetes self-management behaviours, explaining 10% of the variance in diabetes self-management behavioural change in a previous study of individuals with diabetes (Aljasem, Peyrot, Wissow, & Rubin, 2001).

Health behavioural theories offer slightly different ways of predicting health behaviour in response to health education. For example, the HBM places somewhat more emphasis on perceived threat and fear of consequences (Murray-Johnson et al., 2005) and SCT focuses somewhat more on social influences (Bandura, 2004a). Health education delivers health information to effect cognitive changes and cognitive changes lead to health behavioural changes according to SCT (Bandura, 1986). Cognitive influences on health behavioural change include three main factors: knowledge, outcome expectations and self-efficacy (Glanz et al., 2015). Therefore, health education influences health behaviour by affecting the individuals' knowledge, outcome expectations [defined as an individual's estimate that a behavioural

change will produce certain outcomes (Rosenstock et al., 1988)] and self-efficacy which change the outcomes for the individual.

The self-efficacy concept, within SCT, was found to be one of the most frequently applied concepts in developing health education programs for ACS (Guo & Harris, 2016), T2DM (Zhao et al., 2017) or both ACS and T2DM patients (Wu et al., 2009). Although the HBM has been applied to studies of individuals with ACS (Abbaszadeh et al., 2011) and diabetes (Ahmad et al., 2014). Bandura's SCT remains the predominant theory applied in trials (Tanash et al., 2017) and is therefore selected as a theoretical framework for this thesis. A more detailed account of this theory is provided as follows. The SCT is therefore potentially an appropriate conceptual model to facilitate an understanding of the health education being delivered and its impacts for patients with ACS and T2DM within this unique cultural setting, Shanghai, China (Ray Marks & Allegrante, 2005).

(2) Social cognitive theory (SCT)

The social cognitive theory (SCT) as proposed by Bandura (Bandura, 1986), places strong emphasis on personal beliefs about one's own behavioural changes. The focal point of this theory is on perceived self-efficacy. The self-efficacy concept was first proposed by Bandura in 1977, and is a construct common to many health behaviour theories (Bandura, 1977). Self-efficacy is an individual's belief in their own capability to take the actions required to achieve the desired outcomes (Bandura, 1977). Within the health domain, Bandura describes self-efficacy as the confidence an individual has to "exercise control over one's health habits" (Bandura, 2004a, p. 144). Self-efficacy concept illuminates the performance of specific behaviours and how these behaviours influence its outcome, such as the higher the person's self-efficacy level towards certain behaviour, the greater will be their success in achieving a particular outcome (Bandura, 2004a).

SCT identifies how the main determinants of behavioural change, such as personal factors, psychosocial and environmental determinants, self-efficacy and outcome expectations play an important role in the interaction process (Bandura, 1977). Behaviour adoption depends on people's perceptions of the degree of connection between if the behavior is not changed (risk

factors) and outcomes, followed by an expectation that the behaviour will decrease that risk, and the expectation that the individual can achieve the required behavioural change (Bandura, 1977). These three perceptions affect behaviour adoption from initiation to long-term maintenance (Bandura, 1986). Self-efficacy is the critical determinant for an individual's confidence in their ability to undertake a specific action successfully (Bandura, 1977). People can believe that a particular behaviour will result in certain outcomes, but if they entertain serious doubts about whether they have the ability to perform the necessary actions, outcome expectancy does not affect their behaviour (Bandura, 1977). Therefore, efficacy expectations or self-efficacy is much better than outcome expectations in predicting the uptake of positive behaviours.

Moreover, the SCT also describes behavioural changes that can be attained by providing and utilizing the sources of information that affect self-efficacy levels (Bandura, 1977). The four information sources of efficacy-expectations or self-efficacy include: "mastery experiences, social modeling, social persuasion, physical and emotional states" (Bandura, 2004b, p.622-623). Mastery experiences (or performance accomplishment) are the most influential sources of efficacy information (Rosenstock et al., 1988). SCT provides a very broad context for understanding the relationship between the person, environment and behaviour (Bandura, 1977). Environmental factors (such as barriers and opportunities, normative beliefs, observational learning and social support) also influence health behaviour by the psychological mechanisms of the self-system, including self-efficacy (Glanz et al., 2015). SCT explicitly identifies the importance of social norms and environmental factors on behavioural changes, and the continuous interaction between these factors (Bandura, 2004a); unlike the HBM that overlooks social-economic status and cultural factors (Rosenstock, 2005). Social norms and environmental factors can contribute to positive functioning and personal well-being and act as a buffer against life stressors (Bandura, 2004a).

According to SCT, self-efficacy (previously termed "efficacy expectations") and outcome expectations (defined as an individual's estimate that a behavioural change will produce certain outcomes [Rosenstock et al., 1988]) determine whether a person will engage in a specific

behaviour (Bandura, 1977, 1986, 1997, 2004b). As shown in Figure 1, for a patient with ACS and T2DM (Person) to self-manage their conditions (Behaviour) for improved health outcomes (Outcome), he or she must believe both that they can self-manage their conditions that the self-management will benefit his or her conditions (Outcome Expectation) and also that he or she believes they are capable of self-managing their conditions (Efficacy Expectation) (Rosenstock et al., 1988).

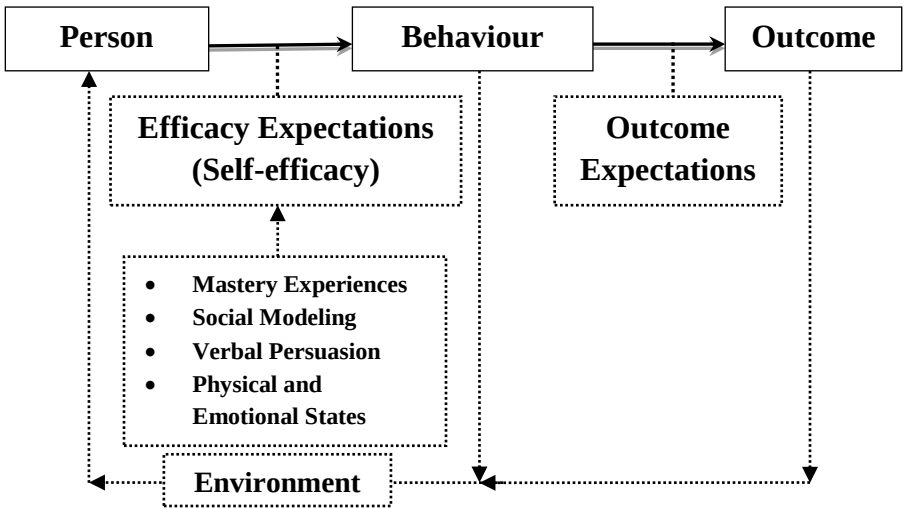

Figure 1 Social Cognitive Theory Adapted from Bandura

Self-efficacy is modifiable and health education programs that focus on self-efficacy are helpful in improving patients' health status and outcomes (Cinar & Schou, 2014). Self-efficacy beliefs are developed and influenced through four main factors (Bandura, 1977), and Marks and Allegrante (2005) also have suggested several strategies based on Bandura's theory that help health professionals to enhance patients' self-efficacy among patients with chronic diseases, including reinforce accomplishments, observation of successful behaviours and coping mechanisms, provision of positive feedback and helping patients to develop new health behaviours.

Self-efficacy influences self-management behaviours in several ways, including influencing patients' choices and the courses of action they pursue (Bandura, 1994). Self-efficacy is the

decision point for whether a patient will attempt a self-management task, how much persistence will be sustained and how much effort will be given – the higher the self-efficacy the greater the effort, persistence and resilience on self-management behaviours (Bandura, 1994; Pajares, 1997). To gain a sense of self-efficacy, an individual can finish a self-management task successfully, observe other patients doing a self-management task successfully, acquire positive feedback about finishing a self-management task, and then individuals may experience improved clinical outcomes (Bandura, 1986).

One systematic review identified that the education programs should aim to increase self-efficacy level in disease management for patients with chronic diseases (Jang & Yoo, 2012). The researchers noted that structured education programs based on the four learning strategies — observation learning, skill mastery, social or verbal persuasion and reinterpretation of symptoms — in self-efficacy concept enhanced individual self-efficacy in disease management and thus benefitted their health outcomes (Jang & Yoo, 2012). Patients with higher self-efficacy may more easily go on to the next step and set perhaps even more complex and difficult goals and are motivated to achieve these outcomes (Lee et al., 2016).

Education programs for ACS patients with T2DM should attempt to increase self-efficacy in individuals rather than to simply educate patients about disease information and the value of a healthy lifestyle (Wu, Chang, Courtney, & Kostner, 2012; Wu et al., 2017). A high level of self-efficacy is related to beneficial outcomes for patients with coronary diseases, such as increased: attendance in CR programs, healthy lifestyle, psychological health, quality of life and self-management skills (Joekes, van Elderen, & Schreurs, 2007; Sol, van der Graaf, van Petersen, & Visseren, 2011). Low cardiac self-efficacy has been reported to be associated to impaired physical exercise ability, increased symptom burden and poorer health-related quality of life in CHD patients (Sarkar, Ali, & Whooley, 2007).

One health education program, based on self-efficacy theory, was provided to patients with ACS and T2DM admitted to a cardiac care unit (CCU) and subsequently transitioned home. The intervention program consisted of face-to-face educational sessions during the inpatient stay and a home visit, follow-up telephone calls and text messages (Wu et al., 2009). The self-

efficacy concept has also been used in cardiac-diabetes self-management programs incorporating peer support and telehealth delivery modes (Wu, Chang, Courtney, & Kostner, 2012; Wu et al., 2009; Wu et al., 2017). This cardiac-diabetes self-management program was reported to enhance self-management skills, diabetes knowledge and self-efficacy of diabetes self-care for patients with ACS and T2DM (Tanash et al., 2017).

1.6 Health professionals' role in health education

Nurses are often regarded as the best health professionals to deliver effective health education, and while providing 24 hour a day care, nurses assume a major responsibility for health education (Park, 2005). Nurses' role in health education may include: identifying patients' learning needs and styles, selecting teaching content, choosing teaching methods and evaluating patients' learning (Barber-Parker, 2002). Although nurses play a lead and central role in educational activities for patients or individuals, their role in patient education in acute care settings is often minimal and many available chances for patient education may be missed due to nurses' "busy-ness", insufficient time and patients' spoken language (Lee & Lee, 2013). Physicians also have a crucial role in educating patients and patients informed by their physicians are more satisfied with their care (Wouda, Zandbelt, Smets, & van de Wiel, 2011). Multidisciplinary teams including dieticians, pharmacists, psychologists, physiotherapists and social workers have also been effective and continue to be very important professionals for health education delivery (Wood et al., 2008).

1.7 Aims of the study

The aims of this research are to gain an understanding of the current health education delivered by health care professionals and received by patients with ACS and T2DM within a Chinese cultural setting. More specifically, this thesis aims to not only gain a better understanding of the health education currently provided by health professionals (such as the educational content, teaching strategies, health professionals' perceptions of the impact of current educational practices and barriers to delivering effective health education), but also the perspectives of patients on the education received. The research also focuses on intended behavioural changes, or those perceived to occur, as well as the effects of inpatient health

education on self-efficacy, self-management and clinical outcomes for patients with ACS and T2DM, within a unique cultural setting within Shanghai China.

1.8 Research questions

Cardiac education programs are intended to help patients with ACS to reduce the mortality and enhance their life experiences by improving their knowledge of disease, as well as by influencing their current attitudes to health (Brown, Clark, Dalal, Welch, & Taylor, 2011). Our preliminary impressions at one hospital in Shanghai indicated that there may be only limited education received by patients with ACS and T2DM. Little is known about the experiences of health care professionals in their delivery of health education programs. As well, little is known about the experiences of patients being the recipients of structured education — a planned program with comprehensive content during a fixed length of educational time, responsive to patients' needs and background (National Institute for Health and Care Excellence [NICE], 2015), or unstructured education — no planned topics or curriculum and no mandated length of training time educational programs (NICE, 2015), on patient outcomes. This thesis contributed to the body of knowledge needed to understand current and potentially future health education to be delivered to patients with ACS and T2DM within this unique cultural setting.

The following research questions and hypotheses addressed the key aims of the study, to be examined in a series of studies: an initial umbrella review was followed by a qualitative study of health professionals experience with health education (Study 1) and a mixed methods study exploring patients' perceptions (Study 2a and 2b).

Research questions:

Study 1

(1) What health education (cardiac and diabetes health education) and teaching and learning strategies are used by health professionals (physicians and registered nurses or other health professionals) to deliver health education to patients with ACS and T2DM admitted to a Shanghai hospital?

(2) What are the health professionals' perceptions of the impact of current educational practices, and barriers to delivering effective health education, for patients with ACS and T2DM admitted to a Shanghai hospital?

Study 2 (a and b)

(3) What is the impact of health education delivered during the acute admission of patients within a Shanghai hospital, presenting with ACS and T2DM, on outcomes of diabetes knowledge, attitudes of ACS symptoms management, diabetes management self-efficacy and clinical outcomes (such as fasting blood glucose levels)?

(4) What are the differences between selected outcomes for patients admitted to a Shanghai hospital who perceived they received limited or sufficient health education relating to ACS and T2DM management?

(5) How does inpatient health education received by patients with ACS and T2DM admitted to a Shanghai hospital, influence patients' or individuals' self-efficacy, self-management and changes in behaviour, on discharge and at follow-up in the community based on patients' perspectives?

Hypothesis:

Health education received during an acute admission, (adjusted for age, gender, diabetes duration, length of admission) would improve:

(1) diabetes knowledge,

(2) ability to self-manage T2DM,

(3) and enhance ACS symptom management on discharge for patients with ACS and T2DM admitted to cardiovascular units in a Shanghai hospital.

1.9 Significance and expected outcomes of this study

This thesis explores cardiac and diabetes education provided to ACS and T2DM patients admitted to a major hospital in Shanghai. A major benefit that accrues from the research is an understanding of the role of health professionals tending to patients with these comorbid conditions (ACS and T2DM). What can be learned in the local setting may be applicable further afield, such as other Eastern health systems. Further, the diseases knowledge and management

skills required for health education delivery can also be disseminated to other healthcare practitioners.

This study may uncover teaching strategies or delivery modes appropriate for patients with multi-morbidities. As health systems address the emerging problems and challenges of chronic disease care, multi-morbidity is becoming frequently encountered in clinical practice. Existing management and care has focused on individuals with only one disease (either ACS or T2DM), but increasingly there is a need to be complemented by support for people with multi-morbidities. This thesis described for the first time the health education provided to patients with comorbid conditions (ACS and T2DM) admitted to a Shanghai hospital. Moreover, with no existing policies or guidelines developed by or for health professionals in their roles and responsibilities in cardiac education and secondary prevention for patients with ACS and T2DM, findings from this study may provide direction for not only local but also national policy.

This study provided precise information upon which to determine further educational programs for patients with comorbid conditions. The impact of the health education delivered within the acute phase of admission will be uncovered in terms of self-care confidence and clinical outcomes. This knowledge will greatly inform future educational program development not only at the individual hospital level but also for Chinese or other populations where these comorbid conditions deliver increased epidemiological challenges. This thesis applied concepts from the SCT and may contribute to further definition of the application of this theory to health educational program development.

Therefore, this study sought knowledge of the experiences and expectations of individuals with ACS and T2DM about health education in the acute setting and its effectiveness. Knowledge of this kind is essential for the formulation of health education policies, guidelines or services for these patients both locally and further afield within the aspect of adopting cardiac and diabetes education practices in the domain of CR and diabetes management and secondary prevention.

1.10 The structure of the thesis

Chapter 1, the Introduction, has provided a rationale for this thesis and has provided an overview of health education for patients with ACS and T2DM, and defined research questions and hypotheses for this study. I have highlighted the key gaps in the literature in regard to the health education for patients with multiple health conditions. The aims, significance and expected outcomes of this study are outlined.

In Chapter 2, I present a published paper that identified the current evidence on health education-related interventions for patients with ACS or T2DM; including identifying the educational content, delivery methods, intensity, durations and settings of key studies. This umbrella review also provides recommendations for educational interventions for high risk patients with both ACS and T2DM.

Chapter 3, the Methodology and Method Chapter, presents a mixed methods approach as the appropriate methodology for study 2b. The methodology for this study was detailed throughout this Chapter. The conceptual model applied to this study was detailed. The relevant ethical considerations are discussed, along with personal reflections on methodological issues and reflexivity.

In the following three Chapters: 4, 5 and 6, I present the findings or results from the series of studies proposed, addressing each of the research questions or aims. Two papers are published and one paper is under review. The style, structure and content of each paper are presented according to journal guidelines.

- In Chapter 4, I present the findings in relation to research questions (research question 1 and 2, page 18 and 19). The manuscript, 'Better to save one life than build a seven-storied pagoda': a qualitative study of health education for patients with acute coronary syndrome and type 2 diabetes mellitus in Shanghai, China is currently published in the journal, British Medical Journal (BMJ) Open.
- In Chapter 5, I present the findings in relation to research questions (research question 3 and 4, page 19). The manuscript, The impact of inpatient education on self-

management for patients with acute coronary syndrome and type 2 diabetes mellitus: a cross-sectional study in China is currently published in the journal, Health Education Research.

- In Chapter 6, I present the findings in relation to the research questions (research question 5, page 19). The manuscript, Preparing Chinese patients to manage their diabetes and heart disease at home: a mixed methods study is currently under review in the journal, Health & Social Care in the Community.

In Chapter 7, the Discussion and Conclusion, I provided an overview of the study findings and pose the recommendations for developing inpatient health education for patients with ACS and T2DM within China. Further research directions, and the strengths and limitations of the study are also reported, as well as the implications for practice.

Chapter 2 Literature Review

2.1 Introduction

The previous Chapter, Chapter 1, provided a rationale for this thesis and an overview of some aspects of the health education for patients with acute coronary syndrome (ACS) and type 2 diabetes mellitus (T2DM), as well as an initial review of the relevant theories, and the aims of the thesis.

This Chapter gives an overview of international research literature and systematically gathers, evaluates and organizes the current evidence relating the health education interventions for patients with ACS or T2DM. This Chapter profferred recommendations for the scope of educational content and delivery methods that would be suitable for patients with ACS and T2DM, within this setting. Considering the large number of systematic reviews or meta-analyses on health education interventions for patients with ACS or T2DM, it was deemed appropriate to conduct an umbrella review where all systematic reviews or meta-analyses on health education interventions for patients with ACS or T2DM could be considered for inclusion in this single umbrella review. It is acknowledged that this was an innovative idea to bring together bodies of literature from two differing topics within one umbrella review, to provide direction for future health education for patients with both conditions.

This Chapter begins with the background information to the review and then describes the methodology of the umbrella review undertaken, outlining the search terms, keywords and themes that led to a summary of the current state of knowledge in this field by summarizing and synthesizing the evidence from systematic reviews or meta-analyses. The purpose of this review was to provide recommendations for educational interventions for high risk patients with ACS and T2DM. This initial umbrella review also sets the scene for the subsequent studies — Study 1 involving health professionals and Study 2 relating to patients with ACS and T2DM.

This umbrella review identified 51 systematic reviews or meta-analyses (15 for ACS and 36 for T2DM) conducted between 2001 and 2016. This Chapter presented the published umbrella review (Liu et al., 2017) that was conducted for this thesis.

2.2 Publication relevant to this thesis

Liu, X. L., Shi, Y., Willis, K., Wu, C-J (Jo)., & Johnson, M. (2017). Health education for patients with acute coronary syndrome and type 2 diabetes mellitus: an umbrella review of systematic reviews and meta-analyses. BMJ Open, 7(10), e016857.

Health education for patients with acute coronary syndrome and type 2 diabetes mellitus: an umbrella review of systematic reviews and meta-analyses

Abstract

Objectives: This umbrella review aimed to identify the current evidence on health education-related interventions for patients with acute coronary syndrome or type 2 diabetes mellitus; identify the educational content, delivery methods, intensity, duration and setting required. The purpose was to provide recommendations for educational interventions for high risk patients with both acute coronary syndrome and type 2 diabetes mellitus.

Design: Umbrella review of Systematic Reviews and Meta-Analyses.

Setting: Inpatient and post discharge settings.

Participants: Patients with ACS and T2DM.

Data sources: CINAHL, Cochrane Library, Joanna Briggs Institute, Journals@Ovid, EMBase, Medline, PubMed, and Web of Science databases from January 2000 through May 2016.

Outcomes measures: Clinical outcomes (such as HbA1C), behavioural outcomes (such as smoking), psychosocial outcomes (such as anxiety) and medical service use.

Results: Fifty-one eligible reviews (15 for ACS and 36 for T2DM) consisting of 1324 relevant studies involving 288,057 patients (15 papers did not provide the total sample); 30 (58.8%) reviews were rated as high quality. Nurses only and multidisciplinary teams were the most frequent professionals to provide education, and most educational interventions were delivered post-discharge. Face-to-face sessions were the most common delivery formats, and many education sessions were also delivered by telephone or via web contact. The frequency of educational sessions was weekly or monthly, and an average of 3.7 topics was covered per education session. Psychoeducational interventions were generally effective at reducing smoking and admissions for patients with ACS. Culturally appropriate health education, self-management educational interventions, group medical visits and psychoeducational interventions were generally effective for T2DM patients.

Conclusions: Results indicate that there is a body of current evidence about the efficacy of health education, its content, and delivery methods for patients with ACS or T2DM. These

results provide recommendations about the content for, and approach to, health education intervention for these high risk patients.

Key Words: Health Education; Acute Coronary Syndrome; Type 2 Diabetes Mellitus; Umbrella Review

Strengths and limitations of this review:

- This umbrella review is the first synthesis of systematic reviews or meta-analyses to consider health education-related interventions for patients with ACS or T2DM.
- These results provide recommendations about the content of a health education intervention for patients with ACS and T2DM.
- The diversity of the educational interventions seen in the reviews included in this umbrella review may reflect the uncertainty about the optimal strategy for providing health education to patients.
- This umbrella review found no reviews focused on patients with ACS and T2DM the intended target group; instead, all of the systematic reviews and meta-analyses focused on only one of these two diseases.

Introduction

Acute coronary syndrome (ACS) is a leading cause of death worldwide. The risk of high mortality rates relating to ACS is markedly increased after an initial cardiac ischemic event.[1] Globally, 7.2 million (13%) deaths are caused by coronary artery disease (CAD),[2] and it is estimated that more than 780,000 persons will experience ACS each year in the United States. [3] Moreover, about 20–25% of patients with ACS reportedly also have diabetes mellitus (DM); predominantly type 2 diabetes mellitus [T2DM]). [4 5] Patients with ACS and DM have an increased risk of adverse outcomes such as death, recurrent myocardial infarction (MI), readmission, or heart failure during follow up. [6] Longer median delay times from symptom onset to hospital presentation, have been reported among patients with ACS and DM than patients with ACS alone. [7]

DM is now considered to confer a risk equivalent to that of CAD for patients for future MI and cardiovascular mortality. [8] Mortality was significantly higher among patients with ACS and DM than among patients with ACS only following either ST segment elevation myocardial infarction (STEMI) (8.5% [ACS and DM] versus 5.4% [ACS]) or unstable angina/non-STEMI (NSTEMI) (2.1% [ACS and DM] vs. 1.1% [ACS]).[9] ACS and T2DM are often associated with high-risk factors such as low levels of physical exercise, obesity, smoking, and unhealthy diet. [10] Some of these and other risk factors, specifically glycemia, high blood pressure (BP), lipidemia, and obesity, are frequently addressed by health education interventions. [10]

Health education interventions are comprehensive programs that healthcare providers deliver to patients aimed at improving patients' clinical outcomes through the increase and maintenance of health behaviours.[11] Along with education about, for example, medication taking, these programs seek to increase behaviours such as physical exercise and a healthy diet thus reducing patient morbidity or mortality. [11] Most diabetes education is provided through programs within outpatient services or physicians' practices. [12] Many recent education programs have been designed to meet national or international education standards [13-15] with diabetes education being individualized to consider patients' existing needs and health conditions. [16] Patients with T2DM have reported feelings of hopelessness and fatigue with low

levels of self-efficacy, after experiencing an acute coronary episode. [17]

Although there are numerous systematic reviews of educational interventions relating to ACS, or T2DM, an umbrella review providing direction on educational interventions for high risk patients with both ACS and T2DM is not available, indicating a need to gather the current evidence and develop an optimal protocol for health education programs for patients with ACS and T2DM. This umbrella review will examine the best available evidence on health education-related interventions for patients with ACS or T2DM. We will synthesize these findings to provide direction for health education-related interventions for high risk patients with both ACS and T2DM.

An umbrella review is a new method to summarize and synthesize the evidence from multiple systematic reviews/meta-analyses into one accessible publication. [18] Our aim is to systematically gather, evaluate and organize the current evidence relating the health education interventions for patients with ACS or T2DM, and proffer recommendations for the scope of educational content and delivery methods that would be suitable for patients with ACS and T2DM.

Methods

Data sources

This umbrella review performed a literature search to identify systematic reviews and meta-analyses examining health education-related interventions for patients with ACS or T2DM. The search strategies are described in Appendix 1. This umbrella review searched eight databases for articles published from January 2000 to May 2016: CINAHL, Cochrane Library, Joanna Briggs Institute, Journals@Ovid, EMBase, Medline, PubMed, and Web of Science. The search was limited to English language only. The following broad MeSH terms were used: *acute coronary syndrome; angina, unstable; angina pectoris; coronary artery disease; coronary artery bypass; myocardial infarction; diabetes mellitus, type 2; counseling; health education; patient education as topic; meta-analysis [publication type];* and *meta-analysis* as a topic.

Inclusion criteria

Participants

All participants were diagnosed with ACS or T2DM using valid, established diagnostic criteria. The diagnostic standards included those described by the American College of Cardiology or American Heart Association, [3] National Heart Foundation of Australia & Cardiac Society of Australia and New Zealand, [19] World Health Organization, [20] or other associations.

Intervention types

For this umbrella review, health education-related interventions refer to any planned activities or programs that include behavioural modification, counseling, and teaching interventions. Results considered for this review included changes in clinical outcomes (including blood pressure levels, body weight, diabetes complications, HbA1C, lipid levels, mortality rate and physical activity levels), behavioural outcomes (such as diet, knowledge, self-management skills, self-efficacy, and smoking), and psychosocial outcomes (such as anxiety, depression, quality of life, and stress) and medical service use (such as medication use, health care utilization, and cost-effectiveness) for patients with ACS or T2DM. These activities or programs included any educational interventions delivered to patients with ACS or T2DM. The interventions are delivered in any format, including face-to-face, telephone and group-based or one-on-one, and the settings include community, hospital and home. The interventions were delivered by nurses (including diabetes nurse educators), physicians, community health care workers, dietitians, lay people, rehabilitation therapists, or multidisciplinary teams.

Study types

Only systematic reviews and meta-analyses were included in this review.

Eligibility assessment

The title and abstract of all of the retrieved articles were assessed independently by two reviewers (XL-L, YS) based on the inclusion criteria. All duplicate articles were identified within EndNote version X7 [21] and subsequently excluded. If the information from the titles and abstract was not clear, the full articles were retrieved. The decision to include an article was based on an appraisal of the full text of all retrieved articles. Any disagreements during this process were settled by discussion and, if necessary, consensus was sought with a third

reviewer. We developed an assessment form in which specific reasons for exclusion were detailed.

Assessment of methodological quality

The methodological quality and risk of bias were assessed for each of the included publications using the Assessment of Multiple Systematic Reviews (AMSTAR),[22] independently by the same two reviewers (see Table 1). The AMSTAR is an 11-item tool, with each item provided a score of 1 (specific criterion is met) or 0 (specific criterion is not met, unclear, or not applicable). [22 23] An overall score for the review methodological quality is then calculated as the sum of the individual item scores: high quality, 8-11; medium quality, 4-7; or low quality, 0-3. [23] If the required data were not available in the article, the original authors were contacted for more information. The low quality reviews (AMSTAR scale: 0-3) were excluded in this umbrella review.

Data extraction

Data were independently extracted by two reviewers using a predefined data extraction form. For missing or unclear information, the primary authors were contacted for clarification.

Statistical presentation of results from reviews

All of the results were extracted for each included systematic review or meta-analysis, and the overall effect estimates are presented in a tabular form. The number of systematic reviews or meta-analyses that reported the outcome, total sample (from included publications), and information of health education interventions is also presented in the Tables (Table 2, 3). [24] A final 'summary of evidence' was developed to present the intervention, included study synthesis, and indication of the findings from the included papers (Table 4). [24] This umbrella review calculated the Corrected Covered Area (CCA). The CCA statistic is a measure of overlap of trials (the repeated inclusion of the same trial in subsequent systematic reviews included in an umbrella systematic review). A detailed description of the calculation is provided by the authors who note slight CCA as 0-5%, moderate CCA as 6-10%, high CCA as 11-15% and very high CCA is more than 15%. [25] The lower the CCA the lower the likelihood of overlap of trials included in the umbrella review.

Synthesizing the results and rating the evidence for effectiveness

The statements of evidence were based on a rating scheme to gather and rate the evidence across the included publications.[26] The statements of evidence were based on the following rating scheme: *sufficient evidence*, sufficient data to support decisions about the effect of the health education-related interventions. [26] A rating of *sufficient evidence* in this review is obtained when systematic reviews or meta-analyses with a large number of included articles or participants produce a statistically significant result between the health education group and the control group. [26] *Some evidence*, is a less conclusive finding about the effects of the health education-related interventions [26] with statistically significant findings found in only a few included reviews or studies. *Insufficient evidence*, refers to not enough evidence to make decisions about the effects of the health education-related interventions, such as non-significant results between the health education group and the control group in the included systematic reviews or meta-analyses. [26] *Insufficient evidence to determine*, refers to not enough pooled data to be able to determine whether of the health education-related interventions are effective or not based on the included reviews. [26]

Results

Characteristics of included reviews

The selection process and number of studies at each step was illustrated as presented in Figure 1. The database search yielded 692 publications, with removal of 197 duplicates and 371 articles that did not meet the inclusion criteria, 124 full-text articles were retrieved after applying the methodological quality rating (AMSTAR scale), and three studies [27-29] were removed due to low scores ≤3 on the AMSTAR scale. Fifty-one systematic reviews or meta-analyses [30-80] conducted between 2001 and 2016 and published in English were included (Figure 1; Tables 1 –3); 15 relating to ACS. None of the articles included patients with both ACS and T2DM.

The overlap of the trials included in the 15 reviews and meta-analyses related to ACS was slight (CCA = 2.6%). For the 36 systematic reviews relating to T2DM, the overlap of trials within these 35 reviews and meta-analyses (one review [47] did not report the included studies) was slight

(CCA = 2.1%) (http://bmjopen.bmj.com/content/7/10/e016857). The umbrella review involved a total of 277,493 patients, including 225,034 patients with coronary heart disease or ACS (one article did not report the total sample) and 52,459 patients with T2DM (16 papers did not report the total sample). The average sample size of included articles was 8,161 (range, 536–68,556) participants, however, 63 studies related to ACS and 177 studies related to T2DM, were included in more than one systematic review or meta-analysis (see Appendix 2 and 3 and CCA statistics). The sample of these studies would therefore be included more than once. Of the included systematic reviews or meta-analyses, eleven were published in *The Cochrane Library*. Nine of the articles described meta-analyses, 29 articles described systematic reviews, and the remaining 13 articles were described as systematic reviews and meta-analyses or meta-regressions or narrative reviews.

Electronic database searches were conducted for all systematic reviews or meta-analyses, with an average of 6 databases searched (range, 2–16). The dates searched ranged widely, from inception of the database through December 2014. Most of the included reviews were randomized controlled trials (RCTs), and an average of 25.6 (range, 7–132) studies was included per systematic review or meta-analyses. Of the total, 818 unique (non-repeated) studies were included in all of the reviews or meta-analyses, 286 included patients with ACS, and 532 included patients with T2DM (Appendix 2, 3). The included reviews assessed the risk of bias using the Cochrane risk of bias tool (22 publications), JADA quality score (seven publications), Joanna Briggs quality assessment tool (two publications), PEDro scale (one publication), RCT Critical Appraisal Skills Programme (one publication), and the SIGN-50 checklist (one publication).

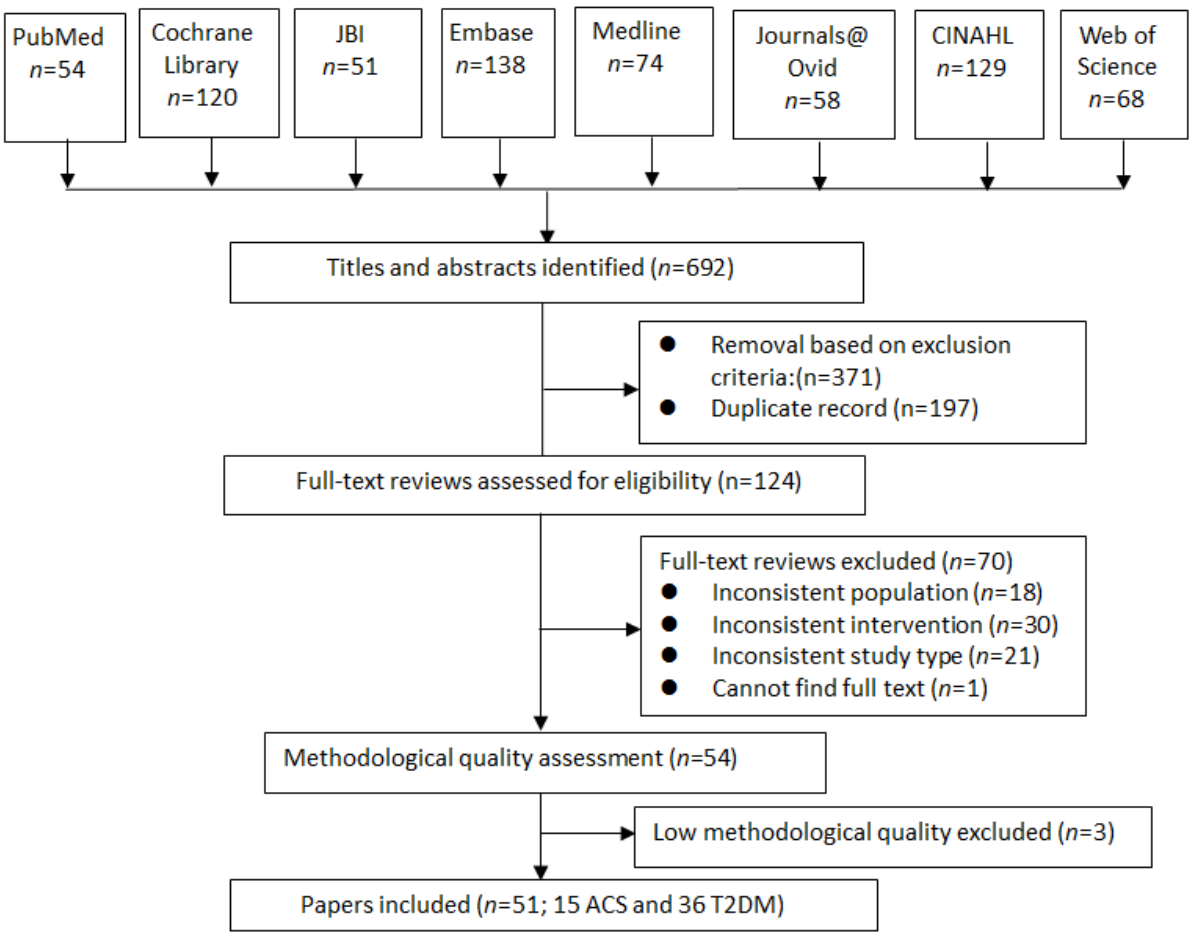

Fig. 1. Flow chart of the systematic reviews and meta-analyses selection process

Methodological quality of included systematic reviews and meta-analyses

The methodological quality of the included publications is presented in Table 1. Thirty (58.8%) publications were classified as high quality (scores 8–11), and 21 (41.2%) publications were classified as medium quality (scores 4–7). Twenty five (49%) reviews specifically provided an *a priori* design, while the use of such a design was unclear for 26 (51%) publications. The inclusion of other forms of literature (such as grey literature) was described in 18 (35%) reviews. Only 14 out of 51 (27%) reviews included a table of included and excluded studies. Only 2 (4%) reviews did not provide a characteristics table of the included papers. The scientific quality of the included papers was evaluated and documented in 47 (92%) reviews. The scientific quality of the included studies was used appropriately to formulate conclusions in 47 (92%) reviews. The

methods to combine the results of the included studies were appropriate in 43 (86%) reviews. Publication bias was assessed in only 19 (37%) reviews. Finally, conflicts of interest were reported in 47 (92%) reviews.

Table 1. Methodological quality assessment of included systematic reviews and meta-analyses

	Systematic Review/ Meta-analysis	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9	Item 10	Item 11	Total score
Systematic reviews and meta-analysis involved ACS patients													
1	Barth, Jacob, Daha, & Critchley, 2015 [69]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	11
2	Devi et al., 2015 [44]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA	Yes	10
3	Ghisi, Abdallah, Grace, Thomas, & Oh, 2014 [50]	CA	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No	No	7
4	Kotb, Hsieh, & Wells, 2014 [59]	CA	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes	8
5	Brown, Clark, Dalal, Welch, & Taylor, 2013 [37]	Yes	No	Yes	CA	No	Yes	Yes	Yes	Yes	NA	Yes	7
6	Dickens et al., 2013 [45]	CA	Yes	Yes	CA	No	Yes	Yes	Yes	Yes	Yes	Yes	8
7	Aldcroft, Taylor, Blackstock, & O'Halloran P, 2011 [31]	CA	No	Yes	CA	NO	Yes	Yes	Yes	Yes	No	Yes	6
8	Brown, Clark, Dalal, Welch, & Taylor, 2011 [70]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA	Yes	10
9	Huttunen-Lenz, Song, & Poland, 2010 [56]	CA	No	Yes	CA	No	Yes	Yes	Yes	Yes	No	No	5
10	Goulding, Furze, & Birks, 2010 [51]	Yes	Yes	Yes	CA	No	Yes	Yes	Yes	Yes	No	Yes	8
11	Auer, Gaume, Rodondi, Cornuz, & Ghali, 2008 [34]	CA	Yes	Yes	CA	No	No	Yes	No	Yes	Yes	No	5
12	J. Barth, Critchley, & Bengel, 2008 [36]	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	10
13	Fernandez et al., 2007 [48]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	8
14	J. Barth, Critchley, & Bengel, 2006 [35]	CA	Yes	Yes	CA	No	Yes	CA	Yes	Yes	Yes	Yes	7
15	Clark, Hartling, Vandermeer, & McAlister, 2005 [41]	CA	Yes	Yes	CA	No	Yes	Yes	Yes	Yes	Yes	Yes	8
Systematic reviews and meta-analysis involved T2DM patients													
16	Choi, Davidson, Walker, Lee, &	CA	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	8

	Palermo, 2016 [40]												
17	Creamer, Attridge, Ramsden, Cannings-John, & Hawthorne, 2016 [42]	Yes	Yes	Yes	CA	No	Yes	Yes	Yes	Yes	No	Yes	8
18	Huang et al., 2016 [55]	CA	CA	Yes	CA	No	Yes	Yes	Yes	Yes	Yes	Yes	7
19	Chen et al., 2015 [39]	CA	CA	Yes	CA	No	Yes	Yes	Yes	Yes	Yes	Yes	7
20	Pillay et al., 2015 [71]	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	9
21	Terranova, Brakenridge, Lawler, Eakin, & Reeves, 2015 [72]	CA	CA	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8
22	Attridge, Creamer, Ramsden, Cannings-John, & Hawthorne, 2014 [33]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	10
23	Odnoletkova et al., 2014 [66]	Yes	CA	Yes	CA	No	No	Yes	Yes	Yes	Yes	No	6
24	Pal et al., 2014 [67]	CA	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes	8
25	Ricci-Cabello et al., 2014 [73]	Yes	CA	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	9
26	Saffari, Ghanizadeh, & Koenig, 2014 [74]	CA	Yes	Yes	CA	No	Yes	Yes	Yes	Yes	Yes	Yes	8
27	Gucciardi, Chan, Manuel, & Sidani, 2013 [52]	CA	Yes	Yes	No	No	Yes	Yes	Yes	Yes	No	Yes	7
28	Pal et al., 2013 [68]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	10
29	Vugt, Wit, Cleijne, & Snoek, 2013 [75]	CA	Yes	Yes	CA	No	Yes	Yes	Yes	NA	No	Yes	6
30	Amaeshi, 2012 [32]	CA	CA	Yes	No	No	Yes	Yes	Yes	NA	No	No	4
31	Nam, Janson, Stotts, Chesla, & Kroon, 2012 [62]	CA	CA	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	8
32	Steinsbekk, Rygg, Lisulo, Rise, & Fretheim, 2012 [76]	CA	Yes	Yes	CA	No	Yes	Yes	Yes	Yes	No	Yes	7
33	Burke et al., 2011 [38]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA	Yes	10
34	Kai Lun Gan, Brammer, & Creedy, 2011 [57]	Yes	Yes	Yes	CA	No	Yes	Yes	Yes	Yes	No	Yes	8
35	Ramadas, Quek, Chan, & Oldenburg, 2011 [77]	CA	CA	Yes	No	No	Yes	Yes	Yes	NA	No	Yes	5
36	Hawthorne, Robles, Cannings-John, & Edwards, 2010 [54]	Yes	Yes	Yes	CA	No	Yes	Yes	Yes	Yes	CA	Yes	8
37	Minet, Moller, Vach, Wagner, & Henriksen, 2010 [61]	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	9
38	Alam, Sturt, Lall, & Winkley,	Yes	Yes	No	CA	No	Yes	Yes	Yes	Yes	Yes	Yes	8

	2009 [30]												
39	Duke, Colagiuri, & Colagiuri, 2009 [46]	Yes	CA	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes	8
40	Fan & Sidani, 2009 [47]	Yes	No	Yes	CA	No	Yes	No	No	Yes	No	Yes	5
41	Hawthorne, Robles, Cannings-John, & Edwards, 2008 [53]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	11
42	Khunti, Camosso-Stefinovic, Carey, Davies, & Stone, 2008 [58]	CA	Yes	Yes	Yes	No	Yes	No	No	No	No	Yes	5
43	Loveman, Frampton, & Clegg, 2008 [60]	Yes	CA	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes	8
44	Wens et al., 2008 [78]	CA	Yes	Yes	CA	No	Yes	Yes	Yes	Yes	NA	Yes	7
45	Nield et al., 2007 [63]	Yes	Yes	Yes	CA	Yes	Yes	Yes	Yes	Yes	No	Yes	9
46	Zabaleta & Forbes, 2007 [79]	CA	CA	Yes	CA	Yes	Yes	Yes	Yes	NA	No	No	5
47	Deakin, McShane, Cade, & Williams, 2005 [43]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	11
48	Vermeire et al., 2005 [80]	Yes	Yes	Yes	CA	Yes	Yes	Yes	Yes	Yes	No	Yes	9
49	Gary, Genkinger, Guallar, Peyrot, & Brancati, 2003 [49]	CA	Yes	No	Yes	No	Yes	Yes	No	Yes	No	Yes	6
50	Norris, Lau, Smith, Schmid, & Engelgau, 2002 [65]	CA	No	Yes	No	No	Yes	Yes	Yes	CA	No	No	4
51	Norris, Engelgau, & Narayan, 2001 [64]	CA	Yes	Yes	CA	No	Yes	Yes	Yes	NA	No	No	5

Item 1:"Was an 'a priori' design provided?"; **Item 2**: "Was there duplicate study selection and data extraction?"; **Item 3**: "Was a comprehensive literature search performed?"; **Item 4**: "Was the status of publication (ie. grey literature) used as an inclusion criterion?"; **Item 5**: "Was a list of studies (included and excluded) provided?"; **Item 6**: "Were the characteristics of the included studies provided?"; **Item 7**: "Was the scientific quality of the included studies assessed and documented?"; **Item 8**: "Was the scientific quality of the included studies used appropriately in formulating conclusions?"; **Item 9**: "Were the methods used to combine the findings of studies appropriate?"; **Item 10**: "Was the likelihood of publication bias assessed?"; **Item 11**: "Was the conflict of interest stated?"

CA= Cannot Answer; NA= Not Application;

Characteristics of health educational interventions

The description of the health educational interventions followed the Workgroup for Intervention Development and Evaluation Research (WIDER) reporting guidelines for behavioural change interventions. [81] The characteristics of the recipients, setting, delivery methods, intensity, duration, and educational content of health educational interventions for patients with ACS or T2DM are summarized in Tables 2 and 3. The delivery strategies for health education included face-to-face, internet-based, phone-based, videotape, written educational materials, or mixed. The format included one-on-one (individualized), group, or both. Face-to-face sessions were the most common delivery formats, and many education sessions were also delivered by telephone/web contact or individualized counseling. The number of sessions, total contact hours, and durations varied, and there was limited information about the intensity of health education for patients provided. The frequency of educational sessions was weekly or monthly, and an average of 3.7 topics was covered per education session. Nurses and multidisciplinary teams were the most frequent educators, and most education programs were delivered post-discharge.

Table 2. Characteristics and interventions of included systematic reviews and meta-analysis involved ACS patients

(First author, Year); Journal	**Primary objectives** (To assess effect of interventions on….)	**Studies details**	**Intervention**					**Outcomes** (Primary outcomes were bold.) "–" : No change " ↑ " : Increase " ↓ " : decrease	**Synthesis methods**
			Educational Content		**Provider**	**Number of session(s), delivery mode, time, setting**			
(Devi et al., 2015) [44]; The Cochrane Library	Lifestyle changes and medicines management	**Number of studies**:11 completed trials (12 publications); **Types of studies:** RCTs; **Total sample:** 1,392 participants.	All Internet based interventions.	√ BEHA (-) √ CVR (-) √ DIET (-) √ EXERCISE (-) ☐ MED √ PSY(-) √ SMOKING (-) ☐ SELF	Dietitians; exercise specialists; nurse practitioners; physiotherapist rehabilitation specialists, or did not describe.	**Number of session:** Weekly or monthly or unclear; **Total contact hours:** Unclear. **Duration:** From six weeks to one year.	**Strategies:** Internet- and mobile phone-based intervention, such as email access, private-messaging function on the website, one-to-one chat facility, a synchronised group chat, an online discussion forum, or telephone consultations; or video files; **Format:** one-on-one chat sessions; "ask an expert" group chat sessions; **Theoretical approach:** Unclear.	Inpatient settings, post discharge, other	**– Clinical outcomes;** **– Cardiovascular risk factors;** – Lifestyle changes; – Compliance with medication; – Healthcare utilization and costs; ↓ Adverse intervention effects.	Meta-analysis used Review Manager software.
(Barth, Jacob, Daha, & Critchley, 2015) [69]; The Cochrane Library	Smoking cessation	**Number of studies**:40 RCTs; **Types of studies:** RCTs; **Total sample:** 7,928 participants.	Psychosocial smoking cessation interventions	☐ BEHA ☐ CVR ☐ DIET ☐ EXERCISE ☐ MED ☐ PSY √ SMOKING ☐ SELF	Cardiologist; general practitioner physician or study nurse.	**Number of session**: Weekly or 2-3 times per week; **Total contact hours:** Unclear. **Duration:** From 8 weeks to one year.	**Strategies:** Face to face, telephone contact, written educational materials, videotape, booklet or unclear; **Format:** One by one counseling; telephone call; group meetings or unclear; **Theoretical approach:** TTM, SCT.	Inpatient settings, post discharge, other	↑ **Abstinence by self-report or validated.**	Meta-analysis used Review Manager software.
(Kotb, Hsieh, & Wells, 2014) [59]; PloS one	Patients' outcomes.	**Number of studies**: 26 studies; **Types of studies:** RCTs; **Total sample:** 4,081 participants.	Telephone-delivered post-discharge interventions.	☐ BEHA √ CVR ☐ DIET ☐ EXERCISE ☐ MED ☐ PSY ☐ SMOKING ☐ SELF	Dietitians; exercise specialist; health educators; nurses and pharmacists.	**Number of session:** 3-6 sessions/telephone calls and was greater than 6 calls in five studies; or unclear; T**otal contact hours:** 40 mins to 180 mins or unclear;	**Strategies:** Telephone calls; **Format:** Unclear, did not describe the format; **Theoretical approach:** Unclear.	Unclear, did not describe the setting.	↓ **All-cause hospitalization;** – **All-cause mortality;** ↓ Depression; – Anxiety; ↑ Smoking cessation, ↓ Systolic blood	Meta-analysis used Review Manager software.

						Duration: 1.5 - 6 months or unclear.			pressure; − LDL-c.	
(Ghisi, Abdallah, Grace, Thomas, & Oh, 2014) [50]; Patient Education and Counseling	knowledge, health behaviour change, medication adherence, psychosocial well-being.	**Number of studies**: 42 articles; **Types of studies:** Thirty were experimental: 23 RCTs and 7 quasi-experimental; and 11 observational and 1 used a mixed-methods design. **Total sample:** 16,079 participants.	Any educational interventions.	√ BEHA (+) √ CVR (++) √ DIET (+++) √ EXERCISE (++) √ MED (++) √ PSY(++) √ SMOKING (+) ☐ SELF	Nurses (35.7%), a multidisciplinary team (31%), dietitians (14.3%), and a cardiologist (2.4%).	**Number of session:** 1-24 or unclear. **Total contact hours:** 5–10 min to 3 h as well as a full day of education. **Duration:** 1-24 month; from daily education to every 6 months.	**Strategies:** Did not describe the strategies; **Format:** Group (88.1%) education was delivered by lectures (40.5%), group discussions (40.5%), and question and answer periods (7.1%). Individual education (88.1%), including individual counseling (50%), follow-up telephone contacts (31%) and home visits (7.1%); **Theoretical approach:** Unclear.	Inpatient settings	**− Knowledge,** **− Behaviour;** **− Psychosocial indicators.**	Narrative synthesis
(Brown, Clark, Dalal, Welch, & Taylor, 2013) [37]; European Journal of Preventive Cardiology	Mortality, morbidity, HRQoL and healthcare costs.	**Number of studies:** Twenty-four papers reporting on 13 RCTs; **Types of studies:** RCTs; **Total sample:** 68,556 participants.	Patient education.	☐ BEHA √ CVR ☐ DIET ☐ EXERCISE ☐ MED ☐ PSY ☐ SMOKING ☐ SELF	Nurses or other healthcare professionals.	**Number of session and Duration:** From a total of 2 visits to a 4-week residential stay reinforced with 11 months of nurse led follow-up. **Total contact hours:** Unclear.	**Strategies:** Face-to-face education sessions, telephone contact and interactive use of the Internet; **Format:** Group-based sessions, individualized education and four utilized a mixture of both sessions; **Theoretical approach:** Unclear.	Inpatient settings, other	**− Mortality,** **− Non-fatal MI,** **− Revascularizations,** **− Hospitalizations,** **− HRQoL,** − Withdrawals/drop outs; − Healthcare utilization and costs.	Meta-analysis used Review Manager software.
(Dickens et al., 2013) [45]; Psychosomatic Medicine	Depression and depressive symptoms.	**Number of studies:** Sixty-two independent studies. **Types of studies:** RCTs; **Total sample:** 17,397.	Psychological interventions.	√ BEHA (-) ☐ CVR ☐ DIET ☐ EXERCISE ☐ MED √ PSY (-) ☐ SMOKING √ SELF (-)	A single health professional or by a unidisciplinary team	**Number of session:** 14.4 (range, 1-156); **Total contact hours:** Varying from 10 to 240 minutes. **Duration:** Unclear.	**Strategies:** Face-to-face sessions, telephone contact or unclear; **Format:** Group or unclear; **Theoretical approach:** Unclear.	Unclear, did not describe.	**↓ Depression;** − Adverse cardiac outcomes; − Ongoing cardiac symptoms.	Univariate analyses using Comprehensive Meta-Analysis, multivariate meta-regression using SPSS 15.0

(Aldcroft, Taylor, Blackstock, & O'Halloran P, 2011) [31]; Journal of Cardiopulmonary Rehabilitation & Prevention	Health behaviour change.	**Number of studies:** 7 trials. **Types of studies:** Six randomized controlled trials and a quasi-experimental trial. **Total sample:** 536 participants.	All psychoeducational or behavioural intervention.	☐ BEHA √ CVR (-) ☐ DIET ☐ EXERCISE ☐ MED √ PSY (-) ☐ SMOKING ☐ SELF	Appropriately trained health care workers.	**Number of session:** Unclear; **Total contact hours:** Unclear; **Duration:** 2-12 months.	**Strategies:** Did not describe the strategies; **Format:** Group setting, combination of group and one-on-one education and one-on-one format only; **Theoretical approach:** TTM, interactionist role theory, Bandura's self-efficacy theory, Gordon's relapse prevention model and a cognitive behavioural approach.	Unclear, did not describe.	↓ **Smoking rates; medication use;** − **Supplemental oxygen use;** ↑ **Physical activity;** ↑ Nutritional habits.	Meta-analysis and narrative presentation
(Brown, Clark, Dalal, Welch, & Taylor, 2011) [70]; The Cochrane Library	Mortality, morbidity, HRQofL and healthcare costs.	**Number of studies:** 24 papers reporting on 13 studies. **Types of studies:** RCTs; **Total sample:** 68,556 participants.	Patient education.	√ BEHA (-) √ CVR (-) ☐ DIET √ EXERCISE (-) √ MED ☐ PSY ☐ SMOKING ☐ SELF	Nurse or did not describe.	**Number of session and Duration:** two 2 visits to 4 week residential 11 months of nurse led folluw up **Total contact hours:** Unclear.	**Strategies:** face-to-face sessions, telephone contact and interactive use of the Internet; **Format:** Four studies involved group sessions, five involved individualized education and three utilized both session types, with one study comparing the two approaches; **Theoretical approach:** did not describe.	Post discharge, other	− **Total mortality;** − **Cardiovascular** − **mortality;** − **Non-cardiovascular mortality;** − **Total cardiovascular (CV) events;** − **Fatal and/or non-fatal MI;** − Other fatal and/or non-fatal CV events	Meta-analysis used Review Manager software.
(Goulding, Furze, & Birks, 2010) [51]; Journal of Advanced Nursing	Change maladaptive illness.	**Number of studies: 13 studies; Types of studies:** RCTs; **Total sample:** Unclear.	Interventions to change maladaptive illness beliefs	√ BEHA (-) ☐ CVR ☐ DIET ☐ EXERCISE ☐ MED √ PSY (-) ☐ SMOKING ☐ SELF	Cardiologist, nurse, psychologist or did not describe.	**Number of session:** Unclear; **Total contact hours:** Unclear; **Duration:** 4 days to two weeks or unclear.	**Strategies:** Face-to-face sessions, telephone contact and written self-administered; **Format:** Unclear; **Theoretical approach:** Common Sense Model, Leventhal's framework.	Inpatient settings, post discharge, other	− **Beliefs (or other illness cognition);** − QoL; − Behaviour; − Anxiety or depression; − Psychological wellbeing; − Modifiable risk factors; protective factors.	A descriptive data synthesis.
(Huttunen-Lenz, Song, & Poland,	Smoking cessation.	**Number of studies:** A total of 14 studies were included.	Psychoeducational cardiac rehabilitation	☐ BEHA ☐ CVR ☐ DIET	Cardiologist, nurse psychologist, or did not describe.	**Number of session:** 4-20 or unclear. **Total contact**	**Strategies:** Face-to-face counselling, self-help materials; home visit, booklet, video and telephone contact.	Inpatient settings, post discharge,	↑ **Prevalent smoking cessation,** ↑ **Continuous**	Subgroup meta-analysis was

2010) [56]; British Journal of Health Psychology		**Types of studies:** RCTs; **Total sample:** 1,792 participants.	intervention.	☐ EXERCISE ☐ MED ☐ PSY √ SMOKING (-) ☐ SELF		**hours:** 10-720 mins or unclear. **Duration:** 4-29 weeks or unclear.	**Format:** individual or unclear. **Theoretical approach:** Social learning theory; ASE model; TTM; Behavioural multicomponent approach.	other	**smoking cessation,** **−** Mortality.	used software.
(Auer, Gaume, Rodondi, Cornuz, & Ghali, 2008) [34]; Circulation	Multiple cardiovascular risk factors and all-cause mortality.	**Number of studies:** 27 articles reporting 26 studies. **Types of studies:** 16 clinical controlled trials and 10 before-after studies. **Total sample:** 2,467 patients in CCTs and 38, 581 patients in before-after studies.	In-Hospital Multidimensional Interventions of Secondary Prevention	☐ BEHA ☐ CVR √ DIET (-) √ EXERCISE (-) √ MED √ PSY (-) √ SMOKING (-) ☐ SELF	Cardiac nurses; physician, or did not describe.	**Number of session:**1-5 or unclear; **Total contact hours:** 30-240mins or unclear; **Duration:** 4 weeks – 12 months.	**Strategies:** Written material; audiotapes; presentations; face-to-face; **Format:** Group or unclear; **Theoretical approach:** Unclear.	Inpatient settings.	**↓ All-cause mortality;** **↓ Readmission rates;** **− Reinfarction rates.**	Stata version 9.1.
(Barth, Critchley, & Bengel, 2008) [36] ; The Cochrane Library	Smoking cessation.	**Number of studies:** Forty trials; **Types of studies:** RCTs; **Total sample:** 7,682 patients.	Psychosocial intervention	√ BEHA (+++) √ CVR (++) ☐ DIET ☐ EXERCISE ☐ MED √ PSY (+) √ SMOKING (+++) √ SELF(+++)	Cardiologist, nurse, physician or study nurse.	**Number of session:** 1-5 or unclear; **Total contact hours:** 15 mins - 9 hours. **Duration:** within 4 weeks or did not report on the duration.	**Strategies:** Face to face; information booklets, audio- or videotapes. **Format:** Group sessions or individual counselling; **Theoretical approach:** TTM.	Inpatient settings	**↑ Abstinence by self-report or validated.**	Meta-analysis used Review Manager software.
(Fernandez et al., 2007) [48]; International Journal of Evidence-Based Healthcare	Risk factor modification.	**Number of studies:** Seventeen trials; **Types of studies:** randomised, quasi-RCTs and clustered trials; **Total sample:** 4,725 participants.	Brief structured intervention.	√ BEHA (-) √ CVR (-) ☐ DIET ☐ EXERCISE ☐ MED ☐ PSY ☐ SMOKING √ SELF (-)	Case manager; dieticians; health educator; nurses; psychologist; and research assistants.	**Number of session:** supportive counselling ranged from 1 to 7 calls for the duration of the study; **Total contact hours:** varied from 10 to 30 mins;	**Strategies:** Written, visual, audio, telephone contact; **Format:** did not describe; **Theoretical approach:** theoretical behaviour change principles.	Unclear, did not describe.	**↓ Smoking;** **− Cholesterol level;** **− Physical activity;** **↑ Dietary habits;** **↓ Blood sugar levels;** **− BP levels;**	Cochrane statistical package Review Manager.

						Duration: Unclear.			↓ **BMI;** − Incidence of admission.	
(J. Barth, Critchley, & Bengel, 2006) [35]; Annals of Behavioural Medicine	Smoking cessation.	**Number of studies:** Nineteen trials; **Types of studies:** RCTs; **Total sample:** 2,548 patients.	Psychosocial interventions.	√ BEHA (+++) √ CVR (++) ☐ DIET ☐ EXERCISE ☐ MED ☐ PSY ☐ SMOKING √ SELF (+++)	Unclear, did not describe.	**Number of session:** Unclear; **Total contact hours:** Unclear; **Duration:** Unclear.	**Strategies:** Face to face, telephone contact or unclear; **Format:** Unclear; **Theoretical approach:** Unclear.	Unclear, did not describe.	↑ **Abstinence;** ↓ **Smoking status**.	Data analyses were carried out in Review Manager 4.2.
(Clark, Hartling, Vandermeer, & McAlister, 2005) [41]; Annals of Internal Medicine	Mortality, MI	**Number of studies:** 63 randomized trials; **Types of studies:** RCTs; **Total sample:** 21,295 patients.	Secondary prevention programs	☐ BEHA ☐ CVR √ DIET (-) √ EXERCISE (-) ☐ MED √ PSY (-) ☐ SMOKING ☐ SELF	Nurse, multidisciplinary team, or did not describe.	**Number of session:** 1-12 or unclear; **Total contact hours:** did not describe. **Duration:** 0.75-48 months.	**Strategies:** Face to face, telephone contact and home visit; **Format:** Group and individual or unclear; **Theoretical approach:** Unclear.	Inpatient settings, post discharge, other	↓ **Mortality,** ↓ **MI,** − Hospitalization rates.	Performed analyses by using Review Manager 4.2 and Qualitative Data Synthesis

Note: SMOKING= Smoking cessation; CVR= Cardiovascular risk factors; PSY =Psychosocial issues (depression, anxiety); DIET =Diet; EXERCISE= Exercise; MED= Medication; BEHA = Behavioural charge (including lifestyle modification); SELF = Self-management (including problems solving); DR =Diabetes risks; CHD= Coronary heart disease; CAD = Coronary Artery Disease; CHW=Community Health Worker; HbA1c = Glycatedhemoglobin; BP =Blood Pressure; LDL = Low-density Lipoprotein Cholesterol; SMS = Short Message Service; BCTs = Behavioural Change Techniques; LEA = Lower Extremity Amputation; PRIDE = Problem Identification, Researching one's routine, Identifying a management goal, Developing a plan to reach it, Expressing one's reactions and Establishing rewards for making progress; ASE = Attitude-social influence-efficacy; CVRF= Cardiovascular Risk Factors; SMS = Short Message System; PA = Physical Activity; EDU = Patient Education; GP= General Practice; RCTs =Randomized controlled trials; CCTS = controlled clinical trials; HRQoL = Health Related Quality of Life; QoL = Quality of Life; MI = Myocardial Infarction; CAD = Coronary Artery Disease; CABG= Coronary Artery Bypass Graft Surgery; BMI = Body Mass Index; HbA1c = Glycatedhemoglobin; BP =Blood Pressure; SBP = Systolic Blood Pressure, DBP = Diastolic Blood Pressure, HDL-c= High-density Lipoprotein Cholesterol; LDL-c = Low-density Lipoprotein Cholesterol; TTM= Transtheoretical Model; SCT=Social Cognitive Theory; HBM =Health Belief Model; SAT=Social Action Theory;

In the educational content: "+": minor focus; "++": moderate focus; "+++" major focus; "-"= unclear what the intensity of the education was for any topic;

In the outcomes: arrow up (" ↑ ") for improvement, arrow down (" ↓ ") for reduction; a dash ("−") for no change or inconclusive evidence. Primary outcomes were bold.

Table 3. Characteristics and interventions of included systematic reviews and meta-analysis involved T2DM patients

(First author, Year); Journal	**Primary objectives** (To assess effect of interventions on….)	**Studies details**	**Intervention**					**Outcomes** (Primary outcomes were bold.) "−" : No change " ↑ " : Increase " ↓ " : decrease	**Synthesis methods**
			Educational Content		**Provider**	**Number of session(s), delivery mode, time, setting**			
(Choi, Davidson, Walker, Lee, & Palermo, 2016) [40]; Diabetes Research and Clinical Practice	Glycemic effect	**Number of studies:** 53 studies(five in English, 48 in Chinese); **Types of studies:** RCTs; **Total sample:** Unclear.	Diabetes education intervention.	☐ BEHA √ DIET (-) ☐ DR ☐ EXERCISE ☐ GC ☐ MED ☐ PSY ☐ SMOKING √ SELF (-)	Unclear, did not describe.	**Number of session:** Unclear; **Total contact hours:** Unclear; **Duration:** 30–150 min or unclear.	**Strategies:** Face to face, written materials; telephone contact and home visit; **Format:** Unclear; **Theoretical approach:** Unclear.	Inpatient settings, post discharge, other	↓ **HbA1c (glycated haemoglobin).**	STATAversion 12 and Review Manager version 5.3
(Creamer, Attridge, Ramsden, Cannings-John, & Hawthorne, 2016) [42]; Diabetic Medicine	successful outcomes and to suggest directions for future research.	**Number of studies: 33; Types of studies:** RCTs; **Total sample:** 7,453 participants.	Culturally appropriate health education.	√ BEHA (-) √ DIET (-) √ DR (-) √ EXERCISE ☐ GC ☐ MED ☐ PSY ☐ SMOKING √ SELF (-)	CHWs, clinical pharmacists dieticians, Nurses, podiatrists, physiotherapists, and psychologists.	**Number of session:** one to ten or unclear; **Total contact hours:** unclear; **Duration:** from a single session to 24 months.	**Strategies:** Face-to-face; Phone contact; **Format:** group sessions (10 studies), individual sessions (13) or a combination of both; **Theoretical approach:** Unclear.	Inpatient settings, post discharge, other	↓ **HbA1c,** − **HRQoL,** − **Adverse events,** − BP, − BMI, − Lipid levels, − diabetes complications, − Economic analyses, − Mortality and diabetes knowledge, − Empowerment, − Self-efficacy and satisfaction.	Meta-analysis using the Review Manager statistical program.
(Huang et al., 2016) [55]; European	Clinical markers of cardiovascular disease	**Number of studies:** 17 studies; **Types of studies:** RCTs;	Lifestyle interventions.	☐ BEHA √ DIET (-) √ CVR (-)	Nurse, Pharmacist or unclear.	**Number of session:** Unclear; **Total contact hours:** Unclear;	**Strategies:** Unclear; **Format:** Individual; Group and Mixed. **Theoretical approach:** Unclear;	Unclear, did not describe.	**Cardiovascular risk factors** (such as, − BMI,	Review Manager 5.1.

Journal of Internal Medicine		**Total sample:** Unclear.		√ EXERCISE (-) ☐ GC ☐ MED ☐ PSY ☐ SMOKING √ SELF (-)		**Duration:** 6 month – 8 years.			↓ HbA1c, – BP, ↓ The level of cholesterol.)	
(Chen et al., 2015) [39]; Metabolism-Clinical and Experimental	Clinical markers.	**Number of studies:** 16 studies; **Types of studies:** RCTs; **Total sample:** per study ranged from 23 to 2575;	Lifestyle intervention.	√ BEHA (-) ☐ DIET √ CVR (-) ☐ EXERCISE ☐ GC √ MED (-) ☐ PSY ☐ SMOKING √ SELF (-)	Unclear, did not describe.	**Number of session:** Monthly; **Total contact hours:** Unclear; **Duration:** < 6 months -8 years.	**Strategies:** Unclear; **Format:** Individual; Group and Mixed; **Theoretical approach:** Unclear.	Unclear, did not describe.	**Cardiovascular risk factors** including ↓ BMI, ↓ HbA1c, ↓ SBP, DBP, – HDL-c, and LDL-c.	All analyses were performed using Comprehensive Meta-Analysis statistical software.
(Terranova, Brakenridge, Lawler, Eakin, & Reeves, 2015) [72]; Diabetes, Obesity and Metabolism	Weight loss.	**Number of studies:** 10 individual studies (from 13 papers); **Types of studies:** RCTs; **Total sample:** ranging from 27 to 5145 participants.	Lifestyle-based-only intervention.	√ BEHA (-) √ DIET (-) √ DR (-) √ EXERCISE (-) ☐ GC ☐ MED ☐ PSY ☐ SMOKING √ SELF (-)	Dietician; diabetes educator; general physician; multidisciplinary team; or nutritionist; nurse.	**Number of session:** 1-42; **Total contact hours:** Unclear; **Duration:** ranged from 16 weeks to 9 years.	**Strategies and Format:** Face-to-face individual or group-based sessions, or a combination of those. One study delivered the intervention via the telephone **Theoretical approach:** Unclear.	Unclear, did not describe.	↓ **Weight change;** – **HbA1c.**	Meta-analyses - Review Manager and meta-regression analysis - stata version
(Pillay et al., 2015) [71]; Annals of internal medicine	HbAlc level.	**Number of studies:** 132; **Types of studies:** RCTs; **Total sample:** Unclear.	Behavioural Programs.	√ BEHA (-) √ DIET (-) ☐ DR √ EXERCISE (-) √ GC (-) √ MED (-) ☐ PSY ☐ SMOKING √ SELF (-)	Trained individuals.	**Number of session:** Unclear; **Total contact hours:** range, 7 to 40.5 hours; **Duration:** 4 or more weeks.	**Strategies:** Unclear; **Format:** Unclear; **Theoretical approach:** Unclear.	Inpatient settings, post discharge, other	– **HbA1c;** ↓ **BMI.**	The analysis was conducted by using a Bayesian network model.

(Pal et al., 2014) [67]; Diabetes Care	Health status, cardiovascular risk factors, and QoL.	**Number of studies:** 20 papers describing 16 studies; **Types of studies:** RCTs; **Total sample:** 3,578 participants.	Computer-based self-management interventions.	☐ BEHA ☐ DIET ☐ DR ☐ EXERCISE ☐ GC ☐ MED ☐ PSY ☐ SMOKING √ SELF	Unclear, did not describe.	**Number of session:** 1-8 ; **Total contact hours:** 10 mins - 6 hours; **Duration:** 8 weeks – 12 months;	**Strategies:** Online/web-based; Phone contact. **Format:** Individual; Group and Mixed. **Theoretical approach:** TTM, social ecological theory, SCT, and self-determination theory.	Unclear, did not describe.	− **HRQoL,** ↓ **HbA1c,** − **Death;** ↓ Cognitions, behaviours, − Social support, ↓ Cardiovascular risk factors, − Complications, − Emotional outcomes, − Hypoglycemia, − Adverse effects, − CE and ecfonomic data.	Meta-analysis using Review Manager software or narrative presentatio.
(Ricci-Cabello et al., 2014) [73]; BMC endocrine disorders	Knowledge, behaviours and clinical outcomes.	**Number of studies:** Thirty-seven studies; **Types of studies:** Almost two thirds of the studies were RCTs, 27% studies were Quasi-experimental design. **Total sample:** Unclear.	DSM educational programs.	☐ BEHA √ DIET(+++) ☐ DR √ EXERCISE (+++) √ GC(+++) √ MED(++) √ PSY(++) ☐ SMOKING ☐ SELF	Dietitian; Nurse; Psychologist; Physician; Research team or staff;	**Number of session:** 13.1; **Total contact hours:** 0.25-180 hours; **Duration:** 0.25-48 months.	**Strategies:** Face-to-face; Telecommunication; Both. **Format:** One on one; Group and Mixed. **Theoretical approach:** Unclear.	Post discharge, other	− **Diabetes knowledge;** − **Self-management;** − **Behaviours;** − **Clinical outcomes;** ↓ Glycated hemoglobin; − **Cost**-effectiveness analysis.	Meta-analyses and bivariate meta-regression were conducted with Stata, version 12.0.
(Saffari, Ghanizadeh, & Koenig, 2014) [74]; Primary Care Diabetes	Glycemic control.	**Number of studies:** 10; **Types of studies:** RCTs; **Total sample:** 960 patients.	An educational intervention using SMS.	√ BEHA (-) ☐ DIET ☐ DR ☐ EXERCISE √ GC (-) √ MED (-) ☐ PSY ☐ SMOKING ☐ SELF	Unclear, did not describe.	**Number of session:** Weekly; or 2 messages daily or unclear; **Total contact hours:** Unclear. **Duration:** 3 months – 1 year	**Strategies:** SMS: sending and receiving data. Receive data through text-messaging by patients only. Used a website along with SMS; **Format:** Unclear; **Theoretical approach:** Unclear.	Inpatient settings, post discharge, other	↑ **Glycemic control**.	Comprehensive Meta-analysis Software Version 2.0.

(Odnoletkova et al., 2014) [66]; Journal of Diabetes & Metabolism	Cost-effectiveness (CE).	**Number of studies:** Seventeen studies; **Types of studies:** RCTs; **Total sample:** Unclear.	Therapeutic education.	√ BEHA (-) ☐ DIET ☐ DR ☐ EXERCISE ☐ GC ☐ MED ☐ PSY ☐ SMOKING √ SELF (-)	General physician; nutritionists or unclear.	**Number of session:** ~ 16; **Total contact hours:** Unclear; **Duration:** Unclear.	**Strategies:** Face-to-face or unclear; **Format:** individual and group lessons; **Theoretical approach:** Unclear.	Inhospital or unclear.	**− CE.**	Incremental Cost-Effectiveness Ratio.
(Attridge, Creamer, Ramsden, Cannings-John, & Hawthorne, 2014) [33]; The Cochrane Library	HbAIc level, Knowledge and clinical outcomes.	**Number of studies:** 33 trials; **Types of studies:** RCTs and quasi-RCTs; **Total sample:** 7453 participants.	'Culturally appropriate' health education.	√ BEHA (-) √ DIET (-) ☐ DR √ EXERCISE (-) √ GC (-) ☐ MED ☐ PSY √ SMOKING (-) ☐ SELF	CHWs; dieticians; exercise physiologists; lay workers; nurses; podiatrists; and psychologists;.	**Number of session:** one session to 24 months; **Total contact hours:** Unclear; **Duration:** The median duration of interventions was six months.	**Strategies:** **Format:** Group intervention method, one-to-one sessions and a mixture of the two methods. Or a purely interactive patient-centred method. **Theoretical approach:** empowerment theories; behaviour change theories, TTM of behaviour change and SCT.	Inpatient settings, post discharge, other	**↓ HbA1c;** **− HRQoL;** **− Adverse events;** − Mortality; − Complications; −Satisfaction; ↑ Empowerment; ↑ Self-efficacy; − Attitude; knowledge; −BP; −BMI; ↓ Lipid levels; −Health economics.	Meta-analyses used Review Manager software.
(Vugt, Wit, Cleijne, & Snoek, 2013) [75] ; Journal of Medical Internet Research	Health outcomes.	**Number of studies:** 13 studies; **Types of studies:** RCTs; **Total sample:** 3813 patients.	BCTs are being used in online self-management interventions.	√ BEHA (-) ☐ DIET ☐ DR ☐ EXERCISE ☐ GC ☐ MED ☐ PSY ☐ SMOKING √ SELF (-)	Health care professional.	**Number of session:** 6 weekly sessions or unclear; **Total contact hours:** Unclear; **Duration:** Unclear.	**Strategies:** Online/web-based; **Format:** Unclear; **Theoretical approach:** self-efficacy theory, social support theory, TTM, SCT, social-ecological model, and cognitive behavioural therapy.	Post discharge	**− Health behaviour change,** **− Psychological well-being;** − Clinical parameters.	Unclear.

(Gucciardi, Chan, Manuel, & Sidani, 2013) [52]; Patient Education and Counseling	HbAIc level,physical activity and diet outcomes.	**Number of studies:** Thirteen studies; **Types of studies:** RCTs and comparative studies; **Total sample:** Unclear.	DSME interventions.	☐ BEHA √ DIET (+++); ☐ DR √ EXERCISE (+++); ☐ GC √ MED (+); √ PSY (+) ☐ SMOKING √ SELF (++).	Dietitians (n = 7/13); Multidisciplinary Team (n = 7/13); Nurse (n = 5/13); Community Peer Worker (n = 3/13).	**Number of session:** Low Intensity: <10 education sessions (n = 7); High Intensity: ≥ 10 education sessions (n = 6); **Total contact hours:** Unclear; **Duration:** < 6 months (n = 7/13); ⩾6months (n = 6/13).	**Strategies:** Face-to-face(n = 13/13); Written Literature: (e.g., handbook) (n = 4/13);Telephone(n = 4/13);Audio-Visual(n = 1/13); **Format:** One-on-one: (n = 11/13);Group (n = 9/13); **Theoretical approach:** SAT; Empowerment Behaviour Change Model; modification theories; Pharmaceutical Care Model; Behaviour Change Theory; PATHWAYS Program; Symptom-Focused Management Model; Motivational interviewing.	Inpatient settings, post discharge	− **HbA1c levels,** − Anthropometrics, − Physical activity; − Diet outcomes.	Arecently described method.
(Pal et al., 2013) [68]; The Cochrane Library	Health status and HRQoL.	**Number of studies:** 16 studies; **Types of studies:** RCTs; **Total sample:** 3,578 participants.	Computer-based diabetes self-management intervention.	☐ BEHA √ DIET (-) ☐ DR √ EXERCISE (-) √ GC (-) √ MED (-) √ PSY (-) ☐ SMOKING ☐ SELF	Nurse or other healthcare professionals.	**Number of session:** Unclear; **Total contact hours:** Unclear; **Duration:** One session – 18 months.	**Strategies:** Online/web-based; phone contact **Format:** Unclear; **Theoretical approach:** Unclear.	Inpatient settings, post discharge, other	− **HRQoL;** − **Death from any cause;** ↓ **HbA1c;** − Cognitions Behaviours; − Social support; − Biological markers; − Complications.	Formal meta-analyses and narrative synthesis.
(Nam, Janson, Stotts, Chesla, & Kroon, 2012) [62]; Journal of Cardiovascular Nursing	Glycemic control.	**Number of studies:** 12 RCTs; **Types of studies:** RCTs; **Total sample:** 1,495 participants.	Diabetes educational interventions (no drug intervention).	☐ BEHA √ DIET (-) ☐ DR √ EXERCISE (-) √ GC (-) √ MED (-) √ PSY (-) ☐ SMOKING √ SELF (-)	Nurses (36%), dieticians (36%), diabetes educators (5%), other professionals (9%) and nonprofessional staff (14%).	**Number of session:** 1 month or less; 1 to 3 months; and 12 months; **Total contact hours:** most studies did not describe, or from 1 session to more than 30 hours; **Duration:** from 1 session to 12 months, frequency: 1 session to 25 weekly or biweekly education.	**Strategies:** Teaching or counseling; home-based support; and visual aids. **Format:** group education or a combination of group education and individual counseling; or only individual counseling; **Theoretical approach:** Unclear.	Inpatient settings, post discharge, other	↓ **HbA1c level.**	Meta-analysis.

(Steinsbekk, Rygg, Lisulo, Rise, & Fretheim, 2012) [76]; BMC Health Services Research	Clinical, lifestyle and psychosocial outcomes.	**Number of studies:** 21 studies (26 publications). **Types of studies:** RCTs; **Total sample:** 2,833 participants.	Group-based education.	Did not describe the content of the intervention.	Community workers; dietician; lay health advisors nurse and nutritionist.	**Number of session and Total contact hours:** 30 hours over 2.5 months, 52 hours over one year, and 36 hours or 96 hours over 6 months. **Duration:** Six months to two years.	**Strategies:** Face to face; **Format:** 5 to 8 participants group to 40 patients group. **Theoretical approach:** empowerment model and the discovery learning theory, the SCT and the social ecological theory, the self-efficacy and self-management theories and operant reinforcement theory.	Inpatient settings, post discharge, other	↓ **HbA1c,** ↑ **Lifestyle outcomes,** ↑ **Diabetes knowledge,** ↑ Self-management skills, ↑ Psychosocial outcomes, ↓ Mortality rate, ↓ BMI, ↓ Blood pressure; ↓ Lipid profile.	Meta-analysis using Review manager v5.
(Amaeshi, 2012) [32]; Podiatry Now	Increasing good foot health practices that will ultimately reduce LEA.	**Number of studies:** 8 studies; **Types of studies:** RCT or clinical controlled trial (CCT); **Total sample:** Unclear.	Foot health education:	Food care.	Podiatrist, psychotogist or unclear.	**Number of session:** Unclear; **Total contact hours:** between 15min and 14 hours; **Duration:** 3-30 months.	**Strategies:** Face to face; **Format:** In three of the studies, educational interventions were delivered to the participants in groups, while the other five provided individualized (one-to-one) foot-care education to the participants; **Theoretical approach:** Unclear.	Unclear, did not describe.	↓ **LEA;** ↑ Self-care.	Narrative synthesis.
(Kai Lun Gan, Brammer, & Creedy, 2011) [57]; JBI Library of Systematic Reviews	Oral hypoglycaemic adherence.	**Number of studies:** Seven studies; **Types of studies:** RCTs; **Total sample:** Unclear.	Educational interventions.	√ BEHA (-) √ DIET (-) ☐ DR √ EXERCISE (-) √ GC (-) √ MED (-) √ PSY (-) ☐ SMOKING √ SELF (-)	Nurses; pharmacists; other skilled healthcare professionals.	**Number of session:** 1-12 or unclear; **Total contact hours:** 2.5 hours or unclear; **Duration:** 4-12 months.	**Strategies:** Face to face; **Format:** Group and individual; **Theoretical approach:** Unclear.	Inpatient settings, post discharge, other	↓ **HbA1c,** − **Medication adherence;** ↓ Blood glucose; − Tablet count; − Medication containers; − Diabetes complications; − Health service utilization.	Narrative summary form.
(Burke et al., 2011) [38]; JBI Database	HbAlc level,BP.	**Number of studies:** 11 RCTs and 4 quasi-experimental	Group medical visits.	√ BEHA (-) √ DIET (-) ☐ DR	Dndocrinologists; DM nurse; family physician;	**Number of session:** 1-4 or unclear; **Total contact hours:** 2-4	**Strategies:** Face to face; **Format:** Group and individual; **Theoretical approach:** Unclear.	Inpatient settings, post discharge,	↓ **HbA1c;** − **Systolic and diastolic BP;**	Meta-analysis.

of Systematic Reviews and Implementation Reports		trials; **Types of studies:** RCTs and quasi-experimental trials; **Total sample:** 2,240 patients.		☐ EXERCISE √ GC (-) √ MED (-) ☐ PSY ☐ SMOKING √ SELF (-)	nutritionist and rehab therapist.	hours or unclear; **Duration:** One session to 2 years.		other	− LDL measurements.	
(Ramadas, Quek, Chan, & Oldenburg, 2011) [77]; International Journal of Medical Informatics	HbA1c level.	**Number of studies:** 13 different studies; **Types of studies:** RCTs and quasi-experimental studies; **Total sample:** Unclear.	Web-based behavioural interventions.	√ BEHA (-) √ DIET (-) ☐ DR ☐ EXERCISE √ GC (-) √ MED (-) ☐ PSY ☐ SMOKING √ SELF (-)	Dietician; endocrinologist; physicians; researchers or research staff members and study nurse.	**Number of session:** Unclear; **Total contact hours:** Unclear; **Duration:** ranged between 12 and 52 weeks, with an average of 27.2 ± 18.3 weeks.	**Strategies:** E-mail and SMS technologies that were commonly used together with the websites to reinforce the intervention, and Website, print material. **Format:** Unclear; **Theoretical approach:** Wagner's Chronic Care Model; Self-efficacy theory/Social support theory; TTM; HBM; SCT.	Inpatient settings, post discharge, other	− **Self-monitoring blood sugar,** − Weight-loss, − Dietary behaviour, − Physical activity.	Not statistically combined and re-analyzed;
(Minet, Moller, Vach, Wagner, & Henriksen, 2010) [61]; Patient Education and Counseling	Glycaemic control.	**Number of studies:** Forty-seven studies; **Types of studies:** RCTs; **Total sample:** Unclear.	Self-care management interventions.	√ BEHA (-) ☐ DIET ☐ DR ☐ EXERCISE ☐ GC ☐ MED ☐ PSY ☐ SMOKING √ SELF (-)	Case nurse manager; group facilitator; nurse educator; multidisciplinary team; physiologist; physician; peer counsellor; researcher; and pharmacist.	**Number of session:** 3-26; **Total contact hours:** Unclear; **Duration:** 4 weeks to 4 years.	**Strategies:** Face to face; home visit; phone calls; **Format:** Group and individual; **Theoretical approach:** Unclear.	Inpatient settings, post discharge, other	↓ **HbA1c.**	Meta-analyses and meta-regression used Stata's meta command.
(Hawthorne, Robles, Cannings-John, & Edwards, 2010) [54]; Diabetic Medicine	Effects of culturally appropriate health education	**Number of studies:** 10 trials; **Types of studies:** RCTs; **Total sample:** 1603 patients.	Culturally appropriate health education	☐ BEHA √ DIET (-) ☐ DR √ EXERCISE (-) ☐ GC ☐ MED ☐ PSY ☐ SMOKING √ SELF (-)	Exercise physiologists; dieticians; diabetes nurses; link workers, and podiatrists.	**Number of session:** Unclear; **Total contact hours:** Unclear; **Duration:** one session to 12 months;	**Strategies:** Face to face; visual aids, leaflets and teaching materials; **Format:** group approach, one-to-one interviews and a mixed approach; **Theoretical approach:** SAT, Empowerment Behaviour Change Model, SCT, Management model and the Theory of Planned Behaviour.	Inpatient settings, post discharge, other	−**QoL;** ↓ **HbA1c;** − **BP;** ↑ Knowledge; − BMI; ↓ Lipid levels, − Diabetic complications,	Meta - analysis using the Review Manager and narrative review.

									− Mortality rates, hospital admissions, hypoglycaemia.	
(Fan & Sidani, 2009) [47]; Canadian Journal of Diabetes	Knowledge, self-management behaviours and metabolic control.	**Number of studies: 50 studies;** **Types of studies:** RCTs; **Total sample: Unclear.**	DSME intervention:	√ BEHA (-) ☐ DIET ☐ DR ☐ EXERCISE ☐ GC ☐ MED √ PSY (-) ☐ SMOKING √ SELF (-)	Unclear, did not describe.	**Number of session:** 10 (range 1 to 28); **Total contact hours:** 17 contact hours (range 1 to 52); ⩽ 10 (46%); 11-20 (21%); > 20 (33%); **Duration:** 22 weeks (range 1 to 48); ⩽ 8 weeks (26%); 9–24 weeks (37%); > 24 weeks (37%).	**Strategies:** Online/web-based (4%); video (2%); face-to-face (60%); phone contact (4%); Mixed (30%). **Format:** One-on-one (32%); Group (40%); Mixed (28%). **Theoretical approach:** Unclear.	Inpatient settings, post discharge, other	**↑ Diabetes knowledge,** **↑ Self-management behaviours;** **↓ HbA1c,**	Comprehensive Meta-Analysis (version 2.0).
(Duke, Colagiuri, & Colagiuri, 2009) [46]; The Cochrane Library	Metabolic control, diabetes knowledge and psychosocial outcomes.	**Number of studies:** Nine studies; **Types of studies:** RCTs; **Total sample:** 1,359 participants.	Individual patient education.	√ BEHA (-) ☐ DIET ☐ DR √ EXERCISE (-) √ GC (-) ☐ MED √ PSY (-) ☐ SMOKING ☐ SELF	Diabetes educators and dieticians.	**Number of session:** 1-6; **Total contact hours:** 20 min – 7 hours; **Duration:** 4 weeks – 1 year.	**Strategies:** Face to face; telephone; **Format:** Individual; **Theoretical approach:** Unclear.	Inpatient settings	**− HbA1c;** **− Diabetes complications;** − Health service utilisation and health care costs; − Psychosocial outcomes; − Diabetes knowledge; patient self-care behaviours; − Physical measures; metabolic.	Meta-analysis.
(Alam, Sturt, Lall, & Winkley, 2009) [30]; Patient Education and Counseling	Glycaemic control and psychological status.	**Number of studies:** 35 trials; **Types of studies:** RCTs; **Total sample:** 1431 patients.	Psycho-educational Interventions.	√ BEHA (-) ☐ DIET ☐ DR ☐ EXERCISE ☐ GC ☐ MED √ PSY (-) ☐ SMOKING ☐ SELF	Generalists; psychological specialists; or did not report the specialist	**Number of session:** 1-16; **Total contact hours:** 20 min – 28 hours; **Duration:** about 13.7 (±11.06) weeks.	**Strategies:** Face to face; telephone calls; **Format:** group format; a single format and used a combination; **Theoretical approach:** TTM; motivational interviewing;	Inpatient settings, other	**↓ HbA1c;** **↓ Psychological distress.**	Meta-analysis.

(Khunti, Camosso-Stefinovic, Carey, Davies, & Stone, 2008) [58]; Diabetic Medicine	Knowledge and biomedical outcomes.	**Number of studies:** nine studies; **Types of studies:** RCTs and RCT was followed by a before-and-after study; **Total sample:** 1004 patients.	Any educational intervention.	☐ BEHA √ DIET ☐ DR ☐ EXERCISE ☐ GC ☐ MED ☐ PSY ☐ SMOKING ☐ SELF	Unclear, did not describe.	**Number of session:** Unclear; **Total contact hours:** Unclear; **Duration:** 3- 12 months.	**Strategies:** Face to face; **Format:** Group and individual; **Theoretical approach:** Unclear.	Unclear, did not describe.	**– Knowledge;** **– Psychological and biomedical outcome measures.**	Unclear.
(Loveman, Frampton, & Clegg, 2008) [60]; Health Technology Assessment	Clinical effectiveness.	**Number of studies:** Twenty-one published trials; **Types of studies:** RCTs and CCTs; **Total sample:** Unclear.	Educational interventions.	√ BEHA (++) √ DIET (+++) ☐ DR √ EXERCISE (+++) √ GC (+++) ☐ MED ☐ PSY ☐ SMOKING √ SELF (+++)	Community workers; diabetes research technician; diabetes nurse, dieticians; educationalist; medical students; nurses; pharmacists; physician, or physician assistant.	**Number of session:** Two to four intensive education of 1.5 to 2 hours followed up with additional education at, 3 and 6 months; **Total contact hours and Duration:** about 150 mins over a 6-month or 61 to 52 hours over one year.	**Strategies:** Face to face; **Format:** Group and individual; **Theoretical approach:** cognitive-behavioural strategies; pedagogical principle.	Inpatient settings, post discharge, other	**– Diabetic control outcomes**; – Diabetic end points; – QoL and cognitive measures.	Narrative review
(Wens et al., 2008) [78]; Diabetes Research and Clinical Practice	Improving adherence to medical treatment recommendations.	**Number of studies:** 8 studies; **Types of studies:** RCTs and controlling before and after studies. **Total sample:** 772 patients.	Interventions aimed at improving adherence to medical treatment.	√ BEHA (-) √ DIET (-) ☐ DR √ EXERCISE (-) √ GC (-) √ MED (-) ☐ PSY ☐ SMOKING √ SELF (-)	Diabetes educator; nurse or did not describe.	**Number of session:** Unclear; **Total contact hours:** Unclear; **Duration:** ～ 9 months or unclear.	**Strategies:** Face-to-face; telephone; **Format:** face-to-face; group based and telemedicine; **Theoretical approach:** Unclear.	Inpatient settings, post discharge, other	**– Adherence;** – HbA1c; – Blood glucose.	Cochrane Review Manager software.
(Hawthorne, Robles, Cannings-	HbAIc level, Knowledge and clinical	**Number of studies:** A total of 11 trials; **Types of studies:**	Culturally appropriate (or adapted)	√ BEHA (-) √ DIET (-) ☐ DR	Dieticians, diabetes nurses, exercise	**Number of session:** Unclear; **Total contact hours:**	**Strategies:** Face-to-face; booklet; **Format:** Group intervention method; one to one interviews; mixture of the	Inpatient settings, post discharge,	**↓ HbA1c** **↑ Knowledge scores**	Narrative presentation and meta-

John, & Edwards, 2008) [53]; The Cochrane Library	outcomes.	RCTs; **Total sample:** 1,603 patients.	health education.	√ EXERCISE (-) √ GC (-) ☐ MED ☐ PSY √ SMOKING (-) ☐ SELF	physiologists; link workers; podiatrists; psychologist and and non-professional link worker.	Unclear; **Duration:** one session to 12 months.	two methods; purely interactive patient-centred method; semi-structured didactic format and combination of the 2 approaches. **Theoretical approach:** SAT; Empowerment Behaviour Change Model; Behaviour Change Theory; SCT, Management Model and the Theory of Planned Behaviour.	other	− Other outcome measures	analysis.
(Nield et al., 2007) [63]; The Cochrane Library	Metablic control.	**Number of studies:** 36 articles (18 trials); **Types of studies:** RCTs; **Total sample:** 1,467 participants.	Dietary advice.	☐ BEHA √ DIET ☐ DR ☐ EXERCISE ☐ GC ☐ MED ☐ PSY ☐ SMOKING ☐ SELF	exercise physiologist; dietitian; group facilitator; nutritionist; nurse educator; and physician.	**Number of session:** 1-12; **Total contact hours:** 20 min-22 hours; **Duration:** 11 weeks – 6months or unclear.	**Strategies:** Face-to-face; **Format:** Group and individual; **Theoretical approach:** Unclear.	Inpatient settings, post discharge, other	**− Weight;** **− Diabetic complications;** **− HbA1c;** − QoL; − Medication use; − Cardiovascular disease risk;	Meta-analysis.
(Zabaleta & Forbes, 2007) [79]; British Journal of Community Nursing	Clinical effectiveness.	**Number of studies:** 21 studies; **Types of studies:** Controlled trials; **Total sample:** Unclear.	Structured group diabetes education.	√ BEHA (-) √ DIET (-) ☐ DR √ EXERCISE (-) √ GC (-) ☐ MED √ PSY (-) ☐ SMOKING ☐ SELF	Diabetes nurse educator; physician's assistant; and physicians;	**Number of session:** 4-6 or unclear; **Total contact hours:** 6-12 hours or unclear; **Duration:** 1-6 months or unclear.	**Strategies:** Face to face; **Format:** Group; **Theoretical approach:** Unclear.	Post discharge.	**−HbA1c.**	A tabulative synthesis.
(Deakin, McShane, Cade, & Williams, 2005) [43]; The Cochrane Library	Clinical, lifestyle and psychosocial outcomes.	**Number of studies:** 14 publications, reporting 11 studies; **Types of studies:** RCTs, and CCTs; **Total sample:** 1,532 participants.	Group-based educational programmes.	Did not describe the content of the intervention.	Health professionals, lay health advisors.	**Number of session:** Unclear; **Total contact hours:** from 6 to 52 hours; **Duration:** 3 hours per year for 2 years and 3 or 4 hours per year for 4 years.	**Strategies:** Unclear; **Format:** Group; **Theoretical approach:** the Diabetes Treatment and Teaching Programme (DTTP); empowerment model; adult learning model, public health model, HBM and TTM.	Inpatient settings, post discharge	**↓ Metabolic control;** **↑ Diabetes knowledge;** ↑ QoL; ↑ Empowerment/self-efficacy.	Summarized statistically
(Vermeire et al., 2005)	Improving adherence	**Number of studies:** 21 articles;	Interventions that were	☐ BEHA ☐ DIET ☐	Nurse, pharmacist and	**Number of session:** Unclear;	**Strategies:** Face to face; telephone; home visit; video; mailed educational	Inpatient settings, post	**Direct indicators,** such as	A descriptive review and

[80]; The Cochrane Library	to treatment recommend ations.	**Types of studies:** RCTs; cross-over study; controlled trial; controlled before and after studies; **Total sample:** 4,135 patients.	aimed at improving the adherence to treatment recommendati ons.	DR ☐ EXERCISE √ GC (-) √ MED (-) ☐ PSY ☐ SMOKING ☐ SELF	other healthcare professionals.	**Total contact hours:** Unclear; **Duration:** Unclear.	materials; **Format:** Unclear. **Theoretical approach:** Unclear.	discharge	↓ Blood glucose level; − Indirect indicators, such as pill counts; −Health outcomes.	sub-group meta-analysis.
(Gary, Genkinger, Guallar, Peyrot, & Brancati, 2003) [49]; Diabetes Educator	Body weight and glycaemic control.	**Number of studies:** Sixty-three RCTs; **Types of studies:** RCTs; **Total sample:** 2,720 patients.	Educational and behavioural component interventions.	☐ BEHA √ DIET (-) ☐ DR √ EXERCISE (-) √ GC (-) √ MED (-) ☐ PSY ☐ SMOKING ☐ SELF	Nurse (39%); dietitian (26%); physician (17%); other or not specified (23%); other professional (13%); psychologist (9%); Exercise psychologist (9%); and health educator (4%).	**Number of session:** Unclear; **Total contact hours:** Unclear. **Duration:** 1 month to 19.2 months.	**Strategies:** Unclear; **Format:** Unclear; **Theoretical approach:** SAT, contracting model and patient empowerment.	Inpatient settings, post discharge	**− Glycaemic control;** **− Weight.**	Sufficient data were combined using meta-analysis.
(Norris, Lau, Smith, Schmid, & Engelgau, 2002) [65]; Diabetes Care	Total GHb.	**Number of studies:** 31 studies **Types of studies:** RCTs. **Total sample:** 4,263 patients.	Self-management education.	√ BEHA (-) √ DIET (-) ☐ DR ☐ EXERCISE ☐ GC ☐ MED ☐ PSY ☐ SMOKING √ SELF (-)	Dietitian; lay health care worker; nurse; physician with team; self (e.g. computer assisted instruction); and team (nurse, dietitian, etc.).	**Number of session:** 6 (1–36); **Total contact hours:** 9.2 (1–28) hours; **Duration:** 6 (1.0–27) months.	**Strategies:** Online/web-based; video ; face-to-face; phone contact; **Format: Group;** individual and mixed; **Theoretical approach:** Unclear	Inpatient settings, post discharge, other	**↓ Total GHb,**	Meta-analysis and meta-regression.
(Norris, Engelgau, & Narayan, 2001) [64]; Diabetes Care	Clinical outcomes, Knowledge, Metablic control.	**Number of studies:** 72 studies (84 papers); **Types of studies:** RCTs; **Total sample:** Unclear.	Self-management training interventions.	√ BEHA (-) √ DIET (-) ☐ DR ☐ EXERCISE ☐ GC ☐ MED ☐ PSY	CHWs; nurse; or other healthcare professionals.	**Number of session:** 1-16; **Total contact hours:** ～22 hours; **Duration:** ～26 months.	**Strategies:** Online/web-based; video (2%); face-to-face; phone contact; **Format:** Group; individual and mixed; **Theoretical approach:** SAT; HBM.	Inpatient settings, post discharge, other	**↑ Knowledge;** **↑ Lifestyle behaviours;** **−Psychological and QoL outcomes;** **↑ Glycemic control**;	Outcomes are summarized in a qualitative fashion.

	☐ SMOKING √ SELF (-)	− Cardiovascular disease risk factors.

Note: SMOKING= Smoking cessation; CVR= Cardiovascular risk factors; PSY =Psychosocial issues (depression, anxiety); DIET =Diet; EXERCISE= Exercise; MED= Medication; BEHA = Behavioural charge (including lifestyle modification); SELF = Self-management (including problems solving); GC= glycemic regulation; DR =Diabetes risks; CHD= Coronary heart disease; CAD = Coronary Artery Disease; CHW=Community Health Worker; HbA1c = Glycated hemoglobin; BP =Blood Pressure; LDL = Low-density Lipoprotein Cholesterol; SMS = Short Message Service; BCTs = Behavioural Change Techniques; LEA = Lower Extremity Amputation; PRIDE = Problem Identification, Researching one's routine, Identifying a management goal, Developing a plan to reach it, Expressing one's reactions and Establishing rewards for making progress; ASE = Attitude-social influence-efficacy; CVRF= Cardiovascular Risk Factors; SMS = Short Message System; PA = Physical Activity; EDU = Patient Education; GP= General Practice; RCTs =Randomized controlled trials; CCTS = controlled clinical trials; HRQoL = Health Related Quality of Life; QoL = Quality of Life; MI = Myocardial Infarction; CAD = Coronary Artery Disease; CABG= Coronary Artery Bypass Graft Surgery; T2DM = Type 2 Diabetes Mellitus; BMI = Body Mass Index; SBP = Systolic Blood Pressure, DBP = Diastolic Blood Pressure, HDL-c= High-density Lipoprotein Cholesterol; LDL-c = Low-density Lipoprotein Cholesterol; DSME = Diabetes Self-management Education; DSM = Diabetes Self-management; TTM= Transtheoretical Model; SCT=Social Cognitive Theory; HBM =Health Belief Model; SAT=Social Action Theory;

In the educational content: "+": minor focus; "++": moderate focus; "+++" major focus; "-" =unclear what the intensity of the education was for any topic;

In the outcomes: arrow up (" ↑ ") for improvement, arrow down (" ↓ ") for reduction; a dash ("–") for no change or inconclusive evidence.

Acute coronary syndrome

The educational content for patients with ACS covered cardiovascular risk factors in 8 reviews (53.33%), psychosocial issues in 8 reviews (53.33%), smoking cessation in 6 reviews (40.00%), exercise in 5 reviews (33.33%), behavioural change in 5 reviews (33.33%), diet in 4 reviews (26.67%), self-management in 3 reviews (20.00%), and medication in 1 review (6.67%). Two reviews only included smoking cessation and cardiovascular risk factors. The most common educational providers were nurses and a multidisciplinary team. Six studies [31 36 48 51 56 69] (6/15, 40%) described the theoretical approach that underpinned the education intervention.

Type 2 diabetes mellitus

The educational content for patients with T2DM included diet in 23 reviews (63.89%), behavioural change in 21 reviews (58.33%), self-management in 20 reviews (55.56%), exercise in 17 reviews (47.22%), glycemic regulation in 16 reviews (44.45%), medication in 13 reviews (36.11%), psychosocial issues in 9 reviews (25.00%), smoking cessation in 2 reviews (5.56%), cardiovascular risk factors in 2 reviews (5.56%), and DM risks in one review (2.78%). The most common providers were dieticians, nurses, and a multidisciplinary team. The number of sessions, total contact hours, and durations varied. Thirteen reviews [30 33 43 49 52-54 60 64 67 75-77] (13/36, 36.11%) described the theoretical approach that underpinned the education intervention.

Effect of interventions

The outcomes of the included systematic reviews and meta-analyses were summarized in Table 4.

Table 4. Summary of evidence from quantitative research syntheses

Intervention	Number of systematic reviews/meta-analysis, Total participants	First author, Year	Primary Results/findings		Rating the evidence of effectiveness
Acute Coronary Syndrome Patients					
General health education	Six/161,997patients (Goulding et al., 2010 did not given the total sample size)	Ghisi et al., 2014 [50]	Knowledge	91% studies (+)	Some evidence
			Behaviour	77%/84%/65% studies (+)	
			Psychosocial indicators	43% studies (+)	
		Brown et al., , 2013 [37]	Mortality		
			MI		
			Revascularizations		
			Hospitalizations		
			HRQoL		
			Withdrawals/drop outs		
			Healthcare utilization and costs		
		Brown et al., 2011 [70]	Total mortality		
			MI		
			CABG		
			Hospitalisations		
			HRQoL	63.6% studies (+)	
			Healthcare costs	40% studies (+)	
			Withdrawal/drop out		
		Goulding et al., 2010 [51]	Beliefs	30.08% studies (+)	
			Secondary outcomes		
		Fernandez et al., 2007 [48]	Smoking		
			Cholesterol level		
			Multiple risk factor modification		
			All-cause hospitalization		
			All-cause mortality		

		Kotb, Hsieh, & Wells, 2014 [59]	Smoking cessation		
			Depression		
			Systolic blood pressure		
			Low-density lipoprotein		
			Anxiety		
Psychoeducational interventions	Six/ 37,883 patients	Barth et al., 2015 [69]	Abstinence by self-report or validated		Sufficient evidence
		Dickens et al., 2013 [45]	Depression		
		Aldcroft et al., 2011 [31]	Smoking cessation		
			Physical activity		
		Huttunen-Lenz et al.,2010 [56]	Prevalent smoking cessation		
			Continuous smoking cessation		
			Total mortality		
		Barth et al., 2008 [36]	Abstinence by self-report or validated		
			Smoking status		
		Barth et al., 2006 [35]	Abstinence		
			Smoking status		
Secondary prevention educational interventions (including Internet based secondary prevention)	Three/25,154 patients	Devi et al., 2015 [44]	Mortality		Some evidence
			Revascularisation		
			Total Cholesterol		
			HDL cholesterol		
			Triglycerides		
			HRQOL		
		Auer et al., 2008 [34]	All-cause mortality		
			Readmission rates		
			Reinfarction rates		
			Smoking cessation rates		
			Mortality		
			MI		

		Clark et al., 2005 [41]	Quality of life	Most of the included studies (+)	
Type 2 Diabetes Mellitus Patients					
General health education	Five/2,319 patients (Choi et al., 2016; Loveman et al., 2008; Zabaleta et al., 2007 did not given the total sample size)	Choi et al., 2016 [40]	HbA1c		Some evidence
		Saffari et al., 2014 [74]	Glycemic control		
		Duke et al., 2009 [46]	HbA1c		
			BP		
			Knowledge, psychosocial outcomes and smoking habits	No Data	
			Diabetes complications or health service utilization and cost analysis	No Data	
		Loveman et al., 2008 [60]	Diabetic control outcomes	46.15% studies (+)	
			Weight	66.67% studies (+)	
			Cholesterol or triglycerides	40.00% studies (+)	
		Zabaleta et al., 2007 [79]	HbA1c	4.8% studies (+)	
Culturally appropriate health education	Eight/ 20,622 patients (Ricci-Cabello et al., 2014	Creamer et al., 2016 [42]	HbA1c		
			HRQoL		
			AEs	No AEs	
		Ricci-Cabello et al., 2014 [73]	HbA1c		
			Diabetes knowledge	73.3% studies (+)	
			Behaviours	75% studies (+)	
			Clinical outcomes	Fasting blood glucose, HbA1c and BP improved in 71%, 59%, and 57% of the studies.	
		Attridge et al., 2014 [33]	HbA1c		
			Knowledge scores		
			Clinical outcomes		
			Other outcome measures	Showed neutral effects.	
			HbA1c levels	Three of ten studies (+)	

	and Gucciardi et al., 2013 did not given the total sample size)	Gucciardi et al., 2013 [52]	Anthropometrics	Three of eleven studies (+)	Some evidence
			Physical activity	One of five studies (+)	
			Diet outcomes	Two of six studies (+)	
		Nam et al., 2012 [62]	HbA1c level		
		Hawthorne et al., 2010 [54]	HbA1c		
			Knowledge scores		
		Khunti et al., 2008 [58]	Knowledge levels	Only one study reporting a significant improvement	
			Biomedical outcomes	Only one study reporting a significant improvement.	
		Hawthorne et al., 2008 [53]	HbA1c		
			Knowledge scores		
			Other outcome measures		
Lifestyle interventions + behavioural program	Six/10,440 patients (Huang et al., 2016; Pillay et al., 2015 and Ramadas et al., 2011 did not given the total sample size)	Huang et al., 2016 [55]	HbA1c		Some evidence
			BMI		
			LDL-c and HDL-c		
		Chen et al., 2015 [39]	HbA1c		
			BMI		
			SBP		
			DBP		
			HDL-c		
		Terranova et al., 2015 [72]	HbA1c level		
			Weight		
		Pillay et al., 2015 [71]	HbA1c levels		
			BMI		
		Ramadas et al., 2011 [77]	HbA1c	46.2% studies (+)	
		Gary et al., 2003 [49]	Fast blood sugar		
			Glychemoglobin		
			HbA1		

			HbA1c		
			Weight		
Self-management educational interventions	Nine/19,597 patients (Minet et al., 2010;Fan et al., 2009 and Norris et al., 2001 did not given the total sample size)	Pal et al., 2014 [67]	Cardiovascular Risk Factors		Sufficient evidence
			Cognitive Outcomes		
			Behavioural Outcomes	Only one study reporting a significant improvement.	
			AEs	No AEs	
		Vugt et al., 2013 [75]	Health behaviours	Seven of 13 studies (+)	
			Clinical outcomes measures	Nine studies (+)	
			Psychological outcomes	Nine studies (+)	
		Pal et al., 2013 [68]	HbA1c		
			Depression		
			Quality of life		
			Weight		
		Steinsbekk, et al., 2012 [76]	HbA1c		
			Main lifestyle outcomes		
			Main psychosocial outcomes		
		Minet et al., 2010 [61]	Glycaemic control		
		Fan et al., 2009 [47]	Diabetes knowledge		
			Overall self-management behaviours		
			Overall metabolic outcomes		
			Overall weighted mean effect sizes		
		Deakin et al., 2005 [43]	Metabolic control (HbA1c)		
			Fasting blood glucose levels		
			Weight		
			Diabetes knowledge		
			SBP		
			Diabetes medication		

		Norris et al.,, 2002 [65]	Total GHb		
		Norris et al., 2001 [64]	Knowledge		
			Self-monitoring of blood glucose		
			Self-reported dietary habits		
			Glycemic control		
Therapeutic education	One/Total sample: Unclear.	Odnoletkova et al., 2014 [66]	Cost-effectiveness	Overall high in studies on prediabetes and varied in studies on T2DM.	Insufficient evidence
Foot health education	One/ Total sample: Unclear.	Amaeshi, 2012 [32]	Diabetes complications		Some evidence
			Incidence of LEA		
Group medical visit	One/2,240 patients.	Burke et al., 2011 [38]	HbA1c		Some evidence
			BP and DBP		
			SBP		
			Cholesterol - LDL		
Psychoeducational intervention.	One/1.431 patients.	Alam et al., 2009 [30]	HbA1c		Some evidence
			Psychological status		
Interventions aimed at improving adherence to medical treatment recommendations	Three/ 4,907 patients (Kai Lun Gan et al., 2011 did not given the total sample size)	Kai Lun Gan et al., 2011 [57]	Oral hypoglycaemic adherence	Five of seven studies (+)	Some evidence
		Wens et al., 2008 [78]	Adherence	General conclusions could not be drawn.	
		Vermeire et al., 2005 [80]	HbA1c		
Dietary advice	One/1,467 patients	Nield et al., 2007 [63]	Glycaemic control (addition of exercise to dietary advice)		Insufficient evidence to determine
			Weight	Limited Data	
			Diabetic micro- and macrovascular diseases	Limited Data	

Note: RCTs =Randomized controlled trials; HRQoL = Health Related Quality of Life; MI = Myocardial Infarction; CABG= Coronary Artery Bypass Graft Surgery; T2DM = Type 2 Diabetes Mellitus; BMI = Body Mass Index; HbA1c = Glycatedhemoglobin; BP = Blood Pressure; SBP = Systolic Blood Pressure, DBP = Diastolic Blood Pressure, HDL-c= High-density Lipoprotein Cholesterol; LDL-c = Low-density Lipoprotein Cholesterol; LEA = Lower Extremity Amputation; Adverse Events = AEs.
(+): Intervention Group is Significantly Better than Control Group; For example: "91% studies (+)" means 91% studies reported a significant better compared with control group.
Green indicated the intervention was beneficial (effective), orange indicated that there was no difference in the investigated comparison.

Patients with ACS

Three major types of health education-related interventions were used for patients with ACS: general health education (only included general health information), psychoeducational interventions (educational interventions with a detailed psychological component, e.g., cognitive behaviour therapy, motivational interviewing and brief psychodynamic therapy), and secondary prevention educational interventions (including strategies to promote a healthy lifestyle, manage medications, and reduce cardiovascular complications) as well as internet-based interventions.

General health education

The findings are based on our synthesis of the findings from 6 systematic reviews. [37 48 50 51 59 70] Overall, there were mixed effects of general health education on behavioural change or clinical outcomes in patients with ACS. There was *some evidence* of a positive effect of general health education on knowledge, behaviour, psychosocial indicators, beliefs, and risk factor modification, but no effects for key clinical outcomes, such as cholesterol level, hospitalization, mortality, MI, and revascularization. The results for health-related quality of life, healthcare utilization, and costs were mixed; several reviews reported a significant change, and other reviews reported no significant change for these outcomes. Only one review focused on telephone-based health education. There is *some evidence* that telephone-based health education during cardiac rehabilitation might improve all-cause hospitalization, anxiety, depression, smoking cessation, and systolic BP but there is no evidence for improvements in all-cause mortality and reductions in low-density lipoprotein cholesterol. [59]

Psychoeducational interventions

Strategies for psychoeducational interventions have a specific focus on smoking cessation, and depression. The findings are based on synthesis of results from six publications. [31 35 36 45 56 69] There is *sufficient evidence* that psychoeducational programs are effective at decreasing smoking, achieving smoking abstinence, and reducing depression. One review reported no effect on smoking cessation [31] or total mortality [56].

Secondary prevention educational interventions

The following statements are based on our synthesis of results from three papers. [34 41 44] There is *some evidence* that secondary prevention educational interventions reduce MI readmission rates and improve quality of life, but the intervention was ineffective in reducing revascularization, cholesterol levels, and improving smoking cessation rates. The results are mixed for mortality and re-infarction rates; two reviews [34 41] found positive effects on mortality, while one review [44] did not.

Patients with T2DM

Ten types of health education-related interventions were used for patients with T2DM: culturally appropriate health education (tailored to the religious beliefs, culture, literacy, and linguistics of the geographical area), dietary advice, foot health education, group medical visits (a group education component taught by health professionals), general health education (only included general health information), improving the uptake and maintenance of medication regimes (e.g., promoting the use of oral hypoglycemic medications), lifestyle interventions (specific focus on dietary changes and increased physical activity, or stress management), psychoeducational interventions (educational interventions with a detailed psychological component, e.g., cognitive behaviour therapy, motivational interviewing and brief psychodynamic therapy) and self-management educational interventions (activities that promote or maintain the behaviours to manage T2DM often based on the National Standards for Diabetes Self-Management Education [13]), and therapeutic education (collaborative process needed to modify behaviour and more effectively manage risk factors).

Culturally appropriate health education

Findings are based on our synthesis of results from 8 publications. [33 42 52-54 58 62 72] Overall, there was *some evidence* of the effects of culturally appropriate health education on clinical outcomes for T2DM. There was *sufficien*t evidence that culturally appropriate health education improves HbA1c reduction and knowledge scores. There is *some* evidence that physical activity and clinical outcomes (blood glucose, HbA1c, BP) were improved. There were no data relating

to adverse events during the intervention and follow-up (such as hypoglycemic events and mortality), and there was insufficient evidence about improvements in quality of life.

General health education

The statements are based on our synthesis of results from five papers. [40 46 60 74 79] Overall, there were mixed effects of general health education programs on clinical outcomes for T2DM, including HbA1C, cholesterol level, and triglyceride level. There was *some evidence* of the effectiveness of general health education on the management of glycemia, weight reduction, and some diabetes management outcomes (HbA1C, diabetes complications). There were no data supporting the effectiveness of general health education on reduced health service utilization, diabetes complications, improved knowledge, psychosocial outcomes, or smoking habits.

Lifestyle interventions

The following statements are based on our synthesis of results from 6 reviews. [39 49 55 71 72 77] Overall, there were mixed effects of the lifestyle interventions on cholesterol level, HbA1C level, and body weight. There is *some evidence* that lifestyle interventions or behavioural programs are effective for blood glucose and BP management, but they were ineffective for reductions in HbA1c scores [71 72].

Uptake and maintenance of medication regimes

The statements are based on our synthesis of results from three publications. [57 78 80] There is *some evidence* of the effectiveness of increased uptake and maintenance of medication regimes for taking medications for HbA1C regulation including oral hypoglycemic agents.

Self-management educational interventions

The statements are based on our synthesis of results from 9 reviews. [43 47 61 64 65 67 68 75 76] Overall, there was *sufficient evidence* of the effects of self-management education interventions on HbA1c level, knowledge, lifestyle outcomes, and main psychosocial outcomes. However, there was *insufficient* evidence of the benefits of this education intervention on depression, quality of life, and body weight.

Other health education-related interventions

Other health education-related interventions for patients with T2DM included therapeutic education, foot health education, group medical visits, psychoeducational interventions, and dietary advice. Statements for all of these interventions are based on our synthesis of results from one review.

There is *some evidence* that foot health education is effective in reducing the incidence of lower extremity amputation. [32] There is *some evidence* that group medical visits are effective for improving HbA1c and systolic BP management [38]. There is also *some evidence* that psychoeducational programs are effective for improving HbA1c regulation and psychological status. [30]

Finally, there is *insufficient evidence* that dietary advice improves glycemic and weight management or reduces micro- and macrovascular diseases. [63] There is also *insufficient evidence* for the cost-effectiveness of therapeutic education for patients with T2DM. [66]

Discussion

This umbrella review identified 51 systematic reviews or meta-analyses (15 for ACS and 36 for T2DM) that assessed the outcomes of various aspects (such as the duration, contact hours, educational content, delivery mode) of the delivery of health education-related interventions relevant to high risk patients with ACS and T2DM. Health education has become an integral part of the management for people with ACS and T2DM. The most appropriate focus of the education provided to ACS patients with T2DM remains largely undefined in the literature. For example, it remains unknown if the focus should be primarily on cardiovascular risk factors, blood glucose monitoring, or all educational components for patients with both conditions. [70 76] In addition, should cardiovascular risk factors be the focus during the acute inpatient stay with other educational needs such as the smoking cessation occurring within the primary care or outpatient settings? [31 69 70]

It remains challenging to determine the specific strategy or format that is the most effective delivery mode for patients with ACS or T2DM. There is very limited evidence to guide clinicians

on the duration, contact hours, educational content, delivery mode, total length, and setting of health education programs for cardiac patients. [50] For patients with DM, one study reported that more successful programs were longer than 6 months (longer duration), consisted of greater than 10 contact sessions (high intensity), and were one-on-one sessions with individualized assessment. [82]

Use of theoretical orientation to develop educational intervention

For patients with ACS

Use of theory when designing behavioural change interventions may also influence effectiveness.[75] Health education using a cognitive behavioural strategy is most consistently effective in changing maladaptive illness beliefs, [51] and studies using more than 2 behavioural change strategies reported significant differences between the intervention and control groups. [31] In one review, a significant change in smoking cessation was not observed in subgroup analyses between studies that did or did not report using a theory in intervention planning; [56] however, the authors did not suggest that using a theory in program planning should be disregarded but reported that examining actual theories or mechanisms underlying health education programs is required. [56] Owing to the considerable overlap between different theories and the detailed description of the theoretical approach in only approximately 40% of the included papers, it is difficult to determine the most effective theoretical approach, but many models can be used with success, such as the health belief model (HBM), social cognitive theory (SCT) and transtheoretical model (TTM). [56 67 69 75] Three reviews [31 41 44] noted that some included studies used behavioural strategies such as goal setting. These strategies were found to be beneficial for patients with coronary heart disease.

For patients with T2DM

Although the theoretical approach underpinning the health education program was not always described, 13 of the 36 reviews (36.11%) related to T2DM reported the theoretical approach used in their included studies. The most common theories were SCT (including self-efficacy), empowerment theories (eg., Empowerment Behaviour Change Model, Self-determination and Autonomy Motivation Theory, Middle-range Theory of Community Empowerment) and TTM.

There is evidence that health education interventions based on a theoretical model are likely to be effective. [43] Vugt et al suggested that self-care education programs should be based on theories and that theory-based self-care interventions are more effective than non-theory-based programs. [75 83] Theories could help to specify the key target health behaviours and behavioural change techniques required to generate the desired outcomes. [75] The decision regarding the theory should be based on the aim of the program and factor for intervention. [77] Only one review reported that a theoretical approach underpinning the health education program is not necessary for better outcomes. [76] Fourteen reviews [30 33 40 46 52 57 60 63 64 67 68 73 75 77] reported that goal setting was conducted in the included studies. Goal setting by patients, health professionals or mutually-agreed goals were linked to improved patient outcomes.

Educational content

For patients with ACS

Most reviews reported that the educational content of the interventions was comprehensive. The most common topics, of the average 3.7 topics per education session, were behavioural change, cardiovascular risk factors management, exercise, psychosocial issues, and smoking cessation. An underlying principle of health education for patients with ACS is that knowledge is necessary, but not enough to develop health behaviours and change risk factors. [31 50] Age, cognitive factors, environmental factors, and social and economic background are also important considerations. [50] While interventions using a behavioural program, telephone-based content, or self-care are effective for smoking cessation, there was insufficient evidence to support that any type of educational program was more efficacious than the others. [69] Psychoeducation, which is defined as multimodal, educationally based, self-management interventions,[31] led to enhanced physical activity levels within 6–12 months when added to cardiac rehabilitation (CR) and was more effective than an exercise program or health education alone. [31 56] Moreover, psychoeducational interventions were more effective for patients with ACS than other types of health education. [31 56]

For patients with T2DM

The educational content for patients with T2DM focused more on behavioural change, diet, exercise, glycemic regulation, medication, and self-management. Health education that was self-management was more effective for patients with T2DM. [40 47] In addition, based on the current evidence, the educational content should be culturally sensitive, especially for patients with T2DM; [33 42 54] culturally appropriate diabetes health education may have a greater impact on the management of glycemia and reduce diabetes complications. [77] The educational interventions for patients with T2DM focused primarily on HbA1C, lipid levels, quality of life, and body weight. HBM and SCT were the most common theories used in the included reviews.

Teaching strategies and outcomes

For patients with ACS

Most reviews reported that the education was provided using multiple teaching methods and in multiple settings. Nurses and multidisciplinary teams were the most frequent people providing education, and most education programs were delivered post-discharge. Although face-to-face sessions were the most common delivery format, many education sessions were also delivered by telephone or through individualized counseling. Telephone-based health education appeared to be effective for reducing hospitalizations, systolic BP, smoking rates, depression, and anxiety. [59] The educational interventions for patients with ACS focused primarily on clinical outcomes (hospitalization and mortality), modifiable risk factors (BP, low-density lipoprotein levels, and smoking cessation), and other psychological outcomes (anxiety and depression).

For patients with T2DM

Mixed health education programs generally included group sessions combined with educator-facilitated individual sessions, covering basic knowledge and problem-solving skills. These programs produced greater benefits and larger effect sizes for blood glucose reduction and knowledge levels in patients with T2DM. [47] In contrast, individual education programs have been reported as more effective in achieving outcomes than group-based education. This may be because education programs might be more efficient at addressing personal needs, with

greater participant engagement. [73] However, one systematic review reported that individual and group patient education, demonstrated similar outcomes among T2DM patients. [46]

Although face-to-face sessions were the most common delivery format, many education sessions were also delivered by telephone or individualized counseling. Face-to-face health education programs were most effective for enhancing blood glucose regulation and knowledge levels, while mixed delivery models (face-to-face, phone contact, online or web-based, or video) produced a moderate effect for knowledge levels. [47] Another review reported that face-to-face health education programs generated a greater benefit for metabolic management than those delivered using electronic communication technology. [73]

Nurses (including diabetes nurses educators), community workers, dieticians and multidisciplinary teams were the most frequent educators, and most of the education programs were delivered post-discharge. Some reviews indicated that health education programs delivered by a group of different educators, with some degree of education reinforcement at additional points of contact, may provide the best results. [60 76] However, based on two studies that reported HbA1C at 12 months, it is indicated that the outcomes in studies with only a diabetes nurse as the educator also tended to do better than the outcomes in studies with a multidisciplinary team , while the biggest effect was seen when a dietician was the only educator. [76] Health education programs delivered by one person may focus more on the patient's ability than the educational content or quality of the health education programs. [76] However, no clear conclusion can be drawn whether having one educator delivering the intervention is best due to few information. [60]

Delivery, timing and follow up

For patients with ACS

Most educational sessions were delivered weekly. Few reviews provided information regarding the duration of education interventions; when the duration was reported, it varied from 4 weeks to 48 months. These findings suggest that there is a significant gap in the evidence in relation to the duration, contact hours, educational content, optimal delivery mode, total length, and setting of health education programs for cardiac patients. [50] For patients with ACS,

one systematic review that included 7 studies with a total of 536 participants reported that studies with education lasting at least 6 months resulted in the most significant changes in the primary outcomes (such as behavioural change, smoking cessation) [31] and that at least 12 months of follow-up is needed to evaluate the impact of telephone-based education. [59] Another review reported that the intensity of education programs is important for efficacy regarding smoking cessation: interventions with a very low intensity and brief interventions, do not have a significant effect, [69] and programs for smoking cessation among patients with coronary heart disease should last >1 month. [69] Most of the reviews were provided for patients with ACS in inpatient settings and then within post discharge settings, five reviews [31 36 45 48 59] did not explicitly state the settings in which the health education related interventions were provided.

For patients with T2DM

Education sessions were delivered weekly or monthly. Longer health education programs for T2DM (>6 months) produced larger effects for all primary outcomes (such as HbA1C). [47] Health education lasting >3 months resulted in the largest effect size compared with health education of a shorter duration (<3 months). [33] For HbA1C, the effect size at 6 months seemed to be significantly greater than at 3 and 12 months; in other words, the effect size peaked at 6 months. [62] In general, health education of a greater intensity (longer duration and more sessions) was more effective for blood glucose reduction and knowledge levels among patients with T2DM.[47 74] Compared with health education programs covering only one topic, programs that included multiple or mixed educational topics yielded consistently greater benefits in blood glucose reduction and knowledge levels. [47] In addition, health education programs combined with specific behavioural change strategies (such as self-care strategies) seemed more effective than other programs. [47] Health education related interventions were mainly delivered in hospital settings, primary care settings, diabetes centers or community based settings; although six reviews [32 39 55 58 67 72] did not explicitly state the delivery settings.

Recommendations about health education interventions for patients with ACS and T2DM

These results from included systematic reviews and meta-analyses help to provide recommendations about the content of a health education intervention for patients with ACS and T2DM, requiring further evaluation. Future development of educational programs for patients with ACS and T2DM by health care professionals should consider the needs of people with these diseases. [37 40 42 70] Based on the results and findings from this umbrella review, recommendations are made in Table 5. The acute life-threatening nature of ACS requires that increased emphasis should be placed on cardiovascular risk factors in any combined education program. Both ACS and T2DM have common lifestyle factors such as inactivity and high fat diet requiring modifications.

Table 5 Recommendations of health education programs for ACS and T2DM patients

		ACS patients	T2DM patients	Both ACS and T2DM
Theoretical approach		SCT, empowerment theories.	HBM; SCT.	HBM; SCT and empowerment theories.
Behavioural strategies		Goal setting	Goal setting	Goal setting
Educational content		Behavioural change (such as smoking cessation), cardiovascular risk factors, exercise, medication, and psychosocial issues.	Behavioural change, diet, exercise, glycemic control, medication, and self-management.	Behavioural change (such as smoking cessation), cardiovascular risk factors, diet, exercise, glycemic control, medication, psychosocial issues, and self- management.
Healthcare professionals to deliver		Nurse or multidisciplinary team	Multidisciplinary team; dietitian or nurse	Nurse or multidisciplinary team
Teaching approaches	Strategies	Face-to-face; telephone or mixed	Face to face, written materials; telephone or mixed	Face to face, written materials; telephone contact or mixed
	Format	Individual (One by one) or mixed	Individual (One by one) or mixed	Individual (One by one) or mixed
Delivery timing	Contact hours	More than 30 min per time per week	More than 30 min per time per week	More than 30 min per time per week
	Duration	At least 6 months	About 6 months	At least 6 months

Duration of follow up	At least 12 months	At least 12 months	At least 12 months
Settings	Inpatient and post-discharge settings	Hospital settings and primary care settings	Inpatient and post-discharge settings

NOTE: ACS = acute coronary syndrome; T2DM = type 2 diabetes mellitus; SCT=Social Cognitive Theory; HBM =Health Belief Model.

Overall completeness and applicability of evidence

This overview potentially provides an estimate with the lowest level of bias for the impact of health education-related interventions for patients with ACS or T2DM and could be regarded as an all-inclusive summary of the current evidence base for health education for these patients. While this umbrella review identified evidence for each of the types of health education, there was only a small number of reviews within some categories (such as psychoeducational intervention [30] and dietary advice [63]), and these studies were not very informative. This umbrella review also found no reviews that systematically analyzed varying doses of health education; therefore, could not examine the dose-response effects. There was insufficient information about the evaluated doses (total contact hours and duration of education) to enable comparison of the benefits of differences in the magnitude of the doses across the different research. This umbrella review found no reviews focused on patients with ACS and T2DM; instead, all of the systematic reviews and meta-analyses focused on only one of these diseases.

Quality of the evidence

The methodological quality of the included systematic reviews and meta-analyses varied. All of the included reviews or meta-analyses were of moderate to high methodological quality, as assessed using AMSTAR. However, only 30 (58.8%) systematic reviews or meta-analyses were rated as high quality and only three (5.9%) systematic reviews or meta-analyses [43 53 69] adequately met all 11 AMSTAR criteria. This indicates that some of the reviews included in this umbrella review may have limitations in their design, conduct, and/or reporting that could have influenced the findings when considered both individually and collectively. [32 65]

The quality of the primary studies in the included systematic reviews or meta-analyses also varied. The main sources of bias were inadequate reporting of allocation concealment and randomization processes, as well as lack of outcome blinding. [33 42 69 70] This bias in the methodological quality led to lower quality assessments, which varied by results within each included review. Other reasons for lower methodological quality included heterogeneity in, or inconsistency of, the effect and imprecise findings. Heterogeneity between studies in this umbrella review was described in terms of the intervention, participant characteristics and length of follow-up. Heterogeneity was an important factor indicating the complexity of the health education interventions. [56] The variability in the approaches, tools or scales used to measure outcomes between the included studies are likely to introduce some heterogeneity. [30] The heterogeneity of the educational interventions seen in the reviews included in this umbrella review may reflect the uncertainty about the optimal strategy for providing health education to patients. [37] Michie et al. [84] conducted a study that investigated the content of behaviour change interventions. They identified 93 behaviour change techniques (BCTs). Within the various included systematic reviews or meta-analyses, there was limited opportunity to examine the active content (e.g., BCTs), target behaviours, facilitators or dose where such details were not published. Interventions with similar active content were examined. In addition, 240 studies were included more than once in the included reviews and meta-analyses. However, the overall overlap of studies among reviews and meta-analyses related ACS and T2DM was slight, CCA of 2.6% and 2.1%, respectively. [25]

Internationally, both ACS and T2DM are topics of substantial health concern and a large volume of systematic reviews or meta-analyses have been published. In addition, treatment modalities have changed substantially over the last decade, therefore, only systematic reviews or meta-analyses from 2000 onwards were included in this umbrella review. This umbrella review is the first synthesis of systematic reviews or meta-analyses to take a broad perspective on health education-related interventions for patients with ACS or T2DM. Given that health education is complex, the biggest challenge for systematic reviews or meta-analyses of health education is accounting for the potential clinical heterogeneity in health education-related interventions (content and delivery approaches) and the population of patients who receive health

education. To facilitate comparisons across systematic reviews of health education and the efficient future update of this umbrella review, future reviews or meta-analyses need high-quality research and to standardize their design and reporting, including the reporting of included study characteristics, assessment criteria for risk of bias, outcomes, and methods to synthesize evidence synthesis.

Conclusions

For clinicians providing educational interventions to individuals with ACS and T2DM, the results from this review provide a contemporaneous perspective on current evidence on the effectiveness of health education (its content, and delivery methods) for this high risk patient group. The current evidence compiled by this umbrella review supports current international clinical guidelines, that theoretically-based education interventions lasting 6 months, delivered in multiple modes (face-to-face, phone contact, online or web-based, or video), and with individualized education delivered weekly, are more likely to generate positive outcomes. This review also supports health education- related interventions provided by health professionals, including nurses and multidisciplinary teams, delivering content including specific clinical factors for ACS and T2DM (BP, glycemic level, and medication), modifiable risk factors (unhealthy diet, inactivity, and smoking), and other psychological factors (anxiety and depression). These health education interventions could be delivered post-discharge, such as rehabilitation centers, primary care centers, and the community and should be at least 6 months in duration. The effectiveness of these programs was based on HbA1C levels, knowledge, psychosocial outcomes, readmission rates, and smoking status rather than clear evidence of reduced mortality, MI, or short and long-term complications. In addition, psychoeducational interventions were more effective for patients with ACS, and health education that was culturally appropriate or taught self-management was more effective for patients with T2DM. We also found that longer durations and high-intensity health education provided in an individualized format were more helpful for patients with ACS or T2DM.
The fact that none of the included reviews included patients with both ACS and T2DM indicates a clear need for further rigorous experimental studies with patients with both diseases. Future research that includes these aspects of education are likely determine the effectiveness of

educational interventions focusing on cardiovascular and DM risk factors and complications within patients with ACS and T2DM.

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Author contributions:

Study conception and design: XL-L, MJ, KW, C-JW, YS. Data collection: XL-L, YS. Data analysis: XL-L, YS, MJ, KW, C-JW. Manuscript drafts: XL-L, MJ, C-JW, KW, YS.

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Data sharing statement: No additional data are available.

Appendix 1. Searching Strategies

Items	Searching Strategy	Results
	PubMed	
#1	((((((((((Acute Coronary Syndrome[MeSH Terms]) OR Myocardial Infarction[MeSH Terms]) OR Angina, Unstable[MeSH Terms]) OR Coronary Artery Disease[MeSH Terms]) OR Coronary Artery Bypass[MeSH Terms]) OR Angina Pectoris[MeSH Terms]) OR "Myocardial Infarct*"[Title/Abstract]) OR "Unstable Angina*"[Title/Abstract]) OR "coronary heart diseas*"[Title/Abstract]) OR "Coronary Artery Disease*"[Title/Abstract]) OR "Unstable Angina Pectori*"[Title/Abstract] Filters: Publication date from 2000/01/01 to 2016/04/31; English	145310
#2	(((((Diabetes Mellitus, Type 2[MeSH Terms]) OR "Type 2 Diabetes Mellitus"[Title/Abstract]) OR "type 2 diabete*"[Title/Abstract]) OR "type ii diabet*"[Title/Abstract]) OR T2DM[Title/Abstract]) OR Adult-Onset Diabetes Mellitus[Title/Abstract] Filters: Publication date from 2000/01/01 to 2016/04/31; English	80218
#3	#1 OR #2	222103
#4	(((((((Health Education[MeSH Terms]) OR Patient Education as Topic[MeSH Terms]) OR Counseling[MeSH Terms]) OR Social Support[MeSH Terms]) OR "Community Health Education*"[Title/Abstract]) OR "Educational Activit*"[Title/Abstract]) OR "Education* intervention*"[Title/Abstract]) OR "Education* program*"[Title/Abstract] Filters: Publication date from 2000/01/01 to 2016/04/31; English	122323
#5	(((Meta-Analysis [Publication Type]) OR Meta-Analysis as Topic[MeSH Terms]) OR "Systematic Revie*"[Title/Abstract]) OR "Meta-analys*"[Title/Abstract] Filters: Publication date from 2000/01/01 to 2016/04/31; English	165265
#6	#3 AND #4 AND #5 Filters: Publication date from 2000/01/01 to 2016/04/31; English	**54**
	Cochrane Library	
#1	MeSH descriptor: [Acute Coronary Syndrome] explode all trees	1070
#2	MeSH descriptor: [Myocardial Infarction] explode all trees	9450
#3	MeSH descriptor: [Angina, Unstable] explode all trees	1015
#4	MeSH descriptor: [Coronary Artery Disease] explode all trees	3469
#5	MeSH descriptor: [Coronary Artery Bypass] explode all trees	5321
#6	MeSH descriptor: [Angina Pectoris] explode all trees	4240
#7	"acute coronary syndrome":ti,ab,kw or Unstable Angina*:ti,ab,kw or Myocardial Infarct*:kw or coronary heart diseas*:ti,ab,kw or Coronary Artery Disease*:ti,ab,kw (Word variations have been searched)	29379
#8	#1 or #2 or #3 or #4 or #5 or #6 or #7	34062
#9	MeSH descriptor: [Diabetes Mellitus, Type 2] explode all trees	10474
#10	Type 2 Diabetes Mellitus:ti,ab,kw or type ii diabet*:ti,ab,kw or noninsulin dependent:ti,ab,kw or type 2 diabet*:ti,ab,kw or Adult-Onset Diabetes Mellitus:ti,ab,kw (Word variations have been searched)	20935
#11	#9 or #10	20937
#12	#8 or #11	53777
#13	MeSH descriptor: [Health Education] explode all trees	11291
#14	MeSH descriptor: [Patient Education as Topic] explode all trees	7507
#15	MeSH descriptor: [Counseling] explode all trees	4026
#16	MeSH descriptor: [Rehabilitation Nursing] explode all trees	55

#17	Education*:ti,ab,kw or Community Health Education:ti,ab,kw or Self-Management*:ti,ab,kw or Cardiac Rehabilitation:ti,ab,kw (Word variations have been searched)	40078
#18	#13 or #14 or #15 or #16 or #17	42943
#19	#12 and #18 Publication Year from 2000 to 2016, in Cochrane Reviews (Reviews only) and Other Reviews	120
#20	Cochrane reviews + other reviews	**49 + 71=120**
Joanna Briggs Institute, Embase, MEDLINE		
#1	Acute Coronary Syndrome.m_titl.	16727
#2	Myocardial Infarction.m_titl.	151398
#3	Unstable Angina.m_titl.	6933
#4	Coronary Artery Disease.m_titl.	54621
#5	Coronary Artery Bypass.m_titl.	30449
#6	Angina Pectoris.m_titl.	17997
#7	Coronary Heart Disease.m_titl.	35397
#8	#1 or #2 or #3 or #4 or #5 or #6	305035
#9	Type 2 Diabetes Mellitus.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, tx, sh, ct, sa, tn, dm, mf, dv, kw]	64926
#10	"type 2 diabet*".m_titl.	102596
#11	"type ii diabet*".m_titl.	6139
#12	Adult-Onset Diabetes Mellitus.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, tx, sh, ct, sa, tn, dm, mf, dv, kw]	307
#13	#9 or #10 or #11 or #12	136982
#14	#8 or #13	439243
#15	Health Education.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, tx, sh, ct, sa, tn, dm, mf, dv, kw]	177285
#16	Patient Education.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, tx, sh, ct, sa, tn, dm, mf, dv, kw]	185631
#17	Counseling.m_titl.	23527
#18	Social Support.m_titl.	11535
#19	"Education*".m_titl.	247901
#20	#15 or #16 or #17 or #18 or #19	577203
#21	#14 and #20	6480
#22	Systematic Review.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, tx, sh, ct, sa, tn, dm, mf, dv, kw]	212014
#23	Meta-Analysis.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, tx, sh, ct, sa, tn, dm, mf, dv, kw]	262009
#24	#22 or #23	381113
#25	#21 and #24	288
#26	limit 25 to English and yr="2000 - 2016"	**263**
Cumulative Index to Nursing and Allied Health Literature (CINAHL)		
#1	TI Acute Coronary Syndrome OR AB Acute Coronary Syndrome	4826

#2	TI Myocardial Infarction OR AB Myocardial Infarction	24578
#3	TI Unstable Angina OR AB Unstable Angina	1353
#4	TI Coronary Artery Disease OR AB Coronary Artery Disease	12930
#5	TI Coronary Heart Disease OR AB Coronary Heart Disease	12321
#6	#1 OR #2 OR #3 OR #4 OR #5	46436
#7	TI Type 2 Diabetes Mellitus OR AB Type 2 Diabetes Mellitus	8952
#8	TI type 2 diabet* OR AB type 2 diabet*	33085
#9	TI Adult-Onset Diabetes Mellitus OR AB Adult-Onset Diabetes Mellitus	23
#10	#7 OR #8 OR #9	33097
#11	#6 OR #10	77923
#12	TI Health Education OR AB Health Education	53415
#13	TI Patient Education OR AB Patient Education	37789
#14	TI Counseling OR AB Counseling	17673
#15	TI Social Support OR AB Social Support	30093
#16	TI Education* OR AB Education*	188291
#17	#12 OR #13 OR #14 OR #15 OR #16	227269
#18	#11 AND #17	4707
#19	TI Systematic Review OR AB Systematic Review	48830
#20	TI Meta-Analysis OR AB Meta-Analysis	28776
#21	#19 OR #20	64611
#22	S18 AND S21 Limiters - Published Date: 20000101-20160431; English Language	**129**
	Web of Science	
#1	TS=("Acute Coronary Syndrome*") OR TS=("Myocardial Infarct*") OR TS=("Unstable Angina") OR TS=("Coronary Artery Disease*") OR TS=("Coronary heart disease*") Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan=All years	404699
#2	TS=("Type 2 Diabetes Mellitus") OR TS=("type 2 diabete*") OR TS=("Noninsulin-Dependent Diabete*") OR TS= ("Adult-Onset Diabetes Mellitus") Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan=All years	103548
#3	#2 OR #1 Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan=All years	495081
#4	TS=("Health Education") OR TS=("Patient Education") Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan=All years	29830
#5	#4 AND #3 Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan=All years	1290
#6	TS=("Systematic Review*") OR TS=("Meta-analysis*") Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan=All years	149663
#7	(#6 AND #5) AND LANGUAGE: (English)	**68**

	Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan=2000-2016	
	Journals@Ovid	
#1	Acute Coronary Syndrome.m_titl.	3021
#2	Myocardial Infarction.m_titl.	24269
#3	Unstable Angina.m_titl.	1038
#4	Coronary Artery Disease.m_titl.	10106
#5	Coronary Artery Bypass.m_titl.	6546
#6	Angina Pectoris.m_titl.	1480
#7	Coronary Heart Disease.m_titl.	6487
#8	#1 or #2 or #3 or #4 or #5 or #6	51548
#9	Type 2 Diabetes Mellitus. m_titl.	5097
#10	"type 2 diabet*".m_titl.	26434
#11	"type ii diabet*".m_titl.	980
#12	Adult-Onset Diabetes Mellitus. m_titl.	391
#13	#9 or #10 or #11 or #12	27795
#14	#8 or #13	78792
#15	Health Education. m_titl.	1135
#16	Patient Education. m_titl.	1556
#17	Counseling.m_titl.	5532
#18	Social Support.m_titl.	2667
#19	"Education*".m_titl.	50950
#20	#15 or #16 or #17 or #18 or #19	58969
#21	#14 and #20	510
#22	Systematic Review.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, tx, sh, ct, sa, tn, dm, mf, dv, kw]	117790
#23	Meta-Analysis.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, tx, sh, ct, sa, tn, dm, mf, dv, kw]	215069
#24	#22 or #23	282984
#25	#21 and #24	61
#26	limit 26 to yr="2000 - 2016"	**58**

References

[1]. Scarborough P, Wickramasinghe K, Bhatnagar P, et al. Trends in coronary heart disease, 1961-2011. *British Heart Foundation*, London (2011).

[2]. Finegold JA, Asaria P, Francis DP. Mortality from ischaemic heart disease by country, region, and age: statistics from World Health Organisation and United Nations. Int J Cardiol 2013;168(2):934-45.

[3]. Amsterdam EA, Wenger NK, Brindis RG, et al. 2014 AHA/ACC guideline for the management of patients with non–ST-elevation acute coronary syndromes: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. J Am Coll Cardiol 2014; 64(24):e139-e228.

[4]. Kahn M, Wheatcroft S. Acute coronary syndromes in diabetes. In: Fisher M (ed.). Heart Disease and Diabetes. Oxford University Press, Oxford, 2008.

[5]. Hasin T, Hochadel M, Gitt AK, et al. Comparison of treatment and outcome of acute coronary syndrome in patients with versus patients without diabetes mellitus. Am J Cardiol 2009;103 (6):772-78.

[6]. Franklin K, Goldberg RJ, Spencer F, et al. Implications of diabetes in patients with acute coronary syndromes: the Global Registry of Acute Coronary Events. Arch Intern Med 2004;164(13):1457-63.

[7]. Ting HH, Chen AY, Roe MT, et al. Delay From Symptom Onset to Hospital Presentation for Patients With Non–ST-Segment Elevation Myocardial Infarction. Arch Intern Med 2010;170(20):1834-41.

[8]. Saely CH, Aczel S, Koch L, et al. Diabetes as a coronary artery disease risk equivalent: before a change of paradigm? Eur J Cardiovasc Prev Rehabil 2010; 17(1):94-99.

[9]. Donahoe SM, Stewart GC, McCabe CH, et al. Diabetes and mortality following acute coronary syndromes. JAMA 2007; 298(7):765-75.

[10]. Lakerveld J, Bot SD, Chinapaw MJ, et al. Motivational interviewing and problem solving treatment to reduce type 2 diabetes and cardiovascular disease risk in real life: a randomized controlled trial. Int J Behav Nutr Phys Act 2013; 10(1):1.

[11]. Glanz K, Rimer BK, Viswanath K. Health behavior and health education: theory, research, and practice: John Wiley & Sons 2008.

[12]. Powers MA, Bardsley J, Cypress M, et al. Diabetes self-management education and support in type 2 diabetes: a joint position statement of the American Diabetes Association, the American Association of Diabetes Educators, and the Academy of Nutrition and Dietetics. Diabetes Educ 2017; 43(1):40-53.

[13]. Haas L, Maryniuk M, Beck J, et al. National standards for diabetes self-management education and support. Diabetes Educ 2012; 38(5):619-29.

[14]. Fisher EB, Boothroyd RI, Coufal MM, et al. Peer support for self-management of diabetes improved outcomes in international settings. Health Aff 2012;31(1):130-39.

[15]. Tang PC, Overhage JM, Chan AS, et al. Online disease management of diabetes: engaging and motivating patients online with enhanced resources-diabetes (EMPOWER-D), a randomized controlled trial. J Am Med Inform Assoc 2013;20(3):526-34.

[16]. Association AD. Standards of medical care in diabetes—2014. Diabetes Care 2014;37 (Supplement 1):S14-S80.

[17]. Chang AM, McDowell J. Perspectives of patients with type 2 diabetes following a critical cardiac event–an interpretative approach. J Clin Nurs 2008;17(5a):16-24.

[18]. Becker LA OA. Chapter 22: overviews of reviews.In: Higgins JPT, Green S (editors). Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0 [updated March 2011]. The Cochrane Collaboration 2011

[19]. Chew DP, Scott IA, Cullen L, et al. National Heart Foundation of Australia and Cardiac Society of Australia and New Zealand: Australian clinical guidelines for the management of acute coronary syndromes 2016. Heart Lung Circ 2016;25(9):895-951.

[20]. Alberti KGMM, Zimmet Pf. Definition, diagnosis and classification of diabetes mellitus and its complications. Part 1: diagnosis and classification of diabetes mellitus. Provisional report of a WHO consultation. Diabet Med 1998;15(7):539-53.

[21]. Thomson Reuters. EndNote version X7 2016 [Available from: http://endnote.com/product-details/x7.]

[22]. Shea BJ, Grimshaw JM, Wells GA, et al. Development of AMSTAR: a measurement tool to assess the methodological quality of systematic reviews. BMC Med Res Methodol 2007;7(1):1.

[23]. Sharif MO, Janjua-Sharif F, Ali H, et al. Systematic reviews explained: AMSTAR-how to tell the good from the bad and the ugly. Oral Health Dent Manag 2013;12(1):9-16.

[24]. Aromataris E, Fernandez R, Godfrey CM, et al. Summarizing systematic reviews: methodological development, conduct and reporting of an umbrella review approach. Int J Evid Based Healthc 2015; 13(3):132-40.

[25]. Pieper D, Antoine S-L, Mathes T, et al. Systematic review finds overlapping reviews were not mentioned in every other overview. J Clin Epidemiol 2014; 67(4):368-75.

[26]. Ryan RE, Weir M, Leslie B, et al. Evidence on Optimal Prescribing and Medicines Use for Decision Makers: Scope and Application of the Rx for Change Database. J Pharm Pract 2011; 41(4):295-99.

[27]. Sapkota S, Brien JAE, Greenfield JR, et al. A systematic review of interventions addressing adherence to anti-diabetic medications in patients with type 2 diabetes. PLoS ONE 2015; 10 (6): e0128581.

[28]. Walker RJ, Smalls BL, Bonilha HS, et al. Behavioral interventions to improve glycemic control in African Americans with type 2 diabetes: a systematic review. Ethn Dis 2013; 23(4):401-08.

[29]. Heinrich E, Schaper NC, de Vries NK. Self-management interventions for type 2 diabetes: a systematic review. Eur Diabetes Nursing 2010; 7(2):71-76.

[30]. Alam R, Sturt J, Lall R, et al. An updated meta-analysis to assess the effectiveness of psychological interventions delivered by psychological specialists and generalist clinicians on glycaemic control and on psychological status. Patient Educ Couns 2009;75(1):25-36.

[31]. Aldcroft SA, Taylor NF, Blackstock FC, et al. Psychoeducational rehabilitation for health behavior change in coronary artery disease: A systematic review of controlled trials. J Cardiopulm Rehabil Prev 2011; 31(5):273-81.

[32]. Amaeshi IJ. Exploring the impact of structured foot health education on the rate of lower extremity amputation in adults with type 2 diabetes. A systematic review. Podiatry Now 2012;15(6):20-27.

[33]. Attridge M, Creamer J, Ramsden M, et al. Culturally appropriate health education for people in ethnic minority groups with type 2 diabetes mellitus. Cochrane Database Syst Rev 2014; 9:CD006424.

[34]. Auer R, Gaume J, Rodondi N, et al. Efficacy of in-hospital multidimensional interventions of secondary prevention after acute coronary syndrome a systematic review and meta-analysis. Circulation 2008;117(24):3109-17.

[35]. Barth J, Critchley J, Bengel J. Efficacy of psychosocial interventions for smoking cessation in patients with coronary heart disease: A systematic review and meta-analysis. Ann Behav Med 2006;32(1):10-20.

[36]. Barth J, Critchley JA, Bengel J. Psychosocial interventions for smoking cessation in patients with coronary heart disease. Cochrane Libr 2008

[37]. Brown JP, Clark AM, Dalal H, et al. Effect of patient education in the management of coronary heart disease: A systematic review and meta-analysis of randomized controlled trials. Eur J Prev Cardiol 2013;20(4):701-14.

[38]. Burke E, Robert, Ferrara A, et al. The effectiveness of group medical visits on diabetes mellitus type 2 (dm2) specific outcomes in adults: a systematic review, JBI Libr Syst Rev. 2011;9(23):833-885.

[39]. Chen L, Pei JH, Kuang J, et al. Effect of lifestyle intervention in patients with type 2 diabetes: A meta-analysis. Metab. Clin. Exp. 2015;64(2):338-47.

[40]. Choi TST, Davidson ZE, Walker KZ, et al. Diabetes education for Chinese adults with type 2 diabetes: A systematic review and meta-analysis of the effect on glycemic control. Diabetes Res Clin Pract 2016;116:218-29.

[41]. Clark AM, Hartling L, Vandermeer B, et al. Meta-analysis: secondary prevention programs for patients with coronary artery disease. Ann Intern Med 2005;143(9):659-72.

[42]. Creamer J, Attridge M, Ramsden M, et al. Culturally appropriate health education for Type 2 diabetes in ethnic minority groups: An updated Cochrane Review of randomized controlled trials. Diabet Med 2016;33(2):169-83.

[43]. Deakin T, McShane CE, Cade JE, et al. Group based training for self-management strategies in people with type 2 diabetes mellitus. Cochrane Database Syst Rev 2005; (2):CD003417.

[44]. Devi R, Singh Sally J, Powell J, et al. Internet-based interventions for the secondary prevention of coronary heart disease. Cochrane Database Syst Rev 2015, 22;(12): CD009386.

[45]. Dickens C, Cherrington A, Adeyemi I, et al. Characteristics of psychological interventions that improve depression in people with coronary heart disease: A systematic review and meta-regression. Psychosom Med 2013;75(2):211-21.

[46]. Duke SA, Colagiuri S, Colagiuri R. Individual patient education for people with type 2 diabetes mellitus. Cochrane Database Syst Rev, 2009;(1):CD005268.

[47]. Fan L, Sidani S. Effectiveness of diabetes self-management education intervention elements: a meta-analysis. Can J Diabetes 2009;33(1):18-26.

[48]. Fernandez R, Griffiths R, Everett B, et al. Effectiveness of brief structured interventions on risk factor modification for patients with coronary heart disease: a systematic review, Int J Evid Based Healthc 2007;5(4):370-405.

[49]. Gary TL, Genkinger JM, Guallar E, et al. Meta-analysis of randomized educational and behavioral interventions in type 2 diabetes. Diabetes Educ 2003;29(3):488-501.

[50]. Ghisi GLD, Abdallah F, Grace SL, et al. A systematic review of patient education in cardiac patients: Do they increase knowledge and promote health behavior change? Patient Educ Couns 2014;95(2):160-74.

[51]. Goulding L, Furze G, Birks Y. Randomized controlled trials of interventions to change maladaptive illness beliefs in people with coronary heart disease: systematic review. J Adv Nurs 2010;66(5):946-61.

[52]. Gucciardi E, Chan VWS, Manuel L, et al. A systematic literature review of diabetes self-management education features to improve diabetes education in women of Black African/Caribbean and Hispanic/Latin American ethnicity. Patient Educ Couns 2013; 92(2):235-45.

[53]. Hawthorne K, Robles Y, Cannings-John R, et al. Culturally appropriate health education for type 2 diabetes mellitus in ethnic minority groups. Cochrane Database Syst Rev 2008;(3):CD006424.

[54]. Hawthorne K, Robles Y, Cannings-John R, et al. Culturally appropriate health education for type 2 diabetes in ethnic minority groups: a systematic and narrative review of randomized controlled trials. Diabet Med 2010;27(6):613-23

[55]. Huang XL, Pan JH, Chen D, et al. Efficacy of lifestyle interventions in patients with type 2 diabetes: A systematic review and meta-analysis. Eur J Intern Med 2016;27:37-47.

[56]. Huttunen-Lenz M, Song F, Poland F. Are psychoeducational smoking cessation interventions for coronary heart disease patients effective? Meta-analysis of interventions. Br J Health Psychol 2010;15(Pt 4):749-77.

[57]. Kai Lun Gan J, Brammer JD, Creedy DK. Effectiveness of educational interventions to promote oral hypoglycaemic adherence in adults with Type 2 diabetes: a systematic review. JBI Libr Syst Rev 2011;9(9):269-312.

[58]. Khunti K, Camosso-Stefinovic J, Carey M, et al. Educational interventions for migrant South Asians with type 2 diabetes: a systematic review. Diabet Med 2008;25(8):985-92.

[59]. Kotb A, Hsieh S, Wells GA. The effect of telephone support interventions on coronary artery disease (CAD) patient outcomes during cardiac rehabilitation: a systematic review and meta-analysis. PLoS One 2014;9(5):e96581.

[60]. Loveman E, Frampton GK, Clegg AJ. The clinical effectiveness of diabetes education models for type 2 diabetes: a systematic review. Health Technol Assess 2008;12(9):1-116,

[61]. Minet L, Moller S, Vach W, et al. Mediating the effect of self-care management intervention in type 2 diabetes: a meta-analysis of 47 randomised controlled trials. Patient Educ Couns 2010; 80(1):29-41.

[62]. Nam S, Janson SL, Stotts NA, et al. Effect of culturally tailored diabetes education in ethnic minorities with type 2 diabetes: a meta-analysis. J Cardiovasc Nurs 2012;27(6): 505-18.

[63]. Nield L, Moore H, Hooper L, et al. Dietary advice for treatment of type 2 diabetes mellitus in adults. Cochrane Database Syst Rev 2007;(3):CD004097.

[64]. Norris SL, Engelgau MM, Narayan KM. Effectiveness of self management training in type 2 diabetes: a systematic review of randomized controlled trials. Diabetes Care 24(3):561-87.

[65]. Norris SL, Lau J, Smith SJ, et al. Self-management education for adults with type 2 diabetes: a meta-analysis of the effect on glycemic control. Diabetes Care 2002;25(7): 1159-71.

[66]. Odnoletkova I, Goderis G, Pil L, et al. Cost-effectiveness of therapeutic education to prevent the development and progression of type 2 diabetes: Systematic review. J Diabetes Metab 2014;5: 438

[67]. Pal K, Eastwood SV, Michie S, et al. Computer-based interventions to improve self-management in adults with type 2 diabetes: a systematic review and meta-analysis. Diabetes Care 2014;37(6):1759-66

[68]. Pal K, Eastwood SV, Michie S, et al. Computer-based diabetes self-management interventions for adults with type 2 diabetes mellitus. Cochrane Database Syst Rev 2013; (3):CD008776

[69]. Barth J, Jacob T, Daha I, et al. Psychosocial interventions for smoking cessation in patients with coronary heart disease. Cochrane Database Syst Rev 2015;(7):CD006886.

[70]. Brown JP, Clark AM, Dalal H, et al. Patient education in the management of coronary heart disease. Cochrane Database Syst Rev 2011;(12):CD008895

[71]. Pillay J, Armstrong MJ, Butalia S, et al. Behavioral Programs for Type 2 Diabetes Mellitus: A Systematic Review and Network Meta-analysis. Ann Intern Med 2015; 163(11):848-60.

[72]. Terranova CO, Brakenridge CL, Lawler SP, et al. Effectiveness of lifestyle-based weight loss interventions for adults with type 2 diabetes: a systematic review and meta-analysis. Diabetes Obes Metab2015;17(4):371-8.

[73]. Ricci-Cabello I, Ruiz-Pérez I, Rojas-García A, et al. Characteristics and effectiveness of diabetes self-management educational programs targeted to racial/ethnic minority groups: a systematic review, meta-analysis and meta-regression. BMC Endocr Disord 2014;14(1): 60.

[74]. Saffari M, Ghanizadeh G, Koenig HG. Health education via mobile text messaging for glycemic control in adults with type 2 diabetes: a systematic review and meta-analysis. Prim Care Diabetes 2014;8(4):275-85.

[75]. Vugt M, Wit M, Cleijne WH, et al. Use of behavioral change techniques in web-based self-management programs for type 2 diabetes patients: systematic review. J Med Internet Res 2013; 15(12):e279.

[76]. Steinsbekk A, Rygg LO, Lisulo M, et al. Group based diabetes self-management education compared to routine treatment for people with type 2 diabetes mellitus. A systematic review with meta-analysis. BMC Health Serv Res 2012;12:213.

[77]. Ramadas A, Quek KF, Chan CK, et al. Web-based interventions for the management of type 2 diabetes mellitus: a systematic review of recent evidence. Int J Med Inform 2011; 80(6):389-405.

[78]. Wens J, Vermeire E, Hearnshaw H, et al. Educational interventions aiming at improving adherence to treatment recommendations in type 2 diabetes: A sub-analysis of a systematic review of randomised controlled trials. Diabetes Res Clin Pract 2008;79 (3):377-88.

[79]. Zabaleta AM, Forbes A. Structured group-based education for type 2 diabetes in primary care. Br J Community Nurs 2007;12(4):158-62.

[80]. Vermeire E, Wens J, Van Royen P, et al. Interventions for improving adherence to treatment recommendations in people with type 2 diabetes mellitus. Cochrane Database Syst Rev 2005;(2):CD003638.

[81]. Albrecht L, Archibald M, Arseneau D, et al. Development of a checklist to assess the quality of reporting of knowledge translation interventions using the Workgroup for Intervention Development and Evaluation Research (WIDER) recommendations. Implement Sci 2013;8:52.

[82]. Glazier RH, Bajcar J, Kennie NR, et al. A systematic review of interventions to improve diabetes care in socially disadvantaged populations. Diabetes Care 2006; 29(7):1675-88.

[83]. Powers MA, Bardsley J, Cypress M, et al. Diabetes Self-management Education and Support in Type 2 Diabetes: A Joint Position Statement of the American Diabetes Association, the American Association of Diabetes Educators, and the Academy of Nutrition and Dietetics. Diabetes Care 2015;38(7):1372-82

[84]. Michie S, Richardson M, Johnston M, Abraham C, Francis J, Hardeman W, Eccles MP, Cane J, Wood CE. The behavior change technique taxonomy (v1) of 93 hierarchically clustered techniques: building an international consensus for the reporting of behavior change interventions. Annals of Behavioral Medicine 2013;46(1):81-95.

2.3 Update of umbrella review

The last literature search of databases to identify relevant systematic reviews and meta-analyses was conducted in May 2016 in the umbrella review. Therefore, a further search of the literature was undertaken in March 2018 for the time period from June 2016 to March 2018, in order to identify recent relevant systematic reviews and meta-analyses. A search of eight database — CINAHL, Cochrane Library, Joanna Briggs Institute, Journals@Ovid, EMBase, Medline, PubMed, and Web of Science — based on the original search strategies was conducted. This database search yielded 134 publications, with removal of 49 duplicates and 45 articles that did not meet the inclusion criteria after review the title and abstract. Twenty-eight articles were excluded after checking the full text, because of an incorrect population (n=14); incorrect intervention (n=9); incorrect study type (n=5). No study was removed due to low scores $\leqslant$3 on the AMSTAR scale.

Twelve publications were eligible, one systematic review (Tanash et al., 2017) was related to ACS and T2DM, one systematic review (Anderson et al., 2017) was related to ACS and ten publications (Ballotari et al., 2017; Chrvala, Sherr, & Lipman, 2016; Doshmangir, Jahangiry, Farhangi, Doshmangir, & Faraji, 2018; He et al., 2017; Moller, Andersen, & Snorgaard, 2017; Odgers-Jewell et al., 2017; Sharoni, Minhat, Mohd Zulkefli, & Baharom, 2016; Sherifali, Viscardi, Bai, W., & Ali, 2016; Yang & Fang, 2016; Zhao, Suhonen, Koskinen, & Leino-Kilpi, 2017) were related to T2DM. The methodological quality of the included publications is presented in Table 2. The characteristics of the recipients, setting, delivery methods, intensity, duration, and educational content of health educational interventions are summarized in Tables 3.

A systematic review examining the effectiveness of self-management programs for people living with both ACS and T2DM was presented with a limited number of 4 trials included and was unable to draw conclusions (Tanash et al., 2017). Three of identified studies from this systematic review (Wu, Chang, Courtney, & Kostner, 2012; Wu, Chang, Courtney, & Ramis, 2012; Chang, & McDowell, 2009) were conducted in Australia and one study (Soja et al., 2007) was conducted in Denmark. The cardiac-diabetes self-management program (CDSMP) employed in 3 of the 4 included studies developed according to the self-efficacy theory

originating from social cognitive theory (SCT) (Tanash et al., 2017). The CDSMP consisted of three face to face educational sessions (total 90 min) with a booklet during the inpatient stay and adopted telephone calls and text messages or home visit during the follow up period (Wu., 2007). This program included a digital video disc (DVD) presented in the inpatient period (Wu et al., 2012). The fourth study used multimedia and telephone approaches, as well as behavioural strategies such as goal setting in diabetes management for T2DM patients after an ACS event (Soja et al., 2007). These programs were feasible for delivery during the inpatient stay and post-discharge. The programs were led by the investigator registered nurses (Wu et al., 2012; Wu et al., 2009), trained peers (Wu et al., 2012) or a range of professionals including nurses, physicians, podiatrist and ophthalmologist (Soja et al., 2007). All programs adopted at least two types of formats and were delivered in one-to-one sessions within the healthcare setting (Tanash et al., 2017).

An updated Cochrane systematic review included a total of 22 trials involving 76,864 participants to assess the effects of patient education on healthcare costs, quality of life mortality and morbidity in coronary heart disease (CHD) patients (Anderson et al., 2017). Patient educational interventions were delivered by a wide variety of personnel, with nine interventions delivered by nurses; four by trained educators; three by physicians, and one each by a care coordinator, case manager, and a researcher (Anderson et al., 2017). The intensity of patient education was from one face to face session (40 minutes) with a follow up call (15 minutes) to four-week residential stay with 11 months follow-up (Anderson et al., 2017). No difference in effect of patient education on non-fatal or fatal myocardial infarction (MI), total revascularizations between intervention group and control group was found but there was some evidence to support that patient education may improve quality of life among patients with CHD (Anderson et al., 2017). Some evidence was found that patient education may be cost-saving when compared to usual care (Anderson et al., 2017).

Five types of health education-related interventions were used for patients with T2DM (including 10 publications): self-management educational interventions (n=5); theory based educational interventions (based on a theory or model, or had a theory or model as the

background or was congruent with theories, n=2); lifestyle interventions (n=1); conversation map (used dialogue cards, data, images, questions and information to provide diabetes education, n=1) and nutrition therapy (including nutrition assessment, nutrition education and counseling, and monitoring and evaluation, n=1). The statements of evidence were based on a rating scheme to rate the evidence across the included publications (Ryan et al., 2014).

For self-management educational interventions, findings are based on our synthesis of results from five publications (Chrvala et al., 2016; He et al., 2017; Odgers-Jewell et al., 2017; Sharoni et al., 2016; Sherifali et al., 2016). There was *sufficient evidence* that self-management educational intervention improves HbA1c levels and mortality risk reduction. There is *some evidence* that knowledge and foot care scores were improved. Chrvala et al. (2016) reported that the duration of diabetes self-management education was one to 36 months and contact time ranged from 1 to 460 hours. The delivery formats were: individual (41.5%, 49/118 of the included studies), group based (29.7%, 35/118 of the included studies) and combination of individual and group based self-management education (17.8 %, 21/118 of the included studies) (Chrvala et al., 2016).

For theory based educational interventions, the statements are based on our synthesis of results from two papers (Doshmangir et al., 2018; Zhao et al., 2017). There was *sufficient evidence* that theory based educational interventions improve HbA1c reduction. There is *some evidence* of the effectiveness of theory based health education on self-efficacy level, self-care activities, diabetes knowledge and quality of life. The most common theories or models were Social Cognitive Theory (SCT), including the self-efficacy concept originating from SCT; empowerment theories; health belief model (HBM), or based on multiple theories (Doshmangir et al., 2018; Zhao et al., 2017). This was consistent with the umbrella review reported in this thesis. Multiple educational forms were used in most included studies to strengthen the theory components (Zhao et al., 2017).

Other health education-related interventions for patients with T2DM included lifestyle interventions (Ballotari et al., 2017), conversation map (Yang & Fang, 2016) and nutrition therapy (Moller et al., 2017). Statements for all of these interventions are based on our

synthesis of results from one review. There is *some evidence* that lifestyle interventions improve blood pressure (BP) regulation and knowledge among south Asians with T2DM living in developed countries (Ballotari et al., 2017). There is *some evidence* that diabetes conversation map is effective for improving HbA1c levels and blood glucose management among patients with T2DM (Yang & Fang, 2016). There is also *some evidence* that nutrition therapy is effective for improving body mass index (BMI), HbA1c and low-density lipoprotein (LDL) regulation among patients with T2DM (Moller et al., 2017).

Table 2. Methodological Quality of Updated Systematic Reviews and Meta-analyses (2016-2018)

	Systematic Review/ Meta-analysis	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9	Item 10	Item 11	Total score
Systematic review involved patients with ACS and T2DM													
1	Tanash et al., 2017	CA	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	9
Systematic review involved ACS patients													
2	Anderson et al., 2017	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	11
Systematic reviews or meta-analysis involved T2DM patients													
3	Doshmangir, Jahangiry, Farhangi, Doshmangir, & Faraji, 2018	Yes	Yes	CA	CA	No	Yes	Yes	Yes	Yes	No	Yes	7
4	Ballotari et al., 2017	CA	CA	Yes	Yes	No	Yes	Yes	Yes	NA	CA	Yes	6
5	He et al., 2017	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	10
6	Moller, Andersen, & Snorgaard, 2017	CA	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No	No	7
7	Odgers-Jewell et al., 2017	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	9
8	Zhao, Suhonen, Koskinen, & Leino-Kilpi, 2017	CA	Yes	Yes	CA	No	Yes	Yes	Yes	Yes	Yes	Yes	8
9	Chrvala, Sherr, & Lipman, 2016	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No	No	8
10	Sharoni, Minhat, Mohd Zulkefli, & Baharom, 2016	CA	Yes	Yes	CA	No	Yes	Yes	Yes	Yes	No	Yes	7
11	Sherifali, Viscardi, Bai, W., & Ali, 2016	CA	Yes	Yes	CA	No	Yes	CA	Yes	Yes	No	Yes	6
12	Yang & Fang, 2016	CA	Yes	Yes	CA	No	Yes	Yes	Yes	Yes	Yes	No	7

Item 1:"Was an 'a priori' design provided?"; **Item 2**: "Was there duplicate study selection and data extraction?"; **Item 3**: "Was a comprehensive literature search performed?"; **Item 4**: "Was the status of publication (ie. grey literature) used as an inclusion criterion?"; **Item 5**: "Was a list of studies (included and excluded) provided?"; **Item 6**: "Were the characteristics of the included studies provided?"; **Item 7**: "Was the scientific quality of the included studies assessed and documented?"; **Item 8**: "Was the scientific quality of the included studies used appropriately in formulating conclusions?"; **Item 9**: "Were the methods used to combine the findings of studies appropriate?"; **Item 10**: "Was the likelihood of publication bias assessed?"; **Item 11**: "Was the conflict of interest stated?"

CA= Cannot Answer.

Table 3. Characteristics of Updated Systematic Reviews and Meta-analyses (2016-2018)

(First author, Year); Journal	**Primary objectives** (To assess effect of interventions on….)	**Studies details**	**Intervention**					**Outcomes** (Primary outcomes were bold.) "–" : No change " ↑ " : Increase " ↓ " : decrease	**Synthesis methods**
			Educational Content		**Provider**	**Number of session(s), delivery mode, time, setting**			
Systematic review involved patients with ACS and T2DM									
Tanash et al., 2017; Journal of Clinical Nursing	Self-management behaviour and psychological outcomes for patients with ACS and T2DM	**Number of studies**: 4 completed trials; **Types of studies:** RCTs; **Total sample:** 146 participants.	Self - management interventions	√ BEHA (-) √ CVR (-) √ DIET (-) √ EXERCISE (-) √ MED (-) √ PSY (-) √ SMOKING (-) √ SELF (+++)	Nurse researcher; trained peers; multi-professional team including nurses, physicians, podiatrist and ophthalmologist.	**Number of session:** Weekly or unclear; **Total contact hours:** 90 mins with telephone call and text messages follow up or interactive teaching sessions of 2·5 hours. **Duration:** 4 weeks or 12 months.	**Strategies:** In person sessions, then followed with telephone calls or text messages. Used a multimedia DVD and interactive teaching sessions. **Format:** One-on-one educational sessions; telephone calls or text messages; **Theoretical approach:** Self - efficacy theory.	Inpatient settings, post discharge, other	**↑ Psychological outcomes;** **– Behavioural outcomes;** ↑ Clinical outcomes; Other outcomes: provide feedback and comments.	A descriptive data synthesis.
Systematic review involved ACS patients									
Anderson et al., 2017; The Cochrane Library	Mortality, morbidity, HRQoL and healthcare costs.	**Number of studies:** 22 trials. **Types of studies:** RCTs; **Total sample:** 76,864 participants.	Patient education.	√ BEHA (-) √ CVR (-) √ DIET (-) √ EXERCISE (-) √ MED (-) √ PSY (-) √ SMOKING (-) √ SELF (-)	Nurses; trained educators; physicians, and care co0ordinator, case manager, and a researcher.	**Number of session, duration and total contact hours:** From just one 40 minute face-to-face session plus a 15 minute follow-up call to a four-week residential stay reinforced with 11 months follow-up. Duration as six months (range 1 to 36 months) with median follow-up of 12 months (range 6 to 60 months).	**Strategies:** Face-to-face sessions, telephone contact and interactive use of the Internet; text messages via a mobile phone; **Format:** Four studies involved group sessions; 12 involved individual education sessions; three used both group and individual sessions; one study compared group and individual approaches; and one study did not report on the mode of teaching. **Theoretical approach:** did not describe.	Post discharge, other	**– Total mortality;** **– Fatal and/or non-fatal MI;** **– Total revascularisations;** – Hospitalisations; – Fatal and/or non-fatal MI; – Other fatal and/or non-fatal CV events	Meta-analysis used Review Manager software.

Systematic reviews or meta-analysis involved T2DM patients

Doshmangir, Jahangiry, Farhangi, Doshmangir, & Faraji, 2018; Public health	HbA1c.	**Number of studies:** 48 studies; **Types of studies:** Controlled trials; **Total sample:** 1151 and 1233 in intervention and control groups respectively.	An education intervention based on models or theories.	√ BEHA (-) √ DIET (-) ☐ DR √ EXERCISE ☐ GC √ MED (-) ☐ PSY ☐ SMOKING √ SELF (-)	Unclear, did not describe.	**Number of session:** 2 to six or weekly or unclear; **Total contact hours:** From 30 mins to 12 hours or Unclear; **Duration:** From 10 to 96 weeks.	**Strategies:** Face to face, written materials; question and answer; CD; **Format:** Unclear; **Theoretical approach:** Six trials used the HBM for intervention, two used SCT and learning theory, two used beliefs, attitudes, subjective norms, and enabling factors (BASNEF model), PRECEDE–PROCEED, TTM, theory of empowerment, and two used information motivation behavior model.	Post discharge, or unclear	**↓ HbA1c.**	STATA version 12.0
Ballotari et al., 2017; Acta diabetologica	Mortality, morbidity, clinical outcomes, knowledge, attitude for and practice of diet, physical activity and self-care skills.	**Number of studies:** Nine studies described in 10 articles; **Types of studies:** Experimental and demonstration studies; **Total sample:** From 39 to 1486 patients.	Interventions aimed at modifying lifestyles, notably diet, physical behaviour and self-care skills	√ BEHA (+++) √ DIET (++) ☐ DR (-) √ EXERCISE (-) ☐ GC ☐ MED ☐ PSY ☐ SMOKING √ SELF (+++)	Health professional; link worker (or peer educators or community health workers) or mixed.	**Number of session:** from 1 to 7 or unclear; **Total contact hours:** unclear; **Duration:** unclear.	**Strategies:** Face-to-face; Phone contact; or unclear. **Format:** group sessions, individual sessions; **Theoretical approach:** Unclear.	Inpatient settings, post discharge, other	− **HbA1c;** **↓ BP, cholesterol and BMI;** ↑ Knowledge; − Self-care skills.	A qualitative synthesis of intervention effects.
He et al., 2017; Endocrine	All-cause mortality risk.	**Number of studies:** 42 studies; **Types of studies:** RCTs; **Total sample:** 13,017 participants.	Diabetes self-management education (DSME).	√ BEHA (-) √ DIET (-) √ CVR (-) √ EXERCISE (-) √ GC (-) ☐ MED ☐ PSY ☐ SMOKING √ SELF (+++)	Trained professional educators, pharmacists, community health workers or multidisciplinary team.	**Number of session:** Unclear; **Total contact hours:** Unclear; **Duration:** From 12 months to 5 years.	**Strategies:** Face-to-face; telephone contact, or unclear. **Format:** Individual; Group and Mixed. **Theoretical approach:** Unclear;	Inpatient settings, post discharge, other.	**↓ All-cause mortality risk.**	Review Manager (Version 5.1.0) and Stata (Version 12.0).
Moller, Andersen, & Snorgaard, 2017; The American Journal of Clinical	HbA1c, BMI, and LDL cholesterol.	**Number of studies:** Five studies; **Types of studies:** RCTs; **Total sample:** 912 patients;	Nutrition therapy (nutrition assessment, nutrition education and counseling,	☐BEHA √ DIET (+++) ☐CVR √ EXERCISE (-) ☐ GC √ MED (-) ☐ PSY	Dietitian with specific expertise and skills in diabetes and nutrition.	**Number of session:** Three to 6; **Total contact hours:** 6 hours or Unclear; **Duration:** 6-12 months.	**Strategies:** Face to face or unclear; **Format:** Individual; or clear; **Theoretical approach:** Unclear.	Outpatient.	**↓ HbA1c** ↓ Weight and BMI, ↓ LDL-c.	Review Manager (Version 5.1.0).

Nutrition			and monitoring and evaluation)	☐ SMOKING √ SELF (-)						
Odgers-Jewell et al., 2017; Diabetic Medicine	HbA1c, Diabetes knowledge and self-efficacy.	**Number of studies:** 47 studies; **Types of studies:** RCTs or controlled clinical trial; **Total sample:** 8,533 participants.	Educative group-based interventions (including those with occasional adjunct individual consultations) .	√ BEHA (-) √ DIET (-) ☐ DR √ EXERCISE (-) ☐ GC √ MED (-) ☐ PSY ☐ SMOKING √ SELF (-)	Peer or lay led; Health professional (Single discipline or Multidisciplinary).	**Number of session:** From 5 to more than 21; **Total contact hours:** From <8 to > 31 hours; **Duration:** ranged From 1 to 60 months.	**Strategies and Format:** Face-to-face individual or group-based sessions. **Theoretical approach:** Unclear.	Primary care or other.	↓ **HbA1c all subgroups);** ↑ Knowledge ; − Self-efficacy.	Review Manager (RevMan, v. 5.3)
Zhao, Suhonen, Koskinen, & Leino-Kilpi, 2017; Journal of Advanced Nursing	HbA1c; BMI; self-efficacy; self-care activities; diabetes knowledge and QoL.	**Number of studies:** Twenty studies (in 23 articles). **Types of studies:** RCTs; **Total sample:** Ranging from 75 to 1570 participants.	Educational intervention was based on a theory or model.	☐ BEHA √ DIET (-) ☐ DR √ EXERCISE (-) √ GC (-) ☐ MED √ PSY (-) ☐ SMOKING √ SELF (-)	Unclear, did not describe.	**Number of session:** From 2 to 12 or weekly or monthly or unclear; **Total contact hours:** From 30 mins to 28 hours or unclear; **Duration:** From 3 to 12 months;	**Strategies:** Pamphlets and face to face lecture; Question and answer; Diabetes conversation maps program; or unclear. **Format:** Individual; Group and Mixed. **Theoretical approach:** Theory of empowerment; HBM, theories of planned behaviour and personal models of sickness; Leventhal's common sense theory, the dual process theory, and the social learning theory; Motivational interviewing; Stages of change model (SOC); SCT; Proactive coping model.	Unclear, did not describe.	↓ **HbA1c;** − BMI; ↑ Self-efficacy; ↑ Self-care activities; ↑ Diabetes knowledge; ↑ Quality of life.	Review Manager 5·3·5 and Stata 12·0 software
Chrvala, Sherr, & Lipman, 2016]; Patient Education and Counseling	Glycemic control.	**Number of studies:** 118 unique DSME interventions published in 120 articles; **Types of studies:** RCTs; **Total sample:** A total of 11,854 and 11,093 participants were enrolled in an intervention and control group.	Meet the definition of DSME defined by the National Standards for Diabetes Self-Management Education and Support.	√ BEHA (-) √ DIET (-) √ DR (-) √ EXERCISE (-) √ GC (-) √ MED (-) √ PSY (-) √ SMOKING (-) √ SELF (+++)	Single or team.	**Number of session:** unclear; **Total contact hours:** 18.26 (SD, 51.10; range, 0.75–460) hours in 92 interventions. **Duration:** 6 months (mean 8.14; SD, 6.75; range, 1–36).	**Strategies:** Face to face, online or by telephone or unclear; **Format:** (1) individual education, (2) group education, (3) a combination of individual and group education, and (4) DSME primarily delivered by remote methods, with subject contact conducted online or by telephone; **Theoretical approach:** Unclear.	Unclear, did not describe.	↑ **Glycemic control**.	Unclear, did not describe.
Sharoni, Minhat, Mohd Zulkefli, & Baharom, 2016; International Journal of Older People	Foot self - care practices and foot problems.	**Number of studies:** 14 articles; **Types of studies:** Intervention studies (RCTs and Non-RCTs); **Total sample:** ranging from 25 to	Diabetes foot self-care educational programmes that included teaching, coaching, discussion,	☐ BEHA (-) ☐ DIET ☐ DR ☐ EXERCISE ☐ GC ☐ MED ☐ PSY ☐ SMOKING	Nurse, diabetic educator, dietician, psychologist, occupational therapist, physician and/or podiatrist	**Number of session:** Unclear; **Total contact hours:** Ranged between 15 min and 2 h per session; **Duration:** 1 month to 3–6 years.	**Strategies:** verbal (e.g. teaching, discussion, assessment, demonstration, home visit, videotaped and phone call) and written (e.g. pictorial form, booklet, leaflet, handbook and newsletter) and mobile health interactive voice response;	Diabetic clinics, non-emergency departments, community health clinics and podiatry clinics or	↑ **Foot self-care scores and the incidence of foot problems.**	A descriptive data synthesis.

Nursing		323 participants.	demonstration and assessment.	√ SELF (-)			**Format:** individual and group education; **Theoretical approach:** Self-efficacy, social cognitive theory and empowerment and discovery learning theories.	participants' homes.		
Sherifali, Viscardi, Bai, W., & Ali, 2016; Canadian Journal of Diabetes	HbA1c levels.	**Number of studies:** 8 trials; **Types of studies:** RCTs; **Total sample:** 724 adult participants.	Health-coaching intervention.	√ BEHA (-) ☐ DIET √ DR (-) ☐ EXERCISE √ GC ☐ MED ☐ PSY ☐ SMOKING √ SELF (-)	A dental professional background; nurse; Computer-generated feedback and physician- or nurse-originated feedback; medical assistant; Dietitian;	**Number of session:** 1-4 or weekly or unclear; **Total contact hours:** ranging from 15 to 60 minutes in time per session; **Duration:** 12 weeks to 16 months.	**Strategies:** Telephone and face-to-face strategies; web-based applications; **Format:** One on one or unclear; **Theoretical approach:** health behavior change theory.	Post discharge or unclear	↓ **HbA1c**	Review Manager (v. 5.3).
Yang & Fang, 2016; Medicine	HbA1c, FBG, and 2hours postprandial blood glucose.	**Number of studies:** 22 trials; **Types of studies:** RCTs; **Total sample:** 3,360 participants.	Diabetes conversation map.	√ BEHA (-) √ DIET (-) √ DR (-) √ EXERCISE (-) √ GC (-) √ MED (-) √ PSY (-) √ SMOKING (-) √ SELF (-)	Unclear, did not describe.	**Number of session:** unclear; **Total contact hours:** unclear; **Duration:** unclear;	**Strategies:** Diabetes conversation map; **Format:** unclear; **Theoretical approach:** unclear.	Unclear, did not describe.	↓ **HbA1c levels,** ↓ Fasting blood-glucose levels, ↓ 2hours postprandial blood glucose (2hPBG)	Review Manager 5.3.3 and STATA (Version 12.0)

Note: SMOKING = Smoking cessation; CVR = Cardiovascular risk factors; PSY = Psychosocial issues (depression, anxiety); DIET = Diet; EXERCISE = Exercise; MED= Medication; BEHA = Behavioural charge (including lifestyle modification); SELF = Self-management (including problems solving); DR = Diabetes risks; GC = glycemic regulation; DR = Diabetes risks; HbA1c = Glycated hemoglobin; BP = Blood Pressure; LDL = Low-density Lipoprotein Cholesterol; RCTs = Randomized controlled trials; CCTS = controlled clinical trials; HRQoL = Health Related Quality of Life; QoL = Quality of Life; MI = Myocardial Infarction; BMI = Body Mass Index; HDL-c = High-density Lipoprotein Cholesterol; LDL-c = Low-density Lipoprotein Cholesterol; DSME = Diabetes Self-Management Education; TTM = Transtheoretical Model; SCT = Social Cognitive Theory; HBM = Health Belief Model; In the educational content: "+": minor focus; "++": moderate focus; "+++" major focus; "-" = unclear what the intensity of the education was for any topic;

In the outcomes: arrow up (" ↑ ") for improvement, arrow down (" ↓ ") for reduction; a dash ("–") for no change or inconclusive evidence. Primary outcomes were bold.

2.4 Summary

This Chapter identified all systematic reviews or meta-analyses published from January 2000 to March 2018 that assessed the outcomes of various aspects (such as the duration, contact hours, educational content, delivery mode) of the delivery of health education-related interventions relevant to patients with ACS or T2DM. The results from this Chapter provide recommendations about the content of a health education intervention for patients with ACS and T2DM. The current evidence from this Chapter supports the view that theoretically-based health education interventions lasting 6 months, delivered in multiple modes, such as face-to-face, phone contact, online or web-based, or video, and with one-to-one education delivered weekly, are more likely to be beneficial for patients with ACS and T2DM.

The umbrella review provided the structure and main elements to develop the interview schedules and the health education content checklist for health professionals, as well as the key health outcome measures considered for the patient healthcare record audit in the subsequent studies. Having identified key aspects of the health education required for patients with both conditions, derived from systematic reviews of each condition (ACS or T2DM), further studies with health professionals (Study 1) and patients with the comorbid conditions (Study 2a and 2b), will explore what content, teaching strategies, and outcomes are currently delivered or experienced by patients within Shanghai hospitals. Within these further studies, the unique context of this setting can be elucidated further, and considered with cultural sensitivity.

The next Chapter, Chapter 3, will focus on the methodology used for Study 1, Study 2a, and Study 2b, and provide further details on ethical aspects of the studies, and the conceptual model directing the methods.

Chapter 3 Methodology and Method

3.1 Introduction

In Chapter 2, an umbrella review presented the health education-related interventions for either ACS or T2DM, reported within existing systematic reviews or meta-analyses. This description of the numerous interventions and their key components provided the background for the subsequent studies presented in this thesis exploring health professionals' and patients' (within a Shanghai hospital) perceptions, and patient health outcomes, related to their health education experience in China. By exploring these perceptions, a broad understanding of how education is understood within this context was provided. In this Chapter, an overview of the methodology and the selection of appropriate methods chosen to address the study aims, questions and hypotheses will be provided.

This Chapter describes the research design and paradigm, research setting, and method. The qualitative approach for Study 1 was outlined. This was followed by a description of a mixed methods design, engaging both quantitative (surveys, patient health care records audit) and qualitative approaches (interviews), reflecting the approach for Study 2a and b. Further detail on the methods for each study also appeared in each of publications that follow for Study 1, Study 2a, and Study 2b. The relevant ethical considerations were discussed, along with personal reflections on methodological issues and reflexivity.

3.2 Methodological approach

3.2.1 Research design

A qualitative approach (Study 1) was used to explore health professionals' experience of delivering health education relating to cardiac and diabetes education in a major hospital in Shanghai, China. One of the central aims of a qualitative study is to develop an understanding of how human beings make sense of the everyday world in which we live (Welch, 2011a). A qualitative approach can help to provide an enhanced understanding of the connotations of interventions or procedures, and might also assist in providing a better understanding of the applicability of interventions or procedures at the practice level (Voit, 2012). The qualitative approach in Study 1 can best be described as "fundamental qualitative description" by

Sandelowski (2000, p. 335), appropriate for exploratory research where little is known about the topic. Qualitative description is an interpretive approach that analyses events and phenomena as perceived by participants and offers a comprehensive analysis of events in the day to day context of those events (Sandelowski, 2000, 2010).

Study 2 (a and b), uses a mixed methods design. Study 2 is interested in both narrative and numerical data and their analysis. The origins of the mixed methods approach can be traced to early fieldwork of sociologists and cultural anthropologists of the twentieth century (Johnson et al., 2007). A mixed methods design provides great promise for scholars who want to see research methodologists develop approaches that are closer to what they actually adopt in their studies (Johnson et al., 2007). Mixed methods design combines components of qualitative and quantitative approaches for the broad aims of breadth and depth of understanding, and combination by use of quantitative and qualitative perspectives, data sources, data analysis methods and inference techniques (Johnson et al., 2007).

The mixed methods approach included the sequential mixed methods design and convergent mixed methods design. The use of a sequential mixed methods design is proposed with two distinct phases, which are conducted in separate timeframes, for example, two phases (Lewis, 2011). This kind of design, is where qualitative and quantitative data collection and analysis are carried out in two distinct phases and the first phase is used to inform the second (Lewis, 2011). With convergent mixed methods studies, the qualitative and quantitative data are collected and analyzed separately during a similar timeframe (Fetters, Curry, & Creswell, 2013). In this study, the convergent mixed methods design used for Study Two, which focuses on patients' experiences in receiving health education and patient health outcomes.

The purpose of conducting mixed methods research includes seeking corroboration of data from different research methods that study similar research questions (Lewis, 2011). Research questions suited for mixed methods research design are those in which a single data source may be insufficient, findings or results need to be explained, or a second approach is needed to improve a primary approach and the overall research aims can be best addressed with multiple approaches (Creswell, & Clark, 2011).

Creswell and Clark (2011) stated that quantitative and qualitative approaches provide different pictures and perspectives and each has its limitations. In some situations using only one method to address a research problem would be deficient and a second approach could provide enhanced understanding. In this study of patients' perspectives, using a series of quantitative scales can provide important information on such concepts as self-efficacy, or health knowledge, but the understanding of the nuances of changing behavior within the community, requires a depth of understanding that could not be garnered from surveys alone.

Figure 2 (page 100) outlines the thesis design using a notation system, with the abbreviation QUAN stands for quantitative and QUAL for qualitative (Lewis, 2011). A "+" indicates that the methods occur concurrently. The notation in this figure includes both the qualitative element of Study 1, and the mixed methods design for Study 2a, b: QUAL (Study 1: Health professionals' interviews); QUAN (study 2a: surveys and health care record review) + QUAL (Study 2b: patients' interviews): Health professionals' interviews (including an education content checklist) + Survey numeric data + Health care record review + Patients' interviews (see Figure 2).

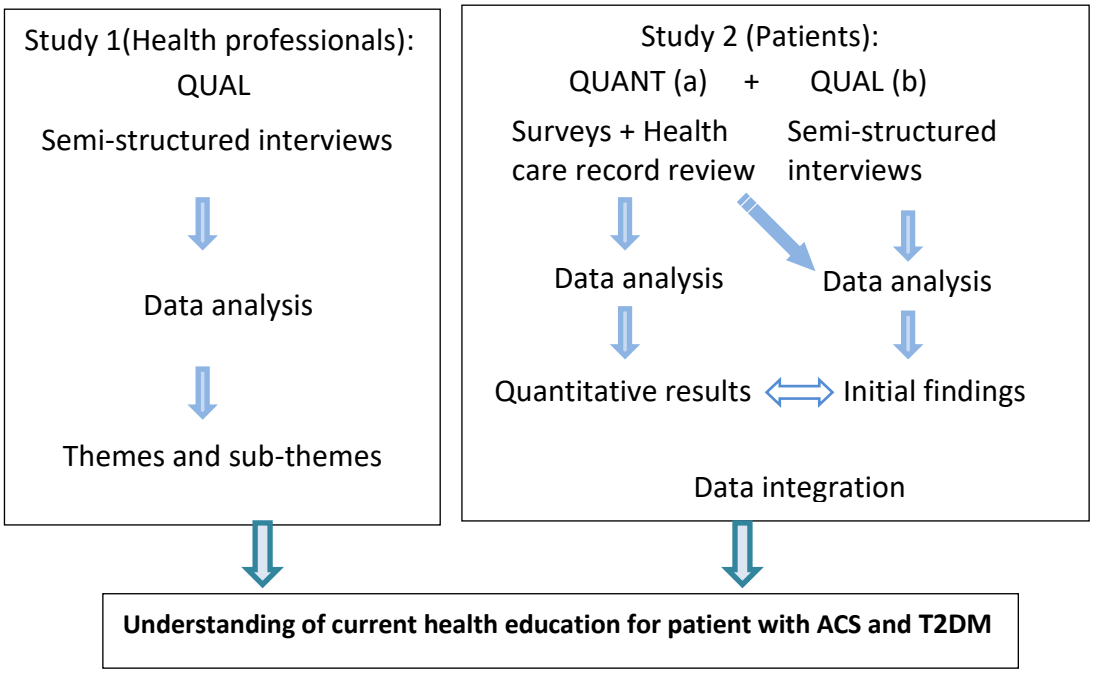

Figure 2. Study Design

3.2.2 Data integration

Mixing of qualitative data and quantitative data in mixed methods study is more than just the combination of two independent elements belonging to these two kinds of data (Zhang & Creswell, 2013). “Data integration is the process of combining data residing at different sources, and providing the researcher with a unified view of these data” (Lenzerini, 2002, p.233). The data integration of qualitative and quantitative results or findings can significantly improve the value of research using mixed methods design (Bryman, 2006; Creswell, Klassen, Plano Clark, & Smith, 2011). Qualitative information can be used to evaluate the validity of quantitative data and quantitative findings can be used to inform the qualitative sample or explain results from the qualitative component (Fetters et al., 2013). Researchers go through similar steps for both kinds of data: preparation of data for analysis, exploration, analysis, representation of the analysis, interpreting the analysis, and validating the data and the interpretations (Creswell, & Clark, 2011).

Data integration in this thesis, relating to Study 2, follows the principle outlined by Fetters, Curry, and Creswell (2013) and O’Cathain, Murphy, and Nicholl (2010). Data integration extended into three aspects of design methodology: the study design, the methods, and the interpretation and reporting of findings.

At the study design level, the quantitative data were used to analyse health education and its effectiveness, improving the patients’ knowledge, their self-efficacy abilities, and changes to key ACS and T2DM outcome measures, and complemented the qualitative data collected through patient interviews, and therefore better inform the social context influencing behavioral change.

At the level of methods, data integration was achieved mainly by linking the methods of data collection and analysis. Linking may occur in at least one of four ways, by connecting, building, merging, or embedding (Creswell et al., 2011). In Study 2, quantitative data were collected using a series of scales and qualitative data were collected from patients using an interview schedule that is made up of parallel and similar questions. Data analysis begins with an initial analysis of each element to identify key themes and questions requiring further exploration,

then the researcher chooses a question or theme from one part and follows it across the other parts (O'Cathain et al., 2010). For example, the initial findings from patient interviews generated a question for testing in the patient health care records or survey data, and the theme then could be explored in the patient health care records or survey results.

At the level of interpretation and reporting, data were first compared. A multiple stage narrative method is then used in the reporting of results or findings. The results are brought together by using statistics-by-themes, for example, in a study that compares patients with high and low scale scores (Guetterman, Fetters, & Creswell, 2015). This thesis has used a narrative reporting approach that "integrates qualitative and quantitative findings together on a theme-by-theme basis" (Fetters et al., 2013, p.2142). At the level of reporting through the narrative approach of both quantitative data and qualitative data from interviews and surveys were interwoven as themes throughout the Chapter 6.

The methods of mixing data or the integration of quantitative and qualitative data are now summarized in Table 4. Moreover, the mixed methods research evaluation criteria developed by Creswell and Clark (2011, pp. 267-268) are applied to Study 2b.

Table 4. The Application of Mixed Methods Criteria in This Research

Criterion	Research application
Both quantitative and qualitative data are collected	Quantitative data- Patient health care records reviews and surveys Qualitative data- Patients' interviews
Rigorous procedures in data analysis used quantitative and qualitative data analysis techniques	Quantitative data- descriptive analysis (SPSS) Qualitative data- Directed content analysis and thematic analysis (NVivo)
Integrates or mixes the two sources of data to enhance understanding of the research problems	(1) At the study design level, qualitative data were embedded in, or linked with, quantitative data. (2) At the level of methods, a merging approach was used. (3) At the level of interpretation and reporting, this study used a narrative reporting approach that integrates quantitative and qualitative results together on a theme-by-theme basis.

The mixed methods research design integrates all features of the study consistent with the design	Integration of both quantitative data and qualitative data from interviews and surveys were interwoven as themes throughout the results, analysis and discussion in Study 2b.
The study is framed within philosophical assumptions	The findings emerged guided by Social Cognitive Theory and mixed methods design.
The final product uses terms consistent with mixed methods research	Such as integration and combination have been used in this research.

Note: SPSS = Statistical Package for the Social Sciences.

3.2.3 Triangulation in this study

Triangulation refers to the use of multiple research methods, data sources, analysis, or theoretical perspectives in order to produce better understanding (Polit & Beck, 2004). Triangulation in mixed methods research includes data triangulation (the use of multiple data sources), theoretical triangulation (the use of a variety of theoretical perspectives to interpret the findings of a study), investigator triangulation (the use of several different researchers) and methodological triangulation (the use of a variety of research methods to achieve the research aims) (Williamson, 2005).

In this research, triangulation of data sources and methodological triangulation were used in order to gain rich data and to better understand the provision of health education in a Shanghai hospital. Data collected using both quantitative and qualitative methods, such as the use of questionnaires and patient health care records review was followed by in-depth interviews, appropriate to answering the research question. Additionally, the present study also employed relevant theoretical perspectives to interpret the findings from this study, such as the Social Cognitive Theory (SCT) and Health Belief Model (HBM).

3.2.4 Conceptual framework for this study

The conceptual framework provides a pattern of reasoning to guide the study. For this research, this conceptual framework informs this research and guides the understanding of the research design, methods, and data interpretation. The conceptual framework is also used to describe the hypothesized relationships between inpatient education and diabetes knowledge, attitudes of ACS, diabetes management self-efficacy and selected clinical outcomes (such as

fasting blood glucose levels). The conceptual framework, entitled *Modified Social Cognitive Conceptual Model for ACS Patients with T2DM* (Figure 3, page 106), is adapted from Bandura's Social Cognitive Theory (SCT) (Bandura, 2004a).

The *Modified Social Cognitive Conceptual Model for ACS Patients with T2DM* suggests individual behaviours are determined by their self-efficacy level or a judgment of their own abilities to change behaviours (Bandura, 1977). Moreover, self-efficacy, health education, and personal factors are identified as the factors influencing adherence to health behaviour (Marks, Allegrante, & Lorig, 2005). According to the proposed conceptual framework, adherence to health behaviours is influenced by five constructs: 1) personal factors; 2) inpatient health education during the acute hospital admission period, 3) diseases management self-efficacy; 4) outcome expectations of taking action or behavioural change; and 5) environment. The *Modified Social Cognitive Conceptual Model for ACS Patients with T2DM* proposes that a person with ACS and T2DM who received health education, (using the four sources of information) could improve their self-efficacy and knowledge, and improve their clinical outcomes.

The focus of the thesis was on enhancing self-management in individuals living with both ACS and T2DM and studies have identified self-efficacy (a construct within SCT) as a key explanatory variable in self- management of ACS and T2DM (Wu & Chang, 2014). Previous pilot studies reported that the cardiac-diabetes self-management programs (CDSMP), based on SCT or a self-efficacy concept, improved knowledge, self-efficacy and self-management behaviours among T2DM patients following an ACS event (Tanash et al., 2017; Wu, Chang, Courtney, & Kostner, 2012; Wu & Chang, 2014; Wu, Chang, & McDowell, 2009). There is clear potential in the use of SCT or self-efficacy concept to understand the health education provided for patients with ACS and T2DM.

Once the SCT was selected to guide this study, study variables congruent with the SCT were selected, as were the tools used for data collection, see Figure 3 (page 106). Guided by the framework, the research focused on:

1) Personal factors: Demographic characteristics (e.g., age, BMI, gender, marital status and smoking status) and disease characteristics (e.g., type of ACS event and duration of T2DM);

2) Health education: Reflecting four sources of information and environmental influences in hospital and community;

3) Symptom management for ACS and self-management for T2DM: Comprising efficacy expectation or self-efficacy;

4) Adherence to health behaviors and clinical outcomes: Reflected in behavioral changes; and

5) Environment: Comprising community, social support, family support and influences.

All five above factors were identified as the constructs for the conceptual framework proposed for this study. Several prior clinical trials have used SCT or self-efficacy concepts to design active content, change behaviour or improve health outcomes among patients with ACS (Aldcroft, Taylor, Blackstock, & O'Halloran, 2011; Allen, 1996) or T2DM (Liebreich, Plotnikoff, Courneya, & Boulé, 2009; McKibbin et al., 2006; Rosal et al., 2005).

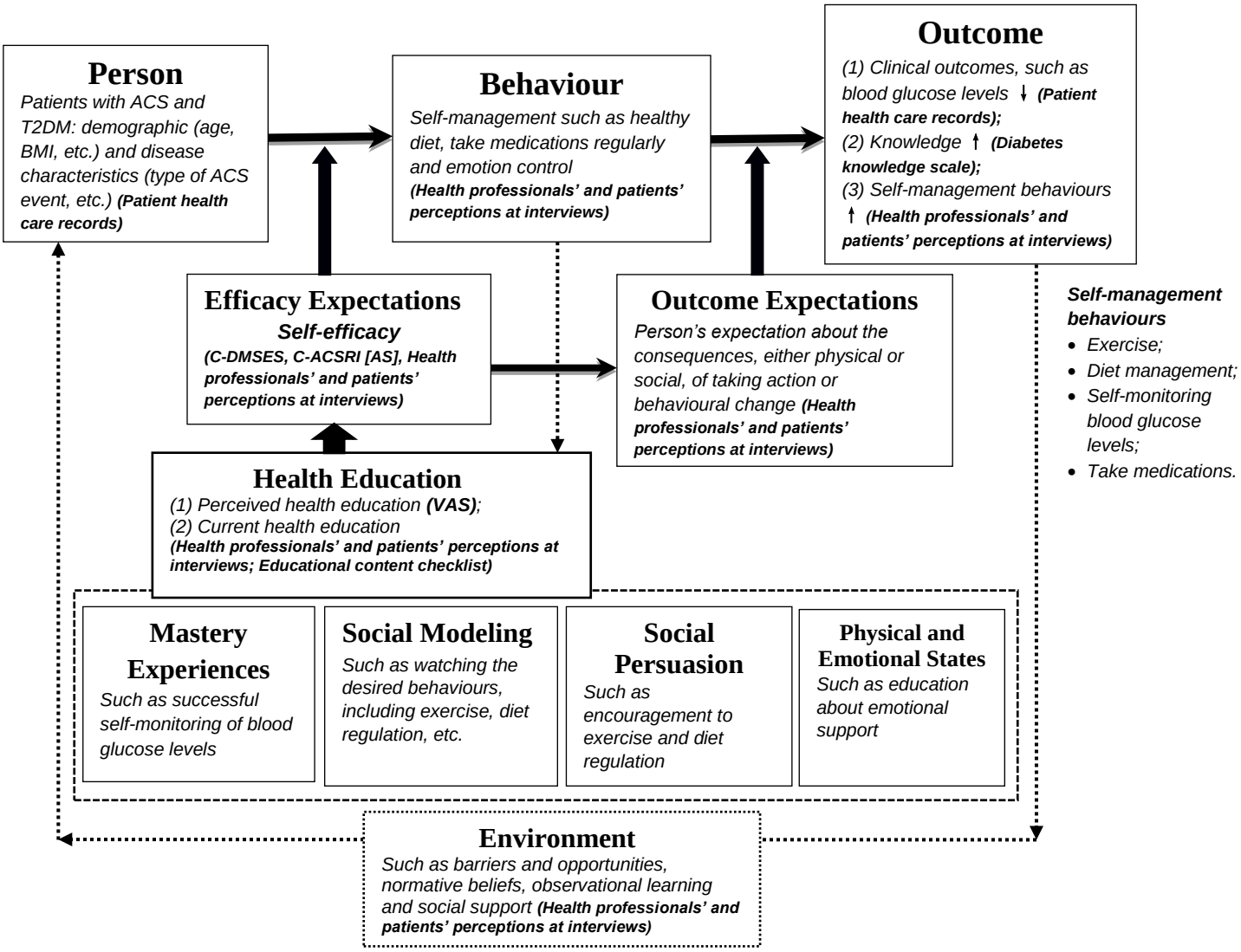

Figure 3. Modified Social Cognitive Conceptual Model for ACS Patients with T2DM

Note: ACS = acute coronary syndrome; T2DM = type two diabetes mellitus; C-ACSRI (AS) = Attitudes Subscale of Chinese Version Acute Coronary Syndrome Response Index; C-DMSES = Chinese Version Diabetes Management Self-efficacy Scale; VAS=Visual analogue scale. In the outcomes: arrow up (" ↑ ") for improvement, arrow down (" ↓ ") for reduction.

Adherence to health behaviors included exercise, self-monitoring blood glucose levels, diet management and take medications. Outcome expectations were collected via patients' and health professionals' interviews. Perceptions of real or intended behavioral changes was determined from narrative data from health professionals' and patients' interviews. Outcomes included diabetes knowledge, clinical outcomes and self-management behaviors were collected.

The four sources of information — "mastery experiences, social modeling, social persuasion, physical and emotional states" (Bandura, 2004b, p.622-623) — are often used in health education programs to increase self-efficacy and were used to understand how the current health education is delivered by health professionals and received by patients with ACS and T2DM. *1) Mastery experiences* involved experiencing success in achieving goals (Bandura, 2004b; Bandura, 1994), such as letting patients test their blood glucose levels and reinforcing the success experiences in blood glucose levels monitoring during health education (successful achievements). *2) Social modeling* involved observing others perform tasks successfully (Bandura, 2004b; Bandura, 1994), such as watching the desired behaviours or health professionals providing some real examples about how to do exercise after an ACS event using written or video materials. *3) Social persuasion* was receiving positive verbal reinforcement (Bandura, 1994), such as encouragement to exercise, diet regulation and takes medications, as well as answering patients' questions. *4) Physical and emotional states,* refer to how individuals view their psychological health (anxiety and depression) as signs of personal deficiency. Poor perceptions of physical and emotional health may influence the perceptions of individuals in judging their capabilities (Bandura, 2004b). As such, health professionals could improve patients' self-efficacy by providing support to enhance their emotional states.

The conceptual framework informed the defined variables, the data collection and data analysis in this study. First, the proposed conceptual framework outlined the connection between health education, efficacy and health behaviours and clinical outcomes. Second, the constructs (including behaviour, efficacy expectations, environment, health education, outcome expectations, outcome and person) in the conceptual framework informed the interview

questions with the qualitative elements of study 1 and 2b and the outcomes measured by the quantitative element in study 2a. Although not all constructs or concepts were measured objectively, qualitative data were used to inform the key constructs.

Overview of data collection and time points considered.

As noted earlier Study 1 uses a qualitative approach and Study 2a and b use a mixed methods design. An overview of the methods for each of the studies appears in brief in Table 5 below. In order to collect all patients' characteristics and clinical outcomes, the researcher reviewed patients' health care records when patients were discharged. Patients needed to first receive the health education before measuring the influence of inpatient health education on their self-efficacy and knowledge on discharge, thus the patients' survey and face to face interviews were conducted one day before discharge (see Table 5). Study 2b also included a telephone-based follow-up interview focused on how participants were managing their health conditions at home (health behavioural changes). The data were collected from July 2016 to March 2017.

Table 5. Data Collection

	Data collection methods		Data collection time points		Participants
			0 - 24h before discharge	After discharge	
Study 1	Educational Content Checklist				Healthcare professionals
	Interviews				
Study 2a	Survey	Knowledge: ✓ Diabetes Knowledge Scale	✓		Patients with ACS and T2DM
		Self-efficacy and Self-care skills: • C-ACSRI(Attitudes Subscale) • C-DMSES	✓		
		Visual analogue scale	✓		
	Patient Health Care Records Review: Blood sugar; blood pressures; ACS risk factors, such as hypertension, smoking; lipid levels, such as total cholesterol.			✓	
Study 2b	Interviews	Face to face interviews	✓		
		Follow-up interviews		✓	

Note: ACS = acute coronary syndrome; T2DM = type 2 diabetes mellitus; C-ACSRI = Chinese version of Acute Coronary Syndrome Response Index; C-DMSES = Chinese version of Diabetes Management Self efficacy Scale.

3.2.5 Setting

Shanghai, the largest Chinese city by population and the global financial center for China is the setting for this study. Shanghai covers an area of 6,340.5 km^2 and the water area covers 697 km^2. Shanghai has an estimated population of 24,260,000 including 21,730,000 (89.57%) in the city area (National Bureau of Statistics of China, 2014). Shanghai has 332 hospitals (including 182 comprehensive hospitals) with 98,300 beds, and the utilization rate of hospital beds being 97.1% with the average hospital stay being 11.1 days (National Bureau of Statistics of China, 2014). From 2007 to 2008, the prevalence of diabetes in Chinese adults was 9.7% (Yang et al., 2010) and data from 2012 showed that the incidence of ACS in Chinese people with T2DM was 19.7%, and ACS-related mortality was 4.9% (Duan et al., 2015).

Figures like these draw attention to the high volume of patients and length of stay pertinent to the study setting and design. Both studies were conducted at a major hospital in Shanghai (See Figure 4). This hospital is a long established (106 years ago) level three A (top level) government comprehensive hospital. It provides health care services to more than 2.38 million people each year. The hospital has 1775 beds and employs around 2469 healthcare professionals including administrative and support staff. It is made up of 42 functioning departments. The cardiovascular ward and the cardiac care unit (CCU) have more than 160 beds making the CCU the largest in Shanghai. Other hospitals refer ACS patients to this major hospital. Participants from this hospital may have originated from different regions, providing good geographical representation of patients with ACS and T2DM.

Figure 4. Location of Study Setting in Shanghai

3.3 Rigor and trustworthiness

Credibility/validity and dependability/reliability are the key concepts essential to the successful completion of any rigorous qualitative or quantitative research. Both studies are highly dependent on the dependability/reliability of the questions asked and the credibility/validity is established when findings closely reflect the meanings as described by health professionals and patients in their interviews, questionnaires and the patient health care records review (Lincoln & Guba, 1985). As outlined in the following two sub sections, truth value, applicability, consistency and neutrality were considered to improve rigor and trustworthiness of the quantitative and qualitative data (Krefting, 1991).

3.3.1 Quantitative data

Key concepts such as validity, reliability, replicability and generalizability criteria should be applied to quantitative research (Bryman, Becker, & Sempik, 2008). Quantitative data in this thesis were taken from patient health care records and survey documents. Logic checks for out of range scores were undertaken to identify errors in data entry. All quantitative data were double checked after being entered into computer to ensure accuracy. The patient health care records review tool was developed to assist data collection and a check of reliability ensured the consistency of the data extraction. Pilot testing of 10 patient health care records was performed. Pilot testing is important to the identification of errors, missing or superfluous data, and also in recognizing incomplete or confusing terms (McConnell-Henry et al., 2015). Pilot testing confirmed that the tool "not only retrieved the required information but was in a format acceptable" to researchers thus enhancing the efficiency of the tool (McConnell-Henry et al., 2015, p. 77).

All the psychometric scales used in this thesis have established validity, reliability and applicability to the sample. The selected instruments or tools are based on the conceptual framework of this study. The processes of the patient health care records review and survey are transparent, and all aspects of data collection have been described in this Chapter, or subsequent publication. Sufficient detail is provided for other researchers to replicate these studies. The findings of this research may be generalizable to local or other hospitals in China.

3.3.2 Qualitative data

In order to achieve trustworthiness in data collection in qualitative research, a number of key elements are required: researcher competence, transparency of the research process, and congruence between the philosophical and methodological approaches selected (Welch & Jirojwong, 2011). Lincoln and Guba (1985) suggest three criteria for assessing the trustworthiness and soundness of a qualitative study. These are credibility, dependability and transferability, which are all composed of numerous procedures to ensure rigour (Shenton, 2004).

Credibility refers to the confidence the reader has that the findings are true and credible (Lincoln & Guba, 1985). Consideration is given to the research questions of the study, context, participants, and approach to collecting data (Graneheim & Lundman, 2004). This is achieved by adopting an appropriate, research design that is likely to address the research questions. To meet this criterion, this series of studies have adopted complex methods such as mixed methods for Study 2, and also triangulation of data sources, to achieve the research aims. Recruiting participants with varying backgrounds (physicians and nurses) and varying levels of experience increases the chances of answering the research questions comprehensively (Graneheim & Lundman, 2004). Similarly, it was important to include perspectives of health professionals and patients themselves to ensure a nuanced understanding of health education was obtained.

Transferability refers to the degree to which the research findings or methods could be transferred to other settings or contexts (Thomas & Magilvy, 2011). Achieving evidence of transferability requires provision of a clear description of the research setting, cultural and contextual background, recruiting, characteristics of participants, and the process of collecting and analyzing data (Graneheim & Lundman, 2004; Thomas & Magilvy, 2011). This research provides such background information to not only establish context for both qualitative and quantitative aspects of the project and thereby connect to other similar samples or contexts, but also to allow comparisons between studies within this project and those of future projects. Hence the critical importance of the replicability of the methods used in this mixed methods

project. In this thesis and its associated publications, the research process was clearly described in the manuscripts submitted to peer-reviewed journals.

Dependability through outlining decisions made throughout the research process means that there is a clear rationale for methodology and interpretation of data (Houghton, Casey, Shaw, & Murphy, 2013; Thomas & Magilvy, 2011). Strategies adopted to achieve dependability in this research included having academic supervisors join in the processes of data analysis and giving detailed information about the research methods to develop the original results (Thomas & Magilvy, 2011). An in-depth description of methodology is given to allow research to be repeated. Dependability of each study was improved by the use of a diary to record the details of the interviews. During the interviews field notes on important points, such as the context in which statements occurred, were made. Preliminary notes were also made on impressions of the key points. Process decisions and comprehensive notes related to the contextual background of the data were documented. The coding, interviewing techniques and questions were checked by supervisors.

Moreover, NVivo was used to organize and manage the qualitative data. NVivo can provide a record of decisions (through notes) during the analysis phase and can be used to locate all the passages that match criteria set in a query and provide a rationale for the methodological judgements of the researcher. Therefore, dependability of the qualitative data in this thesis was also demonstrated by running queries within NVivo (Catherine, Dympna, & David, 2013).

3.4 Data analysis

3.4.1 Quantitative data analysis

Quantitative data were analysed using the Statistical Package for the Social Sciences (SPSS™) Version 22 (IBM Support, 2017). Univariate descriptive data were used to describe responses on different scales. Means and standard deviations were used for continuous variables such as age. Percentages and frequencies were used for categorical variables such as gender. To accept or reject the stated hypothesis of Study 2a the Chi square, *t*-test, Mann-Whitney U and Pearson's correlation statistic were calculated (Coakes, 2013). *P* values less than 0.05 were considered statistically significant.

Reliability analyses. A series of reliability analyses were conducted using SPSS for all scales, including C-ACSRI, C-DKS and C-DMSES. For C-ACSRI and C-DMSES (continuous variables) the Cronbach's alpha statistic was calculated. The most common method for measuring scale's internal consistency reliability is the Cronbach's alpha statistic, which is calculated by obtaining the correlations between items within a given tool or scale (Tavakol & Dennick, 2011). The acceptable level of reliability was Cronbach's alpha values of 0.70 or greater in this thesis (Tavakol & Dennick, 2011). The reliability analysis of C-DKS (dichotomous variable, i.e. correct = 1, incorrect = 0) used the Kuder-Richardson 20 (KR20) analysis.

Normality tests. The assumption of normality was evaluated and determined before the conduct of the statistical analyses, and two group distributions were associated with skewness and kurtosis. A variable was not normally distributed when it was determined that the critical values of skewness and kurtosis were outside the range of -2.00 to +2.00 and -7.00 to +7.00, respectively (Hair et al. 2010). In this study, normality assumptions were analysed through parametric statistical analysis and this underlying assumption required for statistical procedures, such as t-tests, was explored and when required non-parametric tests such as the Mann-Whitney U test were used. The results of normality tests for main valuables were presented in Appendix R (page 326).

Comparisons between groups. The independent *t*-test (original data pass the normality tests, normal distribution) or Mann-Whitney U test (original data did not pass the normality tests, non-normal distribution) assesses whether the means of two sub groups are statistically different from each other on the same continuous variable, for example, comparing the means of two sub groups: limited inpatient education group (limited ≤ 50 score on VAS) and sufficient inpatient education group (> 50 score on VAS) on ACS symptom management (as measured by C-ACSRI), diabetes management self-efficacy level (as measured by C-DMSES), diabetes knowledge level (as measured by C-DKS) and selected key clinical outcomes (such as fasting blood glucose). Fasting blood glucose level at admission was non-normally distributed (skewness value =2.16 and kurtosis value = 7.67), Mann-Whitney U was performed to assess whether there was difference of blood glucose level at admission between the two groups.

Linear multiple regression analyses. A correlation matrix (presented in Appendix S, page 328) was used to determine key predictor variables that were significant at the 0.05 level or lower (0.10), which were then examined using linear multiple regression (LMR) analyses with backward elimination (for continuous variables), to determine the impact of perceived education received on the prediction of diabetes management self-efficacy (as measured by C-DMSES) and ACS symptom management (as measured by C-ACSRI) on discharge in this study. Therefore, the LMR analyses determined what factors significantly predicted diabetes management self-efficacy and ACS symptom management among patients with ACS and T2DM.

Backward elimination, stepwise selection, and forward selection are the three most commonly used methods for regression analyses. Backward selection estimation starts with all predictors or variables in the model and removes the least significant variable at each step. This method of selection continues until the best fit of a multivariate model is obtained (Derksen & Keselman, 1992). Backwards elimination has an advantage compared with stepwise regression and forward selection as it is possible for a set of predictors to have considerable predictive capability in backwards elimination even though any subset of them does not (Strobl, Malley, & Tutz, 2009). Forward selection and stepwise regression have limitations, such as each new variable may render one or more of the already included predictors non-significant in the model (Derksen & Keselman, 1992).

For LMR analyses, Model one: the dependent variable was ACS symptom management (as measured by C-ACSRI) and the independent variables were age, gender, length of stay and perceived heart disease education (as measured by VAS). Model two: the dependent variable was diabetes management self-efficacy (as measured by C-DMSES) and the independent variables were age, duration of diagnosis of T2DM, gender, diabetes knowledge (as measured by C-DKS), length of stay and perceived diabetes education (as measured by VAS). LMR analysis was used to estimate standardized coefficients (β) and 95% confidence intervals (CI) to assess associations between dependent variables and each of the independent variables in Model one (ACS symptom Management) and two (diabetes management self-efficacy, C-DMSES) (IBM Support, 2017). The β value in the LMR analyses measured the proportion of the variance in the

dependent variable explained by the independent variables (IBM Support, 2017). All variables were assumed to be reliably measured and normally distributed (results of normality tests were presented in Appendix R, page 326) in the LMR analyses.

3.4.2 Qualitative data analysis

The first five interviews from health professionals and patients were transcribed in full into Chinese and English by the researcher and coding, interviewing techniques, questions and coding tree were checked by supervisors. Two researchers were bilingual (Chinese and English [X-L L; C-JW]). The remaining interviews were transcribed into Chinese and coded by the author [X-L L] and checked by another bilingual author [C-JW]. Qualitative data were organized and coded by NVivo^{TM} (QSR International, 2017), NVivo can provide a record of decisions (through notes) during the analysis phase and running queries (Catherine, Dympna, & David, 2013).

Data analysis commenced with the researcher becoming familiar with the interview material through listening and reading (re-reading) transcribing recorded information, then organizing material for easy retrieval and identification. All transcripts were thoroughly read and re-read many times in order to comprehend the content of the interview materials and make sense of the interview data as a whole (de Casterle, Gastmans, Bryon, & Denier, 2012).

The deductive aspects of the data analysis applied to the health professional interviews employed a content analysis approach using the frequency of the use of a specific code and the proportion of text relating to specific codes in the educational content checklist (ECC), such as medications, diet, exercise (Riff, Lacy, & Fico, 2014). In addition, content analysis of the overall amount of content focused on specific diseases such as cardiac education was conducted. Comparisons between specific health professionals (nurse or physician) were enabled using this feature in NVivo 11^{TM} (QSR International, 2017). The proportion of text or narrative relating to these areas was identified.

The inductive aspects of the analysis were derived from health professionals' and patients' descriptions of their perceptions about current inpatient health education, using an inductive thematic analysis approach (Whitehead, 2011; Braun & Clarke, 2006). Inductive thematic

analysis means the identified themes were strongly linked to the data themselves (data-driven) without fitting the data into a pre-existing coding frame or theoretical interest (Braun & Clarke, 2006). A theme is defined "as a coherent integration of the disparate pieces of data that constitute the findings" (Vaismoradi, Turunen, & Bondas, 2013. p.402). A theme can be seen as an expression of the meaning of the qualitative data and often includes a number of sub-themes or sub-subthemes at different levels of abstraction (Graneheim & Lundman, 2004).

Inductive thematic analysis enables identification of key ideas within and across the data that help to describe and explain the findings related to the research questions (Green et al., 2007). In this study the phenomenon is the health professionals' delivery of cardiac and diabetes education for patients with ACS and T2DM. In order to fully make sense of the interview text and to learn what is going on within the interviews patients, the following key questions were explored in the data when reading the interview transcripts (Elo & Kyngäs, 2008): Who is telling the story? Where is this happening? When did it happen? What is happening? Why? Each interview transcript was read many times to familiarize the investigators with the essential content and meaning (de Casterle et al., 2012).

Then the transcript data were coded and analyzed using an open coding process by NVivo™ (QSR International, 2017). Open codes were defined as significant statements indicating the content of the inpatient health education program received and recalled by patients (Whitehead, 2011). "Open codes were placed on notecards and three or more codes arising from different interviews that expressed a similar idea represented a constituent theme" (Burke, 2015, p.23). The remaining un-coded interview data were reviewed again, start to finish, making sure that any meaningful themes were not been missed. Provisional categories are developed and relationships between categories are organized and clustered to form themes.

3.5 Ethical considerations

This thesis involves participants who are asked to share information regarding their health, their medical experiences and their perspectives on health education. Importantly, the participant should not only be willing to share their time but also trust the researcher to maintain their anonymity (Chater, 2011). The security of participants includes not only

protection from physical and emotional harm but also that their privacy and anonymity is fully respected (Chater, 2011). In this section on ethics, research merit and integrity, consent, confidentiality and privacy, justice, risks and benefits are detailed.

3.5.1 Research merit and integrity

This research was designed using methods appropriate to achieving the aims, following recognized principles of research conduct and supervised by senior researchers. These studies were conducted at a major hospital in Shanghai, a large government comprehensive hospital with research facilities and resources available to complete the research. The researcher conducting the research project, as a Ph.D. candidate was supervised by experienced academic scholars. The researcher did not work at the study setting and had no dependent relationship with the participants. Results are being disseminated within peer reviewed journals. To ensure the research quality of this series of studies, ethical approval was sought and obtained from both relevant ethics committees: Australian Catholic University (2016-148R, Appendix B.1, page 286) and the major hospital in Shanghai (SHSY-IEC-3.0/16-20/01, Appendix B.2, page 287).

3.5.2 Consent

An essential element of conducting research is the seeking and obtaining of informed written consent. Bond (2004) asserted that the right to withhold consent to take part in any research project is a basic human right and remains a cornerstone of research ethics. Kirk (2007) proffered that informed consent is based in three domains. Potential participants gain knowledge of a project by the provision of a letter informing them of details necessary for their participation. This letter seeks to inform potential participants that they must voluntarily give their consent to participate and that seeks to explore that they are competent to give consent (Kirk, 2007). The purpose of the proposed project was explained to participants. Each participant received a detailed Participant Information Sheet for Study 1 (Appendix C, page 288), and Study 2 (Appendix D, page 292) outlining their role in the research. Each participant was given contact details of the lead investigator (NHMRC, 2016). These details could be used by participants at any stage of the research.

In order to be clear, honest and transparent (Patton, 2015), the purpose of the study was explained to all prospective participants prior to interview. All prospective participants were asked to sign a written consent form (see Appendix E [Study 1], page 296 and Appendix F [Study 2 a, b], page 298). As part of the consent process, participants were asked for permission to take notes and the request for audio recording was repeated. At this time, prospective participants were asked if they had any questions, which were answered by the researcher. Participant Information Sheets and Written Consent Forms were written in both Chinese and English to assist all participants to give informed consent (Chater, 2011), and ensured that all participants were made aware of the nature of the project and its boundaries (Chater, 2011; NHMRC, 2016).

3.5.3 Confidentiality and privacy

The concepts of confidentiality and anonymity are integrally related, especially in regard to the interviewing relationship (Chater, 2011; Patton, 2015). Confidentiality refers to the method in which research data is managed and stored and anonymity relates to managing the kind of data that is released about individuals who participate in a study (Cacciattolo, 2015), thereby maintaining their privacy. The information sheets clearly described how the research data were to be collected, stored and used (NHMRC, 2016).

All data collected remained confidential. No names are attached to scales and completed surveys and consent forms with the signature of participants were held in a secure facility separate from other documents. Interviews were coded using the sex of the participant, interview data and duration of interview time of the recording. For example, F16/12/2016-4554 means the participant is female, interview data were acquired on 16th December, 2016 and the length of the interview time was 45 minutes and 54 seconds. Audio recordings and data were kept in a locked file accessible to only the researcher until they are destroyed. Patient details were stored separately and were destroyed when all the data were collected. The survey data, any clinical data and any interview data were stored and transported in password protected files at all times. All participants were given a pseudonym, the name of each person was replaced with another name so that they were not recognizable in any research report (Chater,

2011). All data will be destroyed after seven years in keeping with NHMRC guidelines (NHMRC, 2016).

3.5.4 Justice

Justice, in this context, refers to the process of recruiting participants in a fair manner, including no unfair burden, fair distribution of the benefits, no exploitation of participants and fair access to the benefits of the research (NHMRC, 2016). In this research, the criteria for inclusion and exclusion of participants are stated clearly in sampling sections and are justifiable. Surveys were left with patients to give them time to complete them slowly or the researcher assisted patients to complete them if requested. The findings of these studies will be published in journals and the researchers of this project will send the papers to the participants by Email once the research findings are published (where participants have requested).

3.5.5 Risks and benefits

Another ethical principle closely associated with the research project is beneficence and risk of harm – the importance of doing well for participants and preventing harm (Rani & Sharma, 2012). Risk of harm is considered negligible if the study does not include human testing or any kind of intervention (Rani & Sharma, 2012), which has not occurred in this study. The study is considered a low risk study by the Human Research and Ethics Committees (NHMRC, 2016). The guiding principle for risk assessment also includes aspects of psychological stress and legal liabilities (Patton, 2015). In addition, researchers should ensure that participation is voluntary with a right to withdraw. Participants had the opportunity to withdraw from this study or end the interview process at any time without explanation and fear of any consequences related to their care (Chater, 2011). In this case as patients were involved, it was important to ensure that patients understood that whether they participated or did not participate in the studies, their health service would not be affected.

This research was not proposing any intervention and the participants are unlikely to receive any direct benefit. However, the knowledge obtained from the research is likely to inform future education programs. There may be some burden to the participant if the participant became unwell during the interview. In this case the interview would be ceased and

appropriate health staff within the CCU contacted. The survey and interviews with patients were conducted 1 day before discharge, when patients were stabilised. The surveys were discontinued if patients told the researcher that they were tired or felt fatigued (7/160, 4.4%). Similarly, patients discontinued the interviews if fatigued. No adverse incidents occurred during the data collection.

3.6 Reflexivity

Reflexivity involves a continual self-scrutiny of subjective responses and the interactions with study participants (Polit & Beck, 2008). Developing a reflexive posture means to continually ask how my previous experiences, my values and my background might shape the data analysis and interpretations (Polit & Beck, 2008). Self-reflexivity is necessary for all research and particularity for qualitative study, it encourages the researcher to be frank and authentic with his or her self, his or her research, and his or her audience (Tracy, 2010). Self-reflexivity requires the researcher to declare the advantages and disadvantages (Tracy, 2010) they bring to the research.

I have always been very interested in health education with my Master degree presenting a review of the evidence related to educational interventions for cancer patients. Extending this interest into patients with comorbid conditions, two conditions of importance to Chinese populations was an exciting opportunity. I was not familiar with the staff from the CCU or patients from the unit.

I therefore initially spent time (about four hours per day) in the CCU, interacting with the unit staff and patients, prior to conducting the interviews for Study 1. Establishing rapport with the staff was important prior to conducting the interviews. Throughout these studies I have met with my supervisors who assisted and developed my interviewing skills through educational material and several role plays, which gave me the confidence to conduct the interviews with health professionals and patients. During data analysis, I have been constantly challenged by my supervisors to understanding the data and the participants, meeting every two weeks with my supervisors over many years has allowed me to develop this self-critique in a supported manner.

One of my challenging issues or perhaps advantages was that I had limited experience as a health clinician working in CCU or cardiology department. These weeks spent in the CCU and cardiology department helped me to gain confidence within the area.

3.7 Summary

This Chapter has outlined the methodology and methods to be used in the study. Details have been provided for the two major studies (Study 1, Study 2a,b) including: research design, sampling strategies, conceptualization, data collection and analysis, and ethical considerations. In the following three Chapters (4, 5 and 6), I will further detail the relevant methods and present the findings of this research. Initially, Chapter 4 will describe the published paper: '*Better save one life than build a seven-storied pagoda: a qualitative study of health education for patients with acute coronary syndrome and type 2 diabetes in Shanghai, China*'. This paper explores, from the perspectives of health professionals, the content and the strategies used in the delivery of health education to patients with ACS and T2DM, as well as the health professionals' experiences of health education delivery.

Chapter 4 Study 1 Exploring health professionals perceptions of health education provided to patients with acute coronary syndrome and type 2 diabetes mellitus admitted to a specialist cardiology unit in Shanghai

4.1 Study 1: Introduction

The previous Chapter provided details of the overarching methodology and also the methods for this and other subsequent studies. This Chapter now details all aspects of Study 1 including the findings and conclusions. An overview of the study context and methods is provided to introduce the publication under review.

4.2 Study 1: Research aim and questions

The aim of this study is to describe, from the perspectives of health professionals from Shanghai, the health education currently being provided, from admission to discharge to home, to patients who present with acute coronary syndrome (ACS) and type 2 diabetes mellitus (T2DM):

(1) What health education (cardiac and diabetes health education) and teaching and learning strategies are used by health professionals (physicians and registered nurses or other health professionals) to deliver health education to patients with ACS and T2DM admitted to a Shanghai hospital?

(2) What are the health professionals' perceptions of the impact of current educational practices, and barriers to delivering effective health education, for patients with ACS and T2DM admitted to a Shanghai hospital?

4.3 Study 1: Methods

Study 1 was concerned with the exploration of health professionals' experiences in the delivery of health education to patients with ACS and T2DM using a qualitative approach. A lack of research into health education provided to patients with ACS and T2DM in the hospital setting in Shanghai offers an opportunity to explore the experience of health professionals delivering health education in these complex medical conditions.

4.3.1 Study 1: Sample

The coronary care unit (CCU) of the major hospital in Shanghai where the study was conducted has 15 physicians, 17 registered nurses and 12 medical students. To provide necessary insights into the nature of interview questions, this study examined various perspectives of health professionals fulfilling different roles through purposive sampling of approximately 15 health professionals (registered nurses and physicians) (Mason, 2010). The "purposeful sample" should be judged according to the purpose and rationale of the study (Patton, 2015, p. 311). A purposive sample ensures that data are collected from a group likely to have diverse experiences and views, and who can provide information rich insights into the phenomenon being examined. In purposive sampling in qualitative research, sample size is not pre-determined, rather the sample size is determined by the quality of the data gathered, ceasing only when no new insights are emerging from the data. We sought to interview health professionals who held diverse opinions and views about, delivering health education to patients with ACS and T2DM (Lewis, 2015).

4.3.2 Study 1: Procedure

Following ethics approval (see Appendix B, page 286) from the Shanghai hospital where the research was conducted, the researcher sought individual meetings with the Medical Director or Nurse Managers of the CCU where health education is provided to patients with ACS and T2DM. The purpose of these meetings was to explain the project and seek verbal permission to attend morning meetings in their units to invite volunteers to participate in the study. A Participant Information Letter (see Appendix C, page 288) was distributed to personnel interested in participating containing information about the aims and methods, and explaining the participants' involvement in the study.

Health professionals interested in participating in this study were asked to contact the researcher, who provided further information, clarified any questions, and scheduled an interview with the participants' consent. Interviews were scheduled at a mutually convenient time and location (either a private office in the hospital or a mutually agreeable alternative location, whichever is more convenient for the participant). All participants were informed that

their participation would be anonymous and were asked to sign a written consent form (see Appendix E, page 296) prior to the interview. Interviews were conducted in private offices away from the patient areas.

4.3.3 Study 1: Data Sources

(1) Interviews: Interviews were based on a semi-structured schedule that assisted the researcher in maintaining a focus on the specific topics (Welch, 2011a). The interview schedule for health professionals is attached as Appendix G (page 300). Interviews were audio recorded with the permission of participants. This qualitative study was conducted with individuals, face-to-face, using semi-structured interviews. Demographic data including: age, classification of staff, department (if not identifiable), gender, length of time for delivery of education to patients with ACS and T2DM, were collected. Pseudonyms were used in all qualitative data to represent individuals.

A semi-structured interview guide "helps make interviewing a number of different people more systematic and comprehensive by delimiting in advance the issues to be explored" (Patton, 2015, p. 439). A semi-structured interview guide has been prepared and is attached (see Appendix G, page 300) to help the researcher ask specific questions and use prompts to obtain more information or to clarify the points being made. The interview schedule was divided into an introductory section, a section on the current provision of health education to patients, and a third section on the experience of health professionals in the delivery of health education. The main topic is the current health education and strategies of delivering the education.

Qualitative interviews require that the interviewers asked open-ended questions, and be clear, listening, probing as appropriate, observing, being both empathic and neutral, making transitions between questions, and being prepared for the unexpected and be present throughout. At any time the researcher may reconsider which study questions are to be asked in order to follow the richness of any line of questioning and thereby best gather "rich" data. Prompts or probes are particularly important as they are used to obtain more information or to clarify the points being made. For example, following a response from a participant, the

researcher may ask, “can you give an example”, or “can you tell me more about this?” Interviewees were invited to provide additional information relevant to the topic.

(2) Education Content Checklist (ECC): The participants were provided with an education content checklist (see Appendix H, page 302) to assist them to consider all possible content considered to be health education. Details on the source of items for this checklist are provided within the following publication.

Findings from this qualitative study indicated the organisation of considerable content, being delivered relative to the stage of recovery of the patient from acute episode to returning to the community using a series of approaches and strategies. The methods and findings are fully described in the relevant publication (Liu, et al., 2018a), which is presented in the following section.

4.4 Study 1: Publication relevant to this thesis

Liu, X. L., Willis, K., Wu, C. J. J., Shi, Y., & Johnson, M. (2018a). ‘Better to save one life than build a seven-storied pagoda’: a qualitative study of health education for patients with acute coronary syndrome and type 2 diabetes mellitus in Shanghai, China. BMJ Open, 8(8), e019351.

'Better to save one life than build a seven-storied pagoda': a qualitative study of health education for patients with acute coronary syndrome and type 2 diabetes mellitus in Shanghai, China

Abstract

Objective: To describe, from the perspectives of health professionals, the health education currently being provided from hospital admission to discharge to home to patients who present with acute coronary syndrome who also have type 2 diabetes mellitus.

Methods: A qualitative study using semi-structured interviews was undertaken in the coronary care unit of a major hospital in Shanghai, China. Fifteen health professionals (nine registered nurses and six physicians) from the coronary care unit, who delivered health education to patients with acute coronary syndrome and type 2 diabetes mellitus participated. Participants also completed an education content checklist containing topics consistent with existing national guidelines.

Findings: Major themes identified included: Health education is an essential embedded component of treatment; Health education comprises varied strategies to facilitate behavioural change, and barriers and required resources to deliver effective health education.

Conclusions: Surviving the initial symptoms and providing immediate treatment is the first step in recovery for patients with acute coronary syndrome and type 2 diabetes mellitus. Health education is an essential component of the management of these patients, and content and focus that is responsive to the recovery stage of the patient is required. Teaching and supporting strategies appropriate for the inpatient phase, prior to discharging to the community phase are required.

Keywords: acute coronary syndrome, type 2 diabetes mellitus, health education, health professionals, China

Strengths and limitations of this study

- This is the first qualitative study to examine how health education is delivered to patients in China presenting with acute coronary syndrome who also have type 2 diabetes mellitus.
- The roles of health professionals, the delivered content and the teaching strategies used are defined and compared to international literature and key local and international guidelines for both conditions of acute coronary syndrome and type 2 diabetes mellitus.
- This exploratory study used an appropriate design, recruiting health professionals with varying roles and levels of experience, to ensure a broad understanding of how education is provided.
- The semi-structured questions, interviewing processes, and coding approaches, were verified by three of the investigators (two were bilingual in English and Chinese languages).
- This study has included nurses and physicians from one major hospital in Shanghai, China. Further research focusing on the patients' perceptions of the health education that is received and required is necessary to obtain a comprehensive understanding of this issue.

Introduction

Health education is the provision of learning and teaching experiences, designed to help people maintain or enhance their health or manage chronic conditions [1], often undertaken through interactions between health professionals and patients [2]. The central premise of health education interventions is that educating patients will enhance functionality, relieve symptoms, reduce physiological and psychological complications, and improve quality of life (QoL) [3], through long-term behavioural and lifestyle changes [4]. The challenge of delivering health education is particularly difficult when patients are experiencing two or more health conditions that may be synergistic or antagonistic in their effects. This study examines how health education is delivered to patients presenting with acute coronary syndrome (ACS) who are also experiencing type 2 diabetes mellitus (T2DM), conditions with similar risk factors, and where poorly controlled glucose contributes to coronary heart disease (CHD).

Health education has been recognized as an essential component of disease management for patients with CHD [5] and diabetes [6]. Inpatient education, following an acute episode of CHD, is critical [7]. The inpatient period after an ACS event is recognized as a "teachable moment" for education programs [8], as patients are more motivated to change their lifestyle after a critical cardiac event [9]. Health education for ACS patients has the potential to address lack of knowledge, increase patients' awareness of the threat or risk factors, promoting lifestyle changes and attention to taking medications [2].

However, knowledge itself does not always result in behavioural change [10]. The focus on behavioural change has resulted in a plethora of health behaviour theories to extend the value of health education beyond knowledge acquisition [4]. Many health behavioural theories have been applied to enhance the potential impact of health education programs to improve health status by encouraging compliance with treatment regimens and promoting behavioural changes [4 11]. The self-efficacy model, within SCT, is one of the most frequently applied theoretical frameworks in patient education [12]. The significant overlap between different theories or models, however, makes it difficult for health professionals to select the

appropriate framework, although many of these theories or models have been applied with considerable success [4 11].

A systematic review exploring the effectiveness of self-management programs for patients with T2DM after an ACS event (the focus of this study) included four trials [13]. The cardiac-diabetes self-management program (CDSMP) employed in three of the four included studies was developed according to the self-efficacy model that aimed to enhance patients' confidence level in managing these conditions within their daily life [14-16]. The CDSMP used four approaches —mastery, social modelling, verbal persuasion, self-appraisal — to improve patients' confidence level and self-management skills [9 14-16]. The fourth study used behavioural strategies such as goal setting — optimal HbA1C level, blood sugar level, lipid level, blood pressure, as well as optimal level of daily physical activity and psychological capacity [17].

Nurses and physicians play a central role in health education although tensions exist in fulfilling this role [18]. Nurses can identify patients' learning needs and styles, select specific content, choose teaching strategies and evaluate patients' learning [19]. Nurses potentially can play a lead role in health education but this is rarely achieved in practice [20]. An exploratory study reported that patient education in acute care settings was minimal and many available chances for patient education were missed due to nurses' busyness and lack of time [21]. Physicians also have a crucial role in educating patients and patients informed by their physicians are reported to be more satisfied with their care [22]. Similarly, multidisciplinary teams (including dietitians, pharmacists, psychologists, occupation therapist and social workers), have an important role to play in health education [3 23], with researchers noting that multidisciplinary teams provide more knowledge and experience as a collaborative and integrated team with each discipline taking an active role in the education process [24 25].

The acute inpatient period is an important time for ACS-T2DM patients from China to receive health education. In China, the health system is centralised to the acute hospital setting with a small primary care health sector [26]. Human resources for healthcare in China are distributed predominantly to hospitals that focus on inpatient care and treatment [27]. The service utilization of primary care facilities in China is very low compared with the acute hospitals [28].

Patients are expected to gain essential knowledge and skills to manage their health prior to returning to home. Limited research has studied the experiences of health professionals in China providing health education for ACS-T2DM patients.

Aim

The aim of this study is to describe, from the perspectives of health professionals from Shanghai, the health education currently being provided from admission to discharge to home to patients who present with ACS who also have T2DM.

Methods

The qualitative approach in this study can best be described as 'fundamental qualitative description' [29], appropriate for exploratory research where little is known about a research topic and where it is important to gain an understanding from the perspectives of those involved. Qualitative description is an interpretive approach that takes a naturalistic approach to the phenomenon under study, summarizes events and phenomena as perceived and described by the participants and offers a comprehensive summary in the everyday context of those events [29-31].

Using semi-structured interviews, we sought to both identify the main components of health education delivered to patients with ACS and T2DM and understand the perceptions of health professionals delivering the education. The use of semi-structured interviews ensured that understanding of the health education context was gained [32]. In addition to the interviews, participants completed an educational content checklist (ECC).

Setting and sample

Participants included purposively selected health professionals from the coronary care unit (CCU), of a major hospital in Shanghai, China. Health professionals (physicians and registered nurses) in the CCU, who routinely provided health education to ACS-T2DM patients, having one or more years of relevant experiences and willing to talk about their experiences in educating ACS-T2DM patients, were invited to participate. The investigator formally described the study to CCU staff and distributed participant information letters. Those interested in participating in

this study were asked to contact the researcher. Interviews were scheduled at a mutually convenient time and location to both the participant and researcher. See Fig. 1.

Interviews. Establishing rapport with the staff was important prior to conducting the interviews [33]. The lead author also spent considerable time (about four hours per day, for 10 days) in the CCU, interacting with the unit staff, prior to conducting the interviews. Semi-structured interviews included specific questions (see Interview Schedule, Appendix 1), and prompts to obtain more information, to clarify the points being made, or for participants to add additional information [34]. The items within the interview schedule were derived from an umbrella review conducted by the research team [35], with some modification following three initial interviews.

The interviews ranged from 16 to 47 minutes in length. Interviews were conducted until "data saturation" (where no new themes or ideas were identified) was achieved [36].

Educational content checklist (ECC). Topics on the ECC were based on national [37 38] and international guidelines [39-41], with the potential for up to 14 topics associated with routine health education for patients with ACS or T2DM, to be identified. Participants completed the ECC before the interview. The use of ECC prior to interview was to assist participants to consider the scope of educational content delivered to patients with ACS and T2DM.

Ethical considerations

This study received ethics approval from Human Research Ethics Committee (HREC), Australian Catholic University (2016-148R) and the Tenth People's Hospital of Tongji University (SHSY-IEC-3.0/16-20/01) in Shanghai where the study was conducted.

Data Analysis

With the permission of participants, interviews were digitally audio-recorded. The first five interviews were transcribed in full into Chinese and English by the researcher and coding, interviewing techniques, questions and coding tree were checked by all four authors. Two researchers were bilingual (Chinese and English [X-L L; C-JW]). The remaining interviews were transcribed into Chinese and coded by the author [X-L L] and checked by another bilingual author [C-JW]. Participants were asked to review their transcripts where there was a lack of

clarity about what was said in the interview. Further transcription into English of a subset of five nurses and five physicians was undertaken by a bilingual physician-researcher independent of the health service or researchers. Minor corrections in English interpretation were clarified.

Transcripts were organized using Nvivo11 (QSR International ™) [42]. Interview data were coded initially using an open coding process with codes entered into Nvivo11™. Data analysis adopted both deductive and inductive approaches to coding [43]. With some content pre-set by the ECC, it was appropriate to draw on this as the framework for coding the health education content described by participants. Content analysis using the frequency of the use of a specific code (medications, diet, exercise) and the proportion of text relating to specific codes were measured [44].

In addition, content analysis of the overall extent of content focused on specific diseases such as cardiac education was conducted. Comparisons between specific health professionals (nurse or physician) were enabled using this feature in NVivo11™ [42]. The inductive aspects of the analysis were derived from the narrative data from the health professionals' perceptions about health education, using a thematic analysis approach [45]. Open codes were defined as significant statements indicating the content of the health education program and how participants experienced their educational approach [46]. Following the open coding process, provisional categories were tagged, relationships between them investigated and themes identified.

Patient and Public Involvement

The researcher [X-L L] will send the published paper to the health professional participants by Email once the research findings are published (where participants have requested). Patients and/or the public were not involved in the study design or conduct. This study was related to health professionals only.

Findings

Participant characteristics

Participants comprised twelve females and three males ranging in age from 23 to 45 years old. Table 1 provides relevant characteristics of the participants.

Table 1. Demographic characteristics of participants (N=15)

Participants' number	Gender	Health professional type	Length of time delivering education (Years) [1]
Physician A	Female	Physician	10
Nurse A	Female	Registered nurse	15
Nurse B	Female	Registered nurse	10
Physician B	Male	Physician	8
Nurse C	Female	Registered nurse	6
Nurse D	Female	Registered nurse	4
Physician C	Male	Physician	10
Physician D	Female	Physician	4
Nurse E	Female	Registered nurse	4
Nurse F	Female	Registered nurse	17
Nurse G	Female	Registered nurse	1
Nurse H	Female	Registered nurse	14
Nurse I	Female	Registered nurse	6
Physician E	Female	Physician	10
Physician F	Male	Physician	22

1: Education relating to Acute Coronary Syndrome and Type 2 Diabetes Mellitus

Health education for patients with ACS and T2DM

Health Education Content

Educational content derived from the ECC completed by health professionals was linked to excerpts from health professionals' interview transcripts as illustrated in Table 2. All participants noted the importance of other professionals (such as dietitians) in teaching topics such as the diabetes disease process, and nutrition and diet.

Table 2. Educational content derived from checklist from health professionals (HPs) and excerpts from interviews

Topics from education content checklist	Interview data
Heart disease	**Nurses:** "*We need to talk about this disease [ACS] to this patient in my ward during our daily work, what's the situation of their disease*" (Nurse F) **Physicians:** *"First part is patients should understand the condition [ACS]….is to let the patient correctly understand this condition [ACS]."* (Physician D)
Diabetes disease process	**Nurses:** *"If the patients also have diabetes, we need to pay more attention to those patents, we would give them more knowledge about diabetes, and more specific education than other patients [without diabetes]"* (Nurse C) **Physicians:** "*We tell the patients that diabetes has a quite high morbidity and its complications are controllable with treatment.*" (Physician D)
Risk factors	**Nurses:** "*The [education] content, one is the risk factors of ACS, then the symptoms of ACS, as well as medication education……*" (Nurse G) **Physicians:** *"Some risk factors are avoidable, such as smoking, sedentary lifestyle and staying up late. In other words, there is something you can change……*" (Physician D)
Symptoms and their management	**Nurses:** "*For ACS patient, they firstly need to know their symptoms such as chest pain or chest tightness….*" (Nurse H) **Physicians:** "*If the patients have some symptoms, they need to come to the hospital immediately, such as having chest pain…*" (Physician A)
Medications	**Nurses:** *"Firstly regarding medications, ACS patients usually need to take some oral medications. Our education includes which oral anticoagulants are required, how long for them to be continued and what's the best time to take them."* (Nurse E) **Physicians:** *"Then they need to take medications regularly."* (Physician D)
Blood pressure management strategies	**Nurses:** *"Also for patients with hypertension, which is very common among ACS patients, they might think it is alright to adjust their own medications as changing dose or ceasing it by themselves. We must reinforce the long-term medication use, the importance of maintaining blood pressure stability by taking medications regularly and managing their own lifestyle."* (Nurse H) **Physicians:** *"For patients with hypertension, blood pressure control is mainly not too low or not too high, less than 90 mmHg /140mmHg or give patients a range."* (Physician B)
Blood sugar levels monitoring	**Nurses:** *"Diabetes patients need to monitor blood sugar level regularly by themselves. They need to know what to do when they have symptoms of low sugar level and have to visit doctors to adjust the medications if blood sugar level is too high [at home]."* (Nurse H) **Physicians:** *"We need to check their glycosylated hemoglobin at least every three months to six months. And fasting and after meal blood glucose levels needs to be recorded."* (Physician D)
Nutrition and diet	**Nurses:** "*Then regarding diet [for ACS patients], we need to tell patients to maintain light diet due to the vascular obstruction… And then [for diabetes patients] we also need to educate patients some information about diet. Are they allowed to take sugar-containing food? Now we tell these patients they can have diet with sugar but it must be in a certain limited amount.*" (Nurse E)

	Physicians: *"Regarding diet, a general brochure contains the content of food pyramid. We can't make it too complicated for our patients. I used to tell them about calories and calculations, which is appropriate in our wards and can be carried out by nutritionists. However I found it impossible to do the same thing in outpatient clinic. So later we looked into some research and oversea experience and decided to use the simple diet pyramid."* (Physician B)
Smoking cessation	**Nurses:** "*For example, there is a patient, yesterday I gave a brochure to him who is a long-term smoker, I told him many times that smoking needs to quit and for sure, smoking cessation was going to be a long and painful process, because the patient has smoked for decades.*" (Nurse G) **Physicians:** "*The second point is no smoking or to quit smoking."* (Physician D)
Physical activity/exercise	**Nurses:** *"We need according to the patients' specific conditions and the previous history of exercise. The amount of exercise, do not let them be breathing hard, chest tightness and something like that. There is a need to properly manage the intensity of exercise."* (Nurse I) **Physicians:** *"The patients need to have aerobic exercise rather than strenuous exercise."* (Physician D)
Return to work	**Nurses:** *"…avoid long-term tiring work, but work appropriately,."* (Nurse G)
Psychosocial issues	**Nurses:** *"Because there are a lot of patients were really struggling and contradictory in their mind. [For example], one patient paid lots of attention to his health condition. He felt like he wasn't going to make it this time so he needed to make a will. You need to tell him to follow what I say. Things would get at least gradually better day by day. I need to encourage and assist him with building up his confidence."* (Nurse H) **Physicians:** "*We want to encourage and assist them with building up their confidence because some patients become depressed knowing that they need to take medications for life long."* (Physician B)
Stress management	**Nurses:** *"He would be in a lot of stress if he knows he has had another [third] disease since he is diagnosed with ACS and T2DM, which would be more stressful if he can't accept the disease."* (Nurse H) **Physicians:** *"One of the aspects is the stress. The person needs to relieve his or her own stress."* (Physician D)
Acute and chronic complications	**Nurses:** *"Diabetes is a risk factor of ACS, So how to control blood sugar level is essential for the treatment of ACS. If your blood sugar level control is not good, it would lead to arteriosclerosis of coronary arteries, and may even cause reclogging after stent surgery."* (Nurse E) **Physicians:** *"Because diabetes is a chronic condition affecting vessels in the long term, which endocrinologist call it memory impairment. Actually, it is a chronic process. When complicated with other issues such as lipid dysfunction and high blood pressure, these risk factors can worsen status of arterial sclerosis and then trigger events like acute rupture of atherosclerotic plaques or thrombosis"* (Physician B)

Note: ACS = Acute Coronary Syndrome; T2DM = Type 2 Diabetes Mellitus.

The interviews revealed that three conditions were considered for health education and that these were interconnected: ACS, T2DM and hypertension. Physicians described these diseases, including coronary heart disease, T2DM and hypertension, as coming from "common soil" [Physician F], or arising from common risk factors. Most text related to cardiac education (59.4%), followed by diabetes education (28.6%), and to a much lesser extent both cardiac and diabetes (6.1%), hypertension education (4.0%), and both cardiac and hypertension (1.8%). Further exploration of the content highlighted differences between health professionals in the delivery of health education (see Table 3).

Table 3 Proportion of text describing specific educational topics within conditions for the health professionals

	Nurses	Physicians
Cardiac education	Lightly seasoned [low salt], not greasy [low fat] diet, 19%	Medications (such as anticoagulants), 17%
	Medications (such as anticoagulants), 17%	Lightly seasoned [low salt], not greasy [low fat] diet, 13%
	Progressive increase in exercise, 16%	Progressive increase in exercise, 11%
	Pre and post- interventional care as needed, 7%	Lifestyle changes, 11%
	Psychological burden (such as anxiety), 6%	Basic knowledge of ACS (including patients' health status), 9%
Diabetes education	Skill acquisition in relation blood glucose monitoring, 31%	Importance of blood glucose regulation (rather than skill acquisition), 27%
	Diet, 30%	Medications (by injection or orally), 24%
	Medications (by injection or orally), 20%	Diet regulation, 23%
	Appropriate exercise, 10%	Appropriate exercise, 10%
	Lifestyle changes, 7%	Diabetes complications, 6%

Note: Content analysis using NVivo was conducted. The proportion of text coded related to each content area, for each specific condition is presented.

Interview thematic analysis - health professionals' perceptions of health education

Three major themes and six sub-themes were identified (see Table 4).

Table 4. Themes and subthemes

Themes	Sub-themes
Health education is an essential embedded component of treatment	Priorities of care in the acute phase and long term management
	Ordering and sequencing of education content relative to recovery
Health education comprises varied strategies to facilitate behavioural change	Teaching approaches during acute care and community follow-up
	Behavioural strategies and psychological support tailored to educational content
Barriers and required resources to deliver effective health education	Time constraints
	Available resources at hospital, community, and national level

Theme 1: Health education is an essential embedded component of treatment

A key finding was that health education is integral to the acute care experience from admission to discharge into the community. Within this theme, two sub themes were evident.

Sub-theme 1: Priorities of care in the acute phase and long term management

Participants were initially concerned with supporting the patient to survive the acute episode of ACS that had necessitated their hospital admission. The need to focus on the immediate rather than the long term is encapsulated by one physician who stated:

> *"There is a saying in Buddhism that "Better to save one life than build a seven-storied pagoda" (Physician B).*

For physicians, the first step was to provide the interventions necessary (such as percutaneous coronary intervention [PCIs], intracoronary stents or coronary artery bypass graft [CABGs]) to save the patient's life in the acute phase of ACS.

However, health education that would support the patient's return to the community was also viewed as integral to acute care. For example, one physician emphasized the importance of long term care after the acute phase:

"Secondary prevention should be carried out after properly [being] treated in [the] acute phase. Long-term clinical experience tells us that I can only save a patient for the time being rather than forever. So the problem is to reduce the number of patients especially in long term [care]." (Physician B)

Sub-theme 2: Ordering and sequencing of education content relative to recovery

Participants described the organisation of considerable content, being delivered relative to the stage of recovery of the patient from acute episode to returning to the community. Health education initially focused on pre- and post- interventional care (intracoronary stents, PCIs or Coronary Artery By-pass Grafts [CABGs]) and medications with the dialogue commencing with health professionals in CCU. For example, Nurse H said:

"For patients undergoing percutaneous coronary intervention (PCI) and electrocardiogram (ECG) procedures, we would hand out these related brochures for them, particularly patients receiving PCI." (Nurse H)

As patients entered the sub-acute phase, physicians and nurses introduced disease knowledge related to ACS and T2DM. The use of a metaphor of streams supports the theme of inherent ordering of health education: *"[Health education was] from upstream to downstream." (Physician C).* Both physicians and nurses not only focussed on the ACS but also considered the patients' comorbidities, such as hypertension. Therefore, the health education needed for ACS-T2DM patients was comprehensive as described by a physician:

"A comprehensive treatment for chronic disease is necessary. So management is a good word in this circumstance. What we try to do is not only purely cure the disease but also comprehensive [disease] management." (Physician B)

Theme 2: Health education comprises varied strategies to facilitate behavioural change

Participants viewed health education and changing behaviour as complex and a series of approaches and strategies were described. Within this theme, two sub themes were identified.

Sub-theme 1: Teaching approaches during acute care and community follow-up

Acute care

Teaching approaches and the format of inpatient education for ACS-T2DM patients involved directly communicating with patients during the daily ward round as the most commonly used approach for the physicians (ward round education). One physician stated that:

"We teach the patients related knowledge during teaching ward rounds with medical students. Our patients can also ask questions during these ward rounds". (Physician B)

Nurses described providing routinized, face to face education on discharge: *"Our guidance for care after discharge is generally given before discharge" (Nurse E)*. But education was also described as integral throughout the whole process of acute care. Strategies such as powerpoint presentations (PPT) and education manuals were described as assisting new nurses when providing education for ACS-T2DM patients. Participants also described the use of WeChat — a very popular mobile application (app) used to provide education and ongoing support. Two nurses described the use of these educational tools to deliver consistent and comprehensive education:

"We have a "touch [PAD]", like a small computer, including the nurse station system and PPT to assist the new nurses to deliver health education if they do not know how to do it." (Nurse F)

Finally we have a WeChat account. We will ask them to scan our QR [Quick Response] code of our hospital. There is a lot of health knowledge in there, including some specialist outpatient service. (Nurse E)

Community follow up

Nurses described the telephone-based follow up call by CCU nurses to all patients two weeks after discharge. This telephone support focuses on the patient's condition at home and answering any questions raised by the patient. One nurse described the process:

"About five minutes (telephone follow up). We need [to] control the time. We don't have enough time if it takes too long. Five-minute follow up is able to give us a rough idea [about how the patient is].We might prolong a little if the patient shows some confusion on the phone. I would give him [or her] some advice if I can solve their problems, patients younger

than 60 years old and post percutaneous coronary intervention (PCI). We'll follow up twice." (Nurse E)

There were also examples of tools used to assist patients to regulate dietary intake after discharge. Participants referred to the Shanghai government public health measure of providing a spoon to measure and control sodium intake as a helpful tool for patients to achieve the optimal salt intake.

Physicians described organising some health lectures and health clubs for ACS patients, but these activities were not often, some being only 'once a month'. The health lectures and health clubs were based on patients' need as described by one physician:

".... small lectures run by me in our clinic are held about once a month. Some lectures are comprehensive while others are for small topics. Actually many patients are familiar with my topics, such as blood lipid, blood sugar, blood pressure, medication, exercise and diet. I will talk about them based on different patients' demand." (Physician B)

Sub-theme 2: Behavioural strategies and psychological support tailored to educational content

Education also comprising behavioural strategies, such as goal setting and psychological support were emphasised by both nurses and physicians in this study.

Goal setting to achieve optimal clinical targets

Effective regulation of blood glucose was one of the goals for disease management of ACS-T2DM patients. One physician described the need for patient awareness of the specific goals (and targets) to be achieved by ACS-T2DM patients:

"They know the exact goals for blood sugar, HbA1c, cholesterol level….. After they fully understand the goals, we can keep monitoring and it has shown great improvement in our analysis." (Physician B)

Using signs and symptoms of behavioural change that patients could easily understand and implement was prioritised by participants. They described how patients after experiencing ACS recover gradually and gradually increase physical activity. Thus providing simple measures such

as not 'breathing hard' to control the intensity of physical activity or exercise was useful. Indicative of this approach is Nurse G's statement:

"According to the classification of the heart function, if you exercise and then rest but cannot alleviate the uncomfortableness, then this exercise or work should not be done." (Nurse G)

Acknowledging and supporting psychological recovery

Psychosocial factors such as depression can worsen the prognosis of ACS. Participants described that patients after experiencing a cardiac event, have psychological issues such as hopelessness, feelings of fatigue or depression, when admitted to the critical care environment or after invasive interventions. One nurse discussed her role in relation to this:

"Because there are a lot of patients…. really struggling in their mind. …. one patient who cares so much about his health….he felt like he wasn't going to make it this time so he needed to make a will. You need to tell him to follow what I say. Things would get at least gradually better day by day. I need to restore his confidence" (Nurse H)

Family inclusion

For patients with limited ability to receive health information, health professionals identified family members who could receive the information and help patients to manage their conditions. For example, one nurse and one physician described providing educational materials or tools to patients' family members

"…under special circumstances, we will give the brochures to the family members to promote the health education." (Nurse G)

"We also attracted a lot of the patient's family members, and then he [the family member] comes here, sometimes also send a small medicine box to the family members…." (Physician B)

Theme 3: Barriers and required resources to deliver effective health education

Participants identified time constraints and the lack of resources at hospital, community, and national level as barriers that reduce the effectiveness of health education in the acute care setting.

Time constraints

While participants identified time as the most critical component of health education delivery, they also described being very busy with insufficient time for health education for patients. While physicians described providing some health information in the outpatient department, the need to see between 100 and 200 patients per morning limited the time available. One physician described the role conflicts that occur in this setting:

> *"Doctors are way too busy with teaching, scientific research and personal issues in spare time....We tertiary doctors can only use our spare time because we are very busy in work with surgery, rescue, ICU, ward work and teaching". (Physician B)*

Available resources at hospital, community, and national level

Participants also described a lack of infrastructure, arguing that ongoing support and funding required more community resources and greater national investment. Participants also described a lack of available educational resources. As indicated by Nurse B and Nurse E, these ranged from basic information brochures: *We do have [a] limited number of these pamphlets" (Nurse E)* to equipment such as TVs *"… what I need urgently now is a TV set of at least 42 inches." (Nurse B).*

Participants also described a lack of community resources in China. The relationship between the community physicians and the acute hospital physicians was identified as problematic with physicians noting differing opinions on care: *What patients are told by community doctors is different from what they are told in hospital (Physician B).* The lack of a national approach was identified as contributing to the problem: *Different opinions by different doctors might be a little related to personal understanding, but mostly because we don't have a unified guideline in China." (Physician B).*

Discussion

Both nurses and physicians were perceived as suitable educators for all topics, although the inclusion of dietitians in topics relating to diet and nutrition was proposed, although not currently practised. Participants selected specific content and teaching strategies according to patients' health conditions and reflected patients' progressive recovery. This finding is

consistent with earlier studies [18 19 22 47] where nurses and physicians play a central role in health education.

Delivering content reflective of patient recovery

Participants described the organisation of considerable content, being delivered relative to the stage of recovery of the patient from acute episode to returning to the community. This was best described with the 'upstream- downstream' metaphor (acute versus long-term) model. Most participants believed that the inpatient period after a cardiac event is a "teachable moment" for ACS patients with T2DM and education should commence during the acute phase. Inpatient education is recommended to begin after invasive intervention (where required) such as angioplasty or bypass surgery [48]. The provision of the majority of education within the acute inpatient phase was pronounced in this setting, potentially due to limited outpatient or primary care facilities [49].

Scope and range of content meeting guideline requirements

The extent of education content described by participants reflects most of the topics described in guidelines in China [37 38] and from other Western countries (Australia and USA) [39-41]. However, education for ACS-T2DM patients in this study was lacking in relation to sexual counselling as it was not mentioned by participants. There is a high prevalence of sexual dysfunction among patients with ACS and in one study only 17.3% of patients with coronary heart diseases received sexual information before discharge [50]. The possible reasons for this include: impaired communication between patients and clinicians, cultural factors and lack of privacy [50].

Behavioural theories and teaching approaches

The content of the health education was largely delivered in an unstructured manner although nurses did refer to using educational support tools (such as powerpoint presentations [Microsoft™] and education manuals) when they were less experienced with these conditions. An umbrella review confirmed the benefits of a theoretical framework and recommended the HBM, SCT and empowerment theories [36] should be applied to health education programs. There was no evidence of the use of theoretical frameworks to direct health education,

however, a series of behavioural and psychological strategies were described in these interviews, such as goal setting strategies. One aspect of strategy referred to by the participants was the use of a spoon to measure and restrict salt intake. The action relates to the national "limit-salt-spoons campaign" introduced in 2007 promoting the use of a small spoon to help Chinese residents to reduce salt in their diets to prevent hypertension [51] and the use of a teaspoon is also recommended by WHO for salt intake control [52].

Barriers to delivering effective health education

The most common barrier discussed was *constraints of time* to provide health education for ACS-T2DM patients. This is consistent with other studies [53] where participants have described being too busy and rushed to provide health education for patients. *Lack of resources at hospital, community, and national level* was the second barrier in this study. Community resources are inadequate and the articulation of services between the hospital and community remains limited in China [54]. The need for national consensus guidelines was identified as a possible solution to improving consistency in information dissemination to patients across the sectors.

Limitations

This study included 15 nurses and physicians from one major hospital in Shanghai, China, and the findings may not be representative of other health professionals or other CCUs within China. Further trials with defined health educational interventions, should be conducted, with continuous evaluation, to determine the effectiveness of specific teaching strategies, on disease and risk factor knowledge, clinical outcomes (blood glucose, HbA1C), modifiable risk factors (BP and lipid levels), self-management, psychosocial indicators (such as self-efficacy), as well as restenosis, readmission, and mortality rates in Chinese populations with ACS-T2DM. Further research should examine the perceptions of patients of the health education they receive or require.

Practice implications and future directions

This study has provided key insights into the current delivery of health education to patients with ACS and T2DM in China. The scope of the content currently being delivered was

appropriate with some select limitations such as sexual function. The educational content should be tailored to patients' specific disease status and responsive to the stage of recovery of the patient from acute illness to returning to the community. The use of a structured format, with prescribed teaching strategies, designed with the use of behavioural theories such as the SCT and HBM, is recommended. National consensus guidelines for health education for patients with ACS and T2DM are needed to deliver consistent information and guide practice from the acute to primary care health sectors.

Conclusions

Health professionals provided immediate treatment and were concerned with supporting the patient to survive the initial acute episode for patients with ACS and T2DM. Health education is a core part of the management of patients' with more than one health condition, and the content and focus should be responsive to the phase of recovery of the patient. Educational teaching methods and support strategies should be tailored for the admission or community follow-up phase. Further research capturing the patients' perspectives on health education is needed.

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References

[1]. de Melo Ghisi GL, Abdallah F, Grace SL, Thomas S, Oh P. A systematic review of patient education in cardiac patients: do they increase knowledge and promote health behavior change? Patient Educ Couns 2014;95(2):160-74.

[2]. Hoving C, Visser A, Mullen PD, van den Borne B. A history of patient education by health professionals in Europe and North America: from authority to shared decision making education. Patient Educ Couns 2010;78 (3):275-81.

[3]. Strömberg A. The crucial role of patient education in heart failure. Eur J Heart Fail 2005; 7(3):363-369.

[4]. Bellamy R. An introduction to patient education: theory and practice. Med Teach 2004;26(4):359-65.

[5]. Anderson L, Brown JP, Clark AM, Dalal H, Rossau HK, Bridges C, et al. Patient education in the management of coronary heart disease. Cochrane Database Syst Rev 2017; 6:Cd008895. doi: 10.1002/14651858.CD008895.pub3.

[6]. Coppola A, Sasso L, Bagnasco A, Giustina A, Gazzaruso C. The role of patient education in the prevention and management of type 2 diabetes: an overview. Endocrine 2016;53(1):18-27. Epub 2015/10/24. doi: 10.1007/s12020-015-0775-7.

[7]. Whitehead D, Wang Y, Wang J, Zhang J, Sun Z, Xie C. Health promotion and health education practice: nurses' perceptions. J Adv Nurs 2008;61(2):181-87.

[8]. McBride CM, Emmons KM, Lipkus IM. Understanding the potential of teachable moments: the case of smoking cessation. Health Educ Res 2003;18(2):156-70.

[9]. Wu CJJ, Chang AM, McDowell J. Perspectives of patients with type 2 diabetes following a critical cardiac event–an interpretative approach. J Clin Nurs 2008;17(5a):16-24.

[10]. McCluskey A, Lovarini M. Providing education on evidence-based practice improved knowledge but did not change behaviour: a before and after study. BMC Med Educ 2005;5(1):40.

[11]. Syx RL. The practice of patient education: The theoretical perspective. Orthop Nurs 2008;27(1):50-4.

[12]. John H, Hale ED, Bennett P, Treharne GJ, Carroll D, Kitas GD. Translating patient education theory into practice: developing material to address the cardiovascular education needs of people with rheumatoid arthritis. Patient Educ Couns 2011;84(1):123-27.

[13]. Tanash MaI, Fitzsimons D, Coates V, Deaton C. An evaluation of the effectiveness of self-management interventions for people with type 2 diabetes after an acute coronary syndrome: a systematic review. J Clin Nurs 2016; 26(11-12):1458-1472. doi: 10.1111/jocn.13487.

[14]. Wu CJJ, Chang AM, Courtney M, Kostner K. Peer supporters for cardiac patients with diabetes: a randomized controlled trial. Int Nurs Rev 2012;59(3):345-52.

[15]. Wu CJJ, Chang AM, Courtney M, Ramis MA. Using user-friendly telecommunications to improve cardiac and diabetes self-management programme: a pilot study. J Eval Clin Pract 2012;18(3):695-97. doi: 10.1111/j.1365-2753.2010.01621.x.

[16]. Wu CJJ, Chang AM, McDowell J. Innovative self-management programme for diabetics following coronary care unit admission. Int Nurs Rev 2009;56(3):396-99. doi: 10.1111/j.1466-7657.2009.00725.x.

[17]. Soja AMB, Zwisler A-DO, Frederiksen M, Melchior T, Hommel E, Torp-Pedersen C, et al. Use of intensified comprehensive cardiac rehabilitation to improve risk factor control in patients with type 2 diabetes mellitus or impaired glucose tolerance—the randomized DANish StUdy of impaired glucose metabolism in the settings of cardiac rehabilitation (DANSUK) study. Am Heart J 2007;153(4):621-28.

[18]. Svavarsdóttir MH, Sigurdardottir AK, Steinsbekk A. What is a good educator? A qualitative study on the perspective of individuals with coronary heart disease. Eur J Cardiovasc Nurs 2016;15(7):513-21.

[19]. Barber-Parker ED. Integrating patient teaching into bedside patient care: a participant-observation study of hospital nurses. Patient Educ Couns 2002;48(2):107-13.

[20]. Nolan J, Nolan M, Booth A. Developing the nurse's role in patient education: rehabilitation as a case example. Int J Nurs Stud 2001;38(2):163-73.

[21]. Twinn SF, Lee DT. The practice of health education in acute care setting in Hong Kong: an exploratory study of the contribution of registered nurses. J Adv Nurs 1997;25(1):178-85.

[22]. Terry PE, Healey ML. The physician's role in educating patients. A comparison of mailed versus physician-delivered patient education. J Fam Pract 2000;49(4):314-18.

[23]. Wood D, Kotseva K, Connolly S, Jennings C, Mead A, Jones J, et al. Nurse-coordinated multidisciplinary, family-based cardiovascular disease prevention programme (EUROACTION) for patients with coronary heart disease and asymptomatic individuals at high risk of cardiovascular disease: a paired, cluster-randomised controlled trial. Lancet 2008;371(9629):1999-2012. doi: 10.1016/S0140-6736(08)60868-5.

[24]. McAlister FA, Lawson FM, Teo KK, Armstrong PW. Randomised trials of secondary prevention programmes in coronary heart disease: systematic review. BMJ 2001;323(7319):957-62.

[25]. Funnell MM, Brown TL, Childs BP, Haas LB, Hosey GM, Jensen B, et al. National standards for diabetes self-management education. Diabetes Care 2009;32(Supplement 1):S87-S94.

[26]. Barber SL, Borowitz M, Bekedam H, et al. The hospital of the future in China: China's reform of public hospitals and trends from industrialized countries. Health Policy Plan 2013:czt023.

[27]. Deng F, Lv J, Wang H, et al. Expanding public health in China: an empirical analysis of healthcare inputs and outputs. Public Health 2017;142:73-84.

[28]. Zhou, Dong Y, Lin X, et al. Community health service capacity in China: a survey in three municipalities. J Eval Clin Pract 2013;19(1):167-72.

[29]. Sandelowski M. What's in a name? Qualitative description revisited. Res Nurs Health 2010;33(1):77-84.

[30]. Willis DG, Sullivan-Bolyai S, Knafl K, Cohen MZ. Distinguishing features and similarities between descriptive phenomenological and qualitative description research. West J Nurs Res. 2016;38(9):1185-204.

[31]. Neergaard MA, Olesen F, Andersen RS, Sondergaard J. Qualitative description–the poor cousin of health research? BMC Med Res Methodol. 2009; 9: 52. doi: 10.1186/1471-2288-9-52.

[32]. Patton MQ. Two decades of developments in qualitative inquiry: A personal, experiential perspective. Qual Soc Work 2002;1(3):261-83.

[33]. Doody O, Noonan M. Preparing and conducting interviews to collect data. Nurse Res 2013;20(5):28-32.

[34]. Welch A. Qualitative Research Design. In: Jirojwong S, Johnson M, Welch A, editors. Research methods in nursing and midwifery: Pathways to evidence-based practice. Oxford: Oxford University Press; 2011. p. 99-119.

[35]. Liu X-L, Shi Y, Willis K, et al. Health education for patients with acute coronary syndrome and type 2 diabetes mellitus: an umbrella review of systematic reviews and meta-analyses. BMJ open 2017;7(10):e016857.

[36]. Welch A. Sampling in qualitative research. In: Jirojwong S, Johnson M, Welch A, editors. Research methods in nursing and midwifery: Pathways to evidence-based practice. Oxford: Oxford University Press; 2011. p. 87-97.

[37]. Chinese Society of Cardiology of Chinese Medical Association. Chinese experts consensus on cardiac rehabilitation/secondary prevention for coronary artery disease. Zhonghua Xin Xue Guan Bing Za Zhi 2013;41(4):267-75.

[38]. Diabetes Association of Chinese Medical Association. Guideline of prevention and treatment for type 2 diabetes in China (2013 edition). Chin J Diabetes Mellitus 2014;30(10): 893-942.

[39]. Australia Diabetes. National Evidence Based Guideline for Patient Education in Type 2 Diabetes. Sydney: Diabetes Australia Guideline Development Consortium (DAGD). 2009. Available from: http://static.diabetesaustralia.com.au/s/fileassets/diabetes-australia/b9b8789d-c7ba-473d-bd49-0b7d793a0835.pdf

[40]. Amsterdam EA, Wenger NK, Brindis RG, Casey DE, Ganiats TG, Holmes DR, et al. 2014 AHA/ACC Guideline for the Management of Patients With Non-ST-Elevation Acute Coronary Syndromes A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. Circulation 2014;130(25): 2354-94. doi: 10.1161/Cir.0000000000000134.

[41]. Montalescot G, Sechtem U, Achenbach S, Andreotti F, Arden C, Budaj A, et al. 2013 ESC guidelines on the management of stable coronary artery disease. Eur Heart J 2013;34(38):2949-3003. doi: 10.1093/eurheartj/eht296.

[42]. QSR International, NVivo qualitative data analysis software, 2017. Available from: http://www.qsrinternational.com/.

[43]. Bradley EH, Curry LA, Devers KJ. Qualitative data analysis for health services research: developing taxonomy, themes, and theory. Health Serv Res 2007;42(4):1758-72.

[44]. Riff D, Lacy S, Fico F. Analyzing media messages: Using quantitative content analysis in research: Routledge; 2014.

[45]. Vaismoradi M, Turunen H, Bondas T. Content analysis and thematic analysis: Implications for conducting a qualitative descriptive study. Nurs Health Sci 2013;15(3):398-405.

[46]. Whitehead L. Qualitative Data Analysis. In: Jirojwong S, Johnson M, Welch A, editors. Research methods in nursing and midwifery: Pathways to evidence-based practice. Oxford: Oxford University Press; 2011. p. 141-61.

[47]. Svavarsdóttir MH, Sigurðardóttir ÁK, Steinsbekk A. How to become an expert educator: a qualitative study on the view of health professionals with experience in patient education. BMC Med Educ 2015;15:87. doi: 10.1186/s12909-015-0370-x.

[48]. Anchah L, Hassali MA, Lim MSH, Ibrahim MIM, Sim KH, Ong TK. Health related quality of life assessment in acute coronary syndrome patients: the effectiveness of early phase I cardiac rehabilitation. Health Qual Life Outcomes 2017;15(1):10. doi: 10.1186/s12955-016-0583-7.

[49]. Pan X, Dib HH, Wang X, Zhang H. Service utilization in community health centers in China: a comparison analysis with local hospitals. BMC Health Serv Res 2006;6(1):93.

[50]. Shi H, Zhang F, Zhu C, Wang S, Li S, Chen S. Incidence of changes and predictive factors for sexual function after coronary stenting. Andrologia 2007;39(1):16-21.

[51]. Liu Y, Li H, Hong S, Yin X. Salt reduction and hypertension in China: a concise state-of-the-art review. Cardiovasc Diagn Ther 2015;5(3):191-6. doi: 10.3978/j.issn.2223-3652.

[52]. World Health Organization: Guideline: Sodium intake for adults and children. 2012, Available from: http://www.who.int/nutrition/publications/guidelines/sodium_intake_printversion.pdf

[53]. Shen H, Edwards H, Courtney M, McDowell J, Wei J. Barriers and facilitators to diabetes self-management: Perspectives of older community dwellers and health professionals in China. Int J Nurs Pract 2013;19(6):627-35. doi: 10.1111/ijn.12114.

[54]. Bhattacharyya O, Delu Y, Wong ST, Bowen C. Evolution of primary care in China 1997–2009. Health Policy 2011;100(2-3):174-80. doi: 10.1016/j.healthpol.2010.11.005.

4.5 Summary

This Chapter presented the methods and findings for Study 1, a qualitative study of health education provided by health professionals for patients with both ACS and T2DM admitted to a major Shanghai hospital. The findings describe the content, intensity, and teaching strategies currently practiced by health professionals. The absence of a theoretical framework, the low intensity of the program (30 minutes), and the unstructured manner in which health education is delivered within the inpatient setting, provides increased opportunities to improve the health education within the inpatient setting and beyond. These findings also enable comparison with the optimal DSME programs outlined in the umbrella review presented in Chapter 2, where the recommended intensity is 10 contact sessions. Aspects of content recalled by health professionals suggest that most content is being delivered based on the available guidelines.

Examining the perceptions of health professionals has been informative, however, Chapter 5, will now present the perspectives of the patients themselves, within a complex mixed methods design, using multiple sources of data. This next Study 2a, will present the quantitative findings only and subsequent Chapters will present the integration of quantitative and qualitative data from the patients.

The next Chapter will examine the impact of current health education delivered during the acute admission of patients presenting with ACS and T2DM on key discharge outcomes (knowledge of diabetes, ACS symptom management, diabetes management self-efficacy and selected clinical outcomes).

Chapter 5 Study 2a: The impact of inpatient health education and its effects on the self-management and clinical outcomes of patients with acute coronary syndrome and type 2 diabetes mellitus admitted to a Shanghai hospital: A cross-sectional study in China

5.1 Study 2a: Introduction

The previous Chapter presented findings relating to current practices in relation to health education being delivered by health professionals to patients with acute coronary syndrome (ACS) and type 2 diabetes mellitus (T2DM). The perspectives from the health professionals are important, however, understanding how patients perceive the education they receive and how this affects key psychosocial factors derived from the modified conceptual framework based on self-efficacy are needed. This Chapter examines the influence of the education received on key psychosocial and clinical outcomes of importance to the immediate and long-term management of ACS and T2DM.

5.2 Study 2a: Research questions and hypothesis

(1) What is the impact of health education delivered during the acute admission of patients within a Shanghai hospital, presenting with ACS and T2DM, on outcomes of diabetes knowledge, attitudes of ACS symptoms management, diabetes management self-efficacy and clinical outcomes (such as fasting blood glucose levels)?

(2) What are the differences between selected outcomes for patients admitted to a Shanghai hospital who perceived they received limited or sufficient health education relating to ACS and T2DM management?

It is hypothesised, that health education received by patients with ACS and T2DM admitted to Shanghai hospital during an acute admission, (adjusted for age, gender, diabetes duration, length of admission) would improve:

(1) diabetes knowledge,

(2) ability to self-manage T2DM, and

(3) enhance ACS symptom management on discharge for patients with ACS and T2DM admitted to cardiovascular units in a Shanghai hospital.

5.3 Study 2a: Methods

5.3.1 Study 2a: Sample

An estimate of the difference between two groups was used to calculate the sample size required for the cross-sectional study that follows. This study adopted a convenience sampling strategy and the main reasons for choosing non-probability sampling was time, cost and the freedom of choice for the researcher allowing for easier access to participants (Welch, 2011b). The sample size for study 2 was estimated based on a power analysis comparing the differences between 2 groups of varying perceived education received. An education intervention previously reported with similar outcome measures as this study was used (ACS Response Index (ACSRI) for hospitalized ACS patients) (Buckley et al., 2007). The ACSRI knowledge score (Mean and SD) of the intervention and control group was 70.61±11.02 and 65.55 ±11.47. The effect size was 0.45, which indicates a small effect size (Cohen, 1992; Pencina, D'agostino, Pencina, Janssens, & Greenland, 2012). Thus, an estimated sample size of 180 patients was required to reach a power of 85% power for statistical analysis with a $P = 0.05$ using a two-tailed t test (See Figure 4), and includes 10% invalid response of the survey, with an effect size of 0.45 (Lakens, 2013).

The first 30, 50, 100 and 150 surveys were used to re-calculate the sample size more accurately within this sample. Finally, a sample of 160 patients with ACS and T2DM were recruited to the study, ie., 160 patients would answer 8/16 questions with adequate power (.80 or above) (see Appendix I, page 308). Note that for some variables measured in this study, it would not be possible to achieve the required sample within the timeframe of a normal thesis (7500 required). Critical clinical markers such as HbA1C required 135 participants.

5.3.2 Study 2a: Procedure

The procedure to be followed in Study 2a comprised 2 stages: recruitment and survey (includes patient health care records review). The processes involved in each stage are briefly outlined here. The researcher (X-L Liu) attended morning meetings in the cardiovascular unit, and

collected information about the number of patients with ACS and T2DM admitted to the CCU. The researcher (X-L Liu) contacted the Nurse Unit Manager to identify potential patients who met the criteria.

Staff were asked to distribute a letter to potential participants, with an explanation of the study (see Appendix J, page 309), requesting patients to participate. The researcher then contacted the Nursing Unit Manager and obtained advice on patients who were interested in participating. A Participant Information Letter (see Appendix D, page 292) was handed to patients with ACS and T2DM willing to participate in the study. This outlined the aims and methods of the study and the required activities for the participants. After written informed consent (see Appendix F, page 298) was obtained and the participants were reassured that the data were to remain strictly confidential, participants were given the survey to complete.

5.3.3 Study 2a: Data sources

(1) Survey: The survey included several scales all with Chinese language versions: Three scales (Appendix K, L and M, page 311-314). The survey also included a Visual Analogue Scale (VAS, Appendix O, page 321) seeking information on the educational experiences of patients. The survey was conducted one day before the patient was discharged from the hospital.

(2) Clinical outcomes: A patient health care record review tool (see Appendix N, page 315) was developed to assist data collection and to ensure consistency or uniformity in the data obtained. The patient health care record review was conducted after discharge. Items of data extracted from the records included: patient demographics (age, gender, marital status, smoking status and BMI), admission history, treatment, admission diagnosis, physical examinations, laboratory tests, hospital admissions, emergency unit attendances, previous ACS events and current medications. To gain entry to these areas of the hospital and access to the patient health care records for research purposes, verbal permission from authorized representatives of the cardiovascular units (Director) and the patient health care records department (Director) were obtained.

The tool was reviewed by three researchers, one a specialist in cardiovascular research. A pilot review of 10 patient health care records was conducted to modify the health care record review form and to determine what data were available for analysis. A supervisor based in China (Professor Yan Shi) provided support and completed an independent extraction of 10 key variables from 10 records. The data is reported in the following publication.

5.4 Study 2a: Description of study sample

Study 2a involved 160 patients who were admitted to the Coronary Care Unit (CCU) as an acute admission related to ACS who also had a diagnosis of T2DM. The majority were men (n = 110; 68.8%), with their duration of diagnosis with T2DM being from 0.5 to 30 years.

Perceived health education received: The median Visual Analogue Scale (VAS) score of diabetes education was 51.86 (scores ranging from 10 to 100) and median VAS score of heart disease education was 41.66 (scores ranging from 5 to 100). Only 30.63% of the participants (n = 49) identified having sufficient heart disease education (VAS score more than 50) and near half of the participants (n = 77, 48.13%) identified having sufficient diabetes education (VAS score more than 50).

Findings from this survey indicated that increasing scores for the ACS symptom management and diabetes management self-efficacy could be explained by higher scores for perceived health education based on the multiple regression analyses. Further results are presented in detail in the following relevant publication (Liu et al., 2018b) and this paper has been published to the Health Education Research.

5.5 Study 2a: Publication relevant to this thesis

Liu, X. L., Wu, C. J., Willis, K., Shi, Y., & Johnson, M. (2018b). The impact of inpatient education on self-management for patients with acute coronary syndrome and type 2 diabetes mellitus: a cross-sectional study in China. Health Education Research, 33(5), 389-401.

The impact of inpatient education on self-management for patients with acute coronary syndrome and type 2 diabetes mellitus: A cross-sectional Study in China

ABSTRACT

This study examined the impact of inpatient education on diabetes knowledge, acute coronary syndrome symptom management and diabetes self-management on discharge for patients with acute coronary syndrome and type 2 diabetes mellitus. A cross-sectional survey and patient health record review of 160 patients was conducted in a major hospital in Shanghai. Patient education received was measured using a visual analogue scale. The survey included valid and reliable measures of diabetes knowledge, self-efficacy, attitudes to acute coronary syndrome and clinical outcomes. Inpatient education contributed to improvements in fasting blood glucose on discharge (P <0.05). Acute coronary syndrome symptom management (C-ACSRI scores) and self-management of type 2 diabetes mellitus (C-DMSES scores) on discharge differed for the limited education group and sufficient education group (P < 0.001). Based on the multiple regression analyses, increasing scores for the C-ASCRI and C-DMSES could be explained by higher scores for perceived health education. Education relating to acute coronary syndrome and type 2 diabetes mellitus delivered during an acute admission was associated with improved scores in acute coronary syndrome symptom management and type 2 diabetes mellitus self-management, preparing some patients to manage both conditions on discharge.

Introduction

The prevalence of acute coronary syndrome (ACS) remains high, despite the reported decline of mortality rates for coronary heart disease (CHD) [1]. Diabetes is a strong independent risk factor for ACS [2, 3], with a two to four fold increased prevalence of ACS among patients with diabetes compared to those people without diabetes [4]. Approximately one-third of ACS patients also had diabetes or impaired glycaemic status (IGS) [5, 6].

In China, patients admitted with type 2 diabetes mellitus (T2DM) have also been frequently reported as having ACS (19.7%) [7]. The occurrence of ACS increased with age and with being male [7]. ACS patients with diabetes are reported as having higher rates of congestive heart failure and stroke, with increased rates of mortality, than those without diabetes in China [8].

Both ACS and T2DM share similar risk factors which contribute substantially to poor patient health status and health-related quality of life (HRQoL) [9]. Sedentary lifestyle such as low physical activity, obesity, smoking, and fast food intake are found to be associated with patients with ACS and T2DM [10]. Management of sedentary lifestyle and high blood pressure (BP), hyper- and hypo glycaemia, poor lipid control and obesity are frequently addressed by health education programs [11]. The health education programs for diabetes focus on reducing these and other risk factors [12].

There is limited research reported to date about ACS patients with T2DM (ACS-T2DM) education, although evidence is emerging [13]. A recent systematic review examining the effectiveness of self-management programs for people living with both ACS and T2DM found 4 relevant trials [13]. All the studies were conducted in an acute hospital setting with most participants being recruited from the cardiology departments such as a coronary care unit (CCU) [13]. All programs were delivered during the inpatient stay (4 trials) and post-discharge (4 trials). This cardiac-diabetes self-management program contained 3 × 30-minute, face-to-face education sessions with a booklet provided and with subsequent telephone calls and text messages or home visits [14-16]. The remaining study in the review did not describe the contact hours but reported 90 minutes of supervised exercise twice per week [17]. These programs were led by the registered nurses [14, 15], trained peers [18] or a range of professionals

including nurses, physicians, a podiatrist and an ophthalmologist [17]. All programs adopted at least two types of formats and commonly delivered one-to-one sessions within the healthcare setting [13].

China has a health system that is centralized to the acute hospital sector [19]. Contemporary reforms have focused on reconstructing the primary care system to shift utilization of health care services from hospitals to primary care facilities [19]. The results of these recent reforms in China aimed at improving access, quality and efficiency of primary care, are unclear [20]. Health education is the one of the main functions of community health centers within primary care, although Chinese people have limited awareness of the need for health education in relation to chronic conditions (31.8%) [21]. Additionally, patients may come from rural communities that have limited access to local primary care services for follow-up education after discharge, or the need to travel also reduces the opportunity for patients to receive education [22-24]. The acute admission period for patients with ACS-T2DM may provide the best opportunity to deliver effective education to these patients within acute settings within China.

A recent qualitative study of health professionals from a CCU within a Shanghai hospital, found that education is delivered during an acute admission for ACS-T2DM patients (Liu et al, under review). The education is delivered by physicians and registered nurses, and reflects the Western clinical guidelines [25-30] and Chinese guidelines [31, 32], for both the management of ACS and T2DM. The effectiveness of the inpatient health education currently being delivered to inpatients with both ACS and T2DM remains unclear. It may be that inpatient health education delivered at the best available opportunity for patients from Shanghai, does effect changes in the patients' ability to respond to symptoms of ACS and self-manage their diabetes.

Aim: This study examines the impact of health education delivered during the acute admission of patients within a Shanghai hospital, presenting with ACS and T2DM, on outcomes of diabetes knowledge, attitudes of ACS symptoms management, diabetes management self-efficacy and clinical outcomes (such as fasting blood glucose levels). In addition, comparisons between subgroups of patients with varying levels of education will be undertaken.

Methods

Study design

A correlational design was used to address the study aim. A cross-sectional survey and review of the patient healthcare records were conducted.

Setting and sample

The study was undertaken at the Tenth People's Hospital of Tongji University in Shanghai, with survey data collected prior to discharge, and clinical outcomes on discharge obtained after discharge from the patient healthcare record. Patients who were admitted to the cardiovascular units as an acute admission related to ACS who also had a diagnosis of T2DM were invited to participate. A non-probability sample of patients was included based on the following criteria: having ACS-T2DM, being over 16 years of age, able to understand, speak and write Mandarin Chinese. Patients with a severe debilitating medical or related condition such as persistent muscle spasms, significant cognitive problems or severe mental illness (determined through assessment by the CCU physicians) were excluded from the study.

Ethical considerations

Ethics approvals were provided by the Human Research Ethics Committee (HREC) of the Australian Catholic University (Number: 2016-148R) and the Tenth People's Hospital of Tongji University (Number: SHSY-IEC-3.0/16-20/01), Shanghai.

The researcher contacted the Nursing Unit Manager and obtained advice on which patients were interested and suitable to participate. A Participant Information Letter was given to all eligible and suitable patients. Further written informed consent was obtained from patients willing to participate. For those patients who were eligible but did not wish to participate (6/166, 3.61%) no further action was taken. After written informed consent was obtained and the participants were reassured that the data were to remain strictly confidential, participants were given the survey to complete. The Participant Information Letter and Consent Forms were written in both Chinese and English to assist all participants to give informed consent.

Data collection tools

Survey:

A Visual Analogue Scale (VAS) was developed with scores ranging from 1 (I have received little or no education) to 100 (I have received comprehensive education) for each of the health conditions ie., referred to as 'heart problems' and 'blood sugar problems'. A VAS is a psychometric response scale which can be used to visually represent a specific statement. Self-reported pain, quality of life and stress have all been measured using a VAS within large clinical trials [33, 34]. A VAS is a sensitive tool for measuring differences such as loss of ability in ACS patients [35]. A VAS scale is well understood and accepted by ACS patients and is easily completed by this group [36].

In addition, the survey consisted of three standardized scales relating to knowledge and self-efficacy.

Diabetes knowledge

The Chinese version of Diabetes Knowledge Scale (C-DKS) includes eight questions reflecting patients' knowledge about diabetes [37], with item responses ranging from 1 (low level of knowledge) to 8 (high level of knowledge). Internal consistency has been supported with a Cronbach's alpha of 0.70 [38].

Attitudes of ACS and diabetes management self-efficacy

The Acute Coronary Syndrome Response Index (ACSRI) includes items relating to patient's knowledge, attitudes, and beliefs about ACS symptoms. It was first developed for adult patients in Western countries [39]. The Chinese language version of the ACSRI (C-ACSRI) is a reliable and valid scale, with Cronbach's alphas reported for total scores, knowledge, attitudes, and beliefs as 0.81, 0.79, 0.87, and 0.71 respectively [40]. Only the attitudes subscale was included in this study.

The Chinese version of Diabetes Management Self efficacy Scale (C-DMSES) examines self-efficacy (confidence to undertake the required activities) towards disease management. Items from the scale include: blood sugar and feet check, nutrition, physical training and body weight,

and treatment. Acceptable internal consistency (Cronbach's alpha= 0.77 to 0.93) has been demonstrated [41].

Patient health care record review and clinical outcomes

A patient health care record review tool was developed to assist data collection and to ensure consistency or uniformity in the data obtained. The items in the tool were based on the discharge management of acute coronary syndromes (DMACS) e-DUE audit tools [42] and the literature [25, 43-47]. The tool was reviewed by three researchers, one a specialist in cardiovascular research. Inter-rater reliability was assessed with two of the authors extracting 10 key variables from 10 records resulting in a Kappa coefficient ranging from 0.77 to 0.89.

Data collection procedures

Nursing staff were requested to distribute an explanation of the study to all appropriate ACS-T2DM patients in the cardiovascular unit. Data collection was commenced after written informed consent was obtained and participants were requested to complete the self-administered survey. The survey included three Chinese language version scales (C-DKS, C-ACSRI and C-DMSES) and the VAS. The survey was conducted one day before patients was discharged from hospital, taking 20 to 30 minutes to complete. The patient health care record review and clinical outcomes data extraction was undertaken after patients were discharged.

Current education

The specific education delivered to this sample has been explored by these authors (Liu et al. 2018a). Education is often delivered as part of normal ward activity, for example nurses might answer patients' questions when they are doing some nursing tasks for patients (Liu et al, under review). Face-to-face teaching occurs, and patients are supplied brochures or pamphlets during admission or on discharge with telephone-based education and WeChat support (an online chat facility). Patients can scan the WeChat quick response (QR) code and then access the WeChat account that includes health information relating to ACS and T2DM on their inpatient and outpatient stage (Liu et al, 2018a). Education from nurses is mainly delivered 1 to 2 days prior to discharge and is usually of 20 mins duration (Liu et al, 2018a). The estimated total education time is 30 mins per patient. One telephone-based follow-up occurs for all

patients 2 weeks after their discharge. This telephone support is usually of 5-to-10 minute duration and focuses on the patient's condition at home and answering any questions raised by the patient (Liu et al, 2018a). Current education does focus on prescribed topics, and the topics reflect the content advised by existing Chinese guidelines (see Table 1) [31, 32]. The educational interventions reported in other trials (see Table 1) for ACS-T2DM patients included 1.5 hours of educational sessions within the inpatient stay with telephone calls and text messages or home visit during the follow-up period [14-16].

Table 1 Health education programs for ACS and T2DM patients in previous studies and this study

		Previous studies	This study [1]
Theoretical approach		Self-efficacy model [14, 15, 18] or unclear [17].	No.
Educational content		Knowledge of diabetes and cardiac conditions, developing basic skills of self-management such as monitoring blood glucose level [14, 15, 18], cooking lessons, exercise training, nutritional counselling, patient education, psychosocial support including a 24-hour telephone line, pharmacologic treatment, risk factor management and smoking cessation [17].	Blood glucose control, blood pressure control, bowel management, cholesterol management, disease knowledge related to ACS and T2DM, diabetes complications, diet, emergency coordination when having a cardiac event, emotional support, exercise, lifestyle change, medications for ACS and T2DM, pre and post operation education (percutaneous coronary intervention [PCIs], intracoronary stents or coronary artery bypass graft [CABGs]), psychological burden, management of risk factors of ACS and T2DM, managing symptoms of ACS, salt intake control, secondary prevention of ACS.
Health professionals to deliver		Registered nurses [14, 15], trained peers [18] or a range of professionals including nurses, physicians, podiatrist and ophthalmologist [17].	Physicians, registered nurses and medical students.
Teaching approaches	Strategies	Face to face (included interactive teaching sessions), booklet, telephone, text messages, digital video disc (DVD), and home visit.	Face to face, written materials, telephone contact, and WeChat.
	Format	Individual (One by one).	Individual (One by one) or mixed.
Delivery timing	Contact hours	Three 30 minutes educational sessions (total 90 minutes) [14-16, 18] or 90 minutes of supervised exercise training twice a week [17].	Estimated total education time 30 minutes.
	Duration	One week [14, 15, 18] or 6 weeks [17].	About 8 days (Mean time of hospital stay).
Duration of follow up		Four weeks [14, 15, 18] or 12 months [17].	Two to four weeks.
Settings		CCU, a physician/outpatient clinic or the patients' home.	CCU.

Note: ACS = acute coronary syndrome; T2DM = type 2 diabetes mellitus; CCU = Coronary care unit; C-ACSRI = Chinese version of Acute Coronary Syndrome Response Index; C-DMSES = Chinese version of Diabetes Management Self efficacy Scale; C-DKS= Chinese version of Diabetes Knowledge Scale; 1: Note this content has been fully described in a recent qualitative study (Liu et al, under review).

Data analysis

Data were analysed using Statistical Package for the Social Sciences (SPSSTM) Version 22. Univariate descriptive data were used for describing scale scores, Chi square-tests were used to compare differences between categorical variables, and independent t-test or the Mann-Whitney U test was used to determine the differences between continuous variables. A correlation matrix was conducted to determine key predictor variables, which was then followed by linear multiple regression analyses with backward elimination to examine the impact of perceived education on prediction of diabetes management self-efficacy, attitudes to ACS and fasting blood glucose level on discharge in this study. P values less than 0.05 were considered statistically significant.

The VAS scores for 'blood sugar' or 'heart' problems were recoded into two groups for comparison, ie., a cut-off point of 50 was taken with participants classified into a limited education group (≤ 50 score on VAS) and sufficient education group (> 50 score on VAS). This approach was previously used to classify knowledge into adequate or inadequate groupings for other samples [48].

Results

A total of 160 patients were included in the study, the majority being men (n = 110; 68.8%). The mean age was 66.29 years (SD 11.66 years). Patient characteristics as summarized in Table 2.

Differences in characteristics of patients with limited or sufficient ACS or diabetes education

The median VAS score for diabetes education was 51.86 (scores ranging from 10 to 100) and median VAS score for heart disease education was 41.66 (scores ranging from 5 to 100). The duration of diagnosis with T2DM was from 0.5 to 30 years and the mean time was 8.5 years (SD 6.11 years). Just over 30.63% of the participants (n = 49) were identified as having sufficient

ACS education and nearly half of the participants (n = 77, 48.13%) were identified as having sufficient diabetes education.

Table 2 Differences in patient characteristics associated with limited or sufficient health education relating ACS and diabetes

	All (N=160)	**VAS_ACS**		**VAS_Diabetes**	
		Limited ≤ 50, (N=111)	**Sufficient > 50, (N=49)**	**Limited ≤ 50, (N=83)**	**Sufficient > 50, (N=77)**
Participant age; Mean(SD)	66.29 ± 11.66	66.32 ± 11.73	66.24 ± 11.60	66.19 ± 12.45	66.40 ± 10.82
Participant gender; No. (%)					
Male	110 (68.8%)	71 (64.0%)	39 (79.6%)*****	53 (63.9%)	57 (74.0%)
Female	50 (31.3%)	40 (36.0%)	10 (20.4%)	30 (36.1%)	20 (26.0%)
Marital status; No. (%)					
Single	17 (10.6%)	13 (11.7%)	4 (8.1%)	9 (10.8%)	8 (10.3%)
Coupled	142 (88.8%)	97 (87.4%)	45 (91.8%)	73 (88.0%)	69 (89.7%)
Unclear	1 (0.6%)	1 (0.9%)	0	1 (1.2%)	0
Principal Diagnosis; No. (%)					
STEMI	65 (40.6%)	49 (44.1%)	16 (32.7%)	39 (47.0%)	26 (33.8%)
Non-STEMI	88 (55.0%)	58 (52.3%)	30 (61.2%)	42 (50.6%)	46 (59.7%)
Unstable Angina	7 (4.4%)	4 (3.6%)	3 (6.1%)	2 (2.4%)	5 (6.5%)
Length of stay (Days)	7.91 ± 3.31	7.75 ± 2.99	8.29 ± 3.95	7.89 ± 3.61	7.94 ± 2.98
Duration of diagnosis ofT2DM (Years)	8.50 ± 6.11	8.27 ± 5.86	9.01 ± 6.69	7.86 ± 5.45	9.19 ± 6.73
BMI	24.83 ± 3.16	24.61 ± 3.12	25.38 ± 3.22	24.83 ± 3.26	24.83 ± 3.09
Smoking status; No. (%)					
Never	85 (53.1%)	64 (57.7%)	21 (42.9%)*****	46 (55.4%)	39 (50.6%)
Current	57 (35.6%)	41 (36.9%)	16 (32.7%)	32 (38.6%)	25 (32.5%)
Former	17 (10.6%)	5 (4.5%)	12 (24.5%)	4 (4.8%)	13 (16.9%)
Unknown	1 (0.6%)	1 (0.9%)	0	1 (1.2%)	0
HbA1C (%); Admission	7.90 ± 1.75	8.01 ± 1.87	7.64 ± 1.39	8.38 ± 1.88	7.40 ± 1.45*****
Lipids (mmol/L) **;** Admission					
Total cholesterol	4.12 ± 1.18	4.30 ± 1.13	3.71 ± 1.20*****	4.25 ± 1.22	3.98 ± 1.12
Triglycerides	1.82 ± 1.03	1.83 ± 1.20	1.82 ± 0.95	1.72 ± 0.93	1.91 ± 1.12
HDL cholesterol	0.99 ± 0.28	1.03 ± 0.31	0.90 ± 0.18*****	1.01 ± 0.30	0.96 ± 0.26
LDL cholesterol	2.42 ± 1.02	2.54 ± 0.98	2.12 ± 1.04*****	2.52 ± 0.99	2.29 ± 1.03

VAS score, **Mean(SD)**	41.66±20.89	51.86±21.90

Note: ACS = acute coronary syndrome; T2DM= Type 2 Diabetes Mellitus; VAS=Visual Analogue Scale; VAS_Diabetes= Diabetes education measured by VAS; VAS_ACS= Heart disease education measured by VAS; STEMI = ST-elevation Myocardial Infarction; Non-STEMI = Non-ST-elevation Myocardial Infarction; BMI=Body Mass Index; HDL=High-density lipoprotein; LDL=Low-density lipoprotein. *: between high and low VAS scores *P* (2-tailed) <0.05.

Differences in clinical outcomes on discharge for patients with perceived sufficient ACS or diabetes education

For patients who perceived they received sufficient versus limited diabetes education, the FBG on discharge, and diastolic BP at admission were significantly lower in the sufficient education group than limited education group (*P* <0.05). Diastolic BP on discharge was increased slightly in the sufficient education group (*P* = 0.01). The C-ACSRI attitudes score showed a significant difference between the two groups (t=6.811, *P* < 0.001[2-tailed], n=160). Similarly, significantly higher diabetes management self-efficacy scores (as measured by the C-DMSES) were achieved in the sufficient education group (t=4.730, *P* < 0.001[2-tailed], n=154). Diabetes knowledge showed a significant difference between the two groups (t=4.109, *P* < 0.001[2-tailed], n=156). No other significant changes were observed between groups for clinical outcomes. Table 3 lists the details of all clinical outcomes in the four groups.

Table 3 Differences in perceived health education received (Limited versus Sufficient) and clinical and other outcomes on admission and discharge for patients with T2DM and ACS

Outcomes	VAS_ACS			VAS_Diabetes		
	Limited ≤ 50, (N=111)	**Sufficient > 50, (N=49)**	***P* value**	**Limited ≤ 50, (N=83)**	**Sufficient > 50, (N=77)**	***P* value**
	(Mean ± SD)	**(Mean ± SD)**		**(Mean ± SD)**	**(Mean ± SD)**	
DBP; Admission	80.77 ± 11.32	80.04 ± 13.76	0.728	82.37 ± 12.23	78.57 ± 11.67	**0.037***
DBP; Discharge	71.42 ± 11.70	74.39 ± 10.07	0.126	70.17 ± 11.67	74.66 ± 10.40	**0.010***
SBP; Admission	145.16 ± 21.10	140.96 ± 21.52	0.250	147.33 ± 23.95	140.14 ± 23.95	0.061
SBP; Discharge	127.38 ± 21.46	128.63 ± 14.28	0.709	127.19 ± 21.47	128.37 ± 17.25	0.471
FBG; Admission	9.81 ± 4.12 MR:81.26	9.44 ± 3.47 MR:77.08	0.599[M]	10.19 ±4.38 MR:86.26	9.16 ± 3.30 MR:73.16	0.073[M]

FBG; Discharge	8.26 ± 2.22	7.95 ± 1.78	0.394	8.64 ± 2.23	7.66 ± 1.82	**0.004***
C-ACSRI; Discharge	11.08 ± 2.31	13.85 ± 2.52	**< 0.001 ***			
C-DMSES; Discharge				115.03 ± 23.07	133.29 ± 26.21	**< 0.001 ***
C-DKS; Discharge				5.37 ± 1.64	6.23 ± 1.21	**< 0.001 ***

Note: ACS = acute coronary syndrome; T2DM= Type 2 Diabetes Mellitus; VAS=Visual Analogue Scale; VAS_Diabetes= Diabetes education measured by VAS; VAS_ACS= Heart disease education measured by VAS; FBG= Fasting Blood Glucose; SBP=Systolic Blood Pressure; DBP=Diastolic Blood Pressure; C-ACSRI = Chinese version of Acute Coronary Syndrome Response Index; C-DMSES = Chinese version of Diabetes Management Self efficacy Scale; C-DKS= Chinese version of Diabetes Knowledge Scale; An independent sample t-test or Mann-Whitney U was performed to assess whether there was difference between the two groups, *: between high and low VAS scores *P* (2-tailed) < 0.05; ᴹ: Mann-Whitney U was performed; MR: Mean Rank.

Modelling the impact of perceived health education on knowledge, self-efficacy and selected clinical outcomes on discharge

Predicting attitudes to ACS (symptom management) and the impact of health education

An initial correlation matrix identified relationships between ACS (measured by C-ACSRI) and VAS_ACS (r_s =0.541, *P* < 0.01.), and age (r_s -0.176, *P* < 0.05). Four variables were used in the analysis as predictors according to the results from the correlation matrix (Table 4). Within 3 steps in regression, 2 variables were removed (age and length of stay) which were not significant. Two predictors remained which significantly predicted attitudes to ACS and explained 34 % of the variance in the C-ACSRI scores, *F* = 42.32, *P* < 0.0001. Increasing scores for the C-ASCRI could be explained by gender (being male) and higher scores for perceived health education. In addition, length of stay was not significant and was removed in the final model.

Table 4. Regression modeling of predictors of Attitudes to ACS (C-ACSI scores) in patients with T2DM and ACS (N=159)

Variables used in first equation	**β's in first equation R^2 = 0.36 R^2 adjusted = 0.34**	**β's in final equation R^2 = 0.35 R^2 adjusted = 0.34**	**95% CI**
Age	-0.09		
Gender (Male)	0.11	0.14*	0.07, 1.56
VAS_ACS	0.55**	0.56**	0.06, 0.09
Length of stay	-0.03		

Note: ACS = acute coronary syndrome; T2DM= Type 2 Diabetes Mellitus; C-ACSRI = Chinese version of Acute Coronary Syndrome Response Index; VAS=Visual Analogue Scale; VAS_ACS= Heart disease education measured by VAS; *: significant at the 0.05 level (2-tailed); **: significant at the 0.01 level (2-tailed).

Predicting diabetes management self-efficacy and the impact of health education

An initial correlation matrix identified relationships between scores on C-DMSES and VAS_Diabetes (r_s = 0.340, P < 0.01). Similarly, the scores on the C-DKS and C-DMSES were positively related (r_s = 0.472, P < 0.01). The correlation between FBG on discharge and VAS_Diabetes was r_s = -0.217, P < 0.01, and the FBG on discharge was negatively correlated with scores on the C-DMSES (r_s -0.162, P < 0.05). FBG on discharge was also positively associated with length of stay (r_s= 0.156, P < 0.05).

Six variables were used in the analysis as predictors according to the results from the correlation matrix (Table 5). Within 4 steps in regression, 3 variables were removed (age, length of stay, duration of diagnosis of T2DM) with low standardized betas which were not significant. Three predictors remained which significantly predicted diabetes self-efficacy and explained 27% of the variance in the C-DMSES scores, F = 19.72, P < 0.0001. Increasing self-efficacy could be explained by gender, increased health education (higher VAS scores), and higher scores on the C_DKS. Perceived health education, although related to scores on the C-DKS (r = 0.345), did uniquely contribute to the variance explained with a standardized beta of 0.15 (correlation of 0.047). In addition, duration of diagnosis and length of stay were not significant and were removed in the final model.

Table 5. Regression modelling of predictors of Diabetes Management Self-efficacy (C-DMSES scores) in patients with T2DM and ACS (N=153)

Variables used in first equation	**β's in first equation R^2 = 0.29 R^2 adjusted = 0.26**	**β's in final equation R^2 = 0.28 R^2 adjusted = 0.27**	**95% CI**
Age	0.10		
Gender (Male)	0.16*	0.15*	0.70, 16.34
VAS_Diabetes	0.27**	0.27**	0.15, 0.50
C-DKS	0.37**	0.35**	3.59, 8.73
Length of stay	0.02		

Duration of diagnosis of T2DM	-0.06

Note: C-DMSES = Chinese version of Diabetes Management Self efficacy Scale; VAS=Visual Analogue Scale; VAS_Diabetes = Diabetes education measured by VAS; C-DKS= Chinese version of Diabetes Knowledge Scale; T2DM= Type 2 Diabetes Mellitus; *: significant at the 0.05 level (2-tailed); **: significant at the 0.01 level (2-tailed).

Discussion

This study investigated the effects of a relatively low intensity inpatient education program for Chinese patients with ACS and T2DM. This is a difficult time for patients who may be recovering from coronary angiography, percutaneous coronary intervention (PCIs) or intracoronary stents [49]. The current confidence in acute health care services of the Chinese population [19] and minimal primary care services, suggests that this acute phase may be a valuable time for education [21] or the only time available [50].

Perceived health education received

The VAS has provided a measure of the patient's perception of the education received. The median VAS score of diabetes education was 51.86 but more than half of the participants had a VAS score ≤ 50. In this sample the mean number of years since diagnosis of diabetes was 8.5 years, and therefore it could be assumed that education prior to this admission may have occurred during the many interactions with health professionals or previous admissions for diabetes-related complications that would have occurred.

The median VAS score of ACS education was 41.66, and only 30.6% of patients perceived they received sufficient education (VAS > 50). These results demonstrated that ACS patients with T2DM received some education although patients perceived that they required more. The variance explained in the C-ACSI score, within the modelling was substantial (34%) and did support the view that the perceived education (VAS_ACS score), was related to perceptions of being able to manage symptoms (C-ACSI score).

The education provided is of low intensity compared with other education programs, and perceived by patients, to be insufficient in relation to ACS education although not inclusive of the multidisciplinary team (only nurses and physicians delivered health education) [13].

Nonetheless, patients' perceptions of their ability to manage symptoms was high (mean score 13.85, SD 2.25), compared to other trials using more intensive educational interventions [51] with mean scores of ACSRI (ACS symptom management) from 8.7 (SD 3.2) to 13.0 (SD 1.7).

The impact of education on ACS symptom management and diabetes self-management

This study found that the inpatient education was related to enhanced knowledge and self-efficacy of T2DM for patients with ACS and T2DM. Our study's findings support previous studies [14-16, 18, 23, 52, 53] that have demonstrated that inpatient education improves knowledge of diabetes, self-efficacy in T2DM self-management and ACS symptom management and selected clinical outcomes of ACS and diabetes among ACS-T2DM patients.

As the purpose of health education is to prepare patients exiting the acute health care sector to self-manage their T2DM, and symptoms of ACS, two valid and reliable measures of these outcomes, validated in Chinese samples, were used. For ACS, the mean score of the attitude subscale of C-ACSRI was 13.85 (SD 2.25) in the *sufficient education group* of the sample on discharge compared to other trials (education intervention by cardiac nurses) conducted in inpatient cardiac wards [51] with mean scores of attitude of ACSRI from 8.7 (SD 3.2) to 13.0 (SD 1.7). Therefore, the form of education delivered to this sample has supported positive outcomes in terms of the patient's confidence and ability to manage ACS symptoms when sufficient education was noted.

For ACS symptom management (C-ACSRI scores) the impact of education was substantial with an exponential beta of 0.55 for perceived education received, with the addition of gender (being male) having a lesser effect (0.11). Once again, duration of diagnosis of T2DM, and length of hospital stay were not significant in the final model. Inpatient education is practical, adaptable and applicable to the clinical setting for patients with ACS. The inpatient education helps patients to manage symptoms when they occur [54]. ACS patients with poor knowledge, attitudes or beliefs about disease management, are more likely to have an increased length of hospital stay or poor prognosis [55].

The mean score of C-DKS was 6.23 (SD 1.21) in the *sufficient education group* of the sample on discharge, compared to other studies with more intensive education 90-minute inpatient education, with text messages and telephone follow-up, demonstrating a DKS from 4.2 (SD1.99) to 6.9 (SD 0.99) in the intervention group [16].

Similarly, the mean score for our sample for C-DMSES was 133.29 (SD 26.21) in the *sufficient education group* on discharge compared to other trials using educational self-efficacy programs of 6 hours duration where the DMSES scores were from 121.7 (SD 34.2) to 146.9 (SD 24.6) in the intervention group [53]. Further studies using similar content and follow-up have reported the DMSES scores of 134.6 (SD 31.48) to 161.3 (SD 28.57) in the intervention group [16]. Therefore, the form of education delivered to this sample has supported improved knowledge and perceptions that the patient can manage their diabetes on discharge, with this low intensity inpatient educational approach. Higher levels of self-efficacy may lead patients to adhere to better self-care practices and are likely to support disease management tasks [56]. Overall, we have provided evidence that in this sample within CCU in Shanghai, patients with sufficient education perceived they were adequately prepared to manage their symptoms and self-manage their diabetes at home.

The modelling for diabetes management (C-DMSES scores) demonstrated an exponential beta of 0.27 for perceived education received compared to 0.37 for diabetes knowledge (C-DKS score). Although these variables were related, prior knowledge of diabetes management is likely to have existed given the duration of T2DM was 8.50 years (SD 6.11years). Neither hospital length of stay, nor length of admission were significant, although there was a negative correlation for being female and C-DMSES scores.

This study has identified a positive relationship between increased health education and improvements in self-efficacy. This result demonstrated that health education provided information and knowledge about disease management to patients which in turn could enhance patient confidence to overcome barriers and accomplish a specific goal. Providing the essential information about the management for the diseases may improve diabetes patients'

level of confidence in their self-management skills, that is, skills to control glycaemia status and ability to perform the plan their diet, and exercise in their daily life [56].

The impact of inpatient education on clinical outcomes

For the two groups divided by diabetes education received (limited or sufficient), the patients with lower FBG and diastolic blood pressure in the *sufficient education group* compared well with the *limited education group*. Health education in any format can significantly improve glycemic improvement for Chinese patients [57]. Patients with diabetes who attend a health education program are more likely to follow the treatment recommendations, and education helps optimize glycemic improvement, reduce and manage complications, and improve quality of life in a cost-effective approach [58]. In addition, this sample was provided a standard diabetic diet during their hospital stay. This also has potential benefits, combined with anti-glycaemic agents [59] administered during the patient stay, to reduce the blood glucose levels on discharge.

Practice implications

The provision of health education was positively associated with improvements in self-management scores for both ACS symptoms and diabetes self-management. Patients with sufficient education perceived they were adequately prepared to manage their symptoms and self-manage their diabetes, or ACS symptoms at home, however, this represented only a small proportion of the total sample. The content and duration of education delivered in this critical care setting was relatively limited, requiring additional behavioural and psychosocial elements. Nonetheless, the education received by patients is associated with positive changes in key psychosocial and clinical outcomes. Additionally, there may be benefits to providing a formalised structured approach (defined content delivered by specific health professionals at specific times) with increased contact hours (10 hours). A theoretical approach could also support health behavioural change as has been demonstrated in other diabetes self-management education programs [14, 15, 18]. Physicians and registered nurses have provided the education for ACS-T2DM patients in this setting; the extension to include the multidisciplinary team may also enhance patient outcomes.

Limitations

The findings of this study may not be generalizable to other cultures or dissimilar health systems. This study does not provide evidence of cause and effect, rather an association between the perceived education received and key outcomes. The VAS and other self-report scales used in this study may under or over represent the true value of the score for the scale and the need for socially desirable scores to be reported may have influenced these data. However, clinical outcomes have also demonstrated positive effects. There was also no baseline data collected on behavioural or clinical outcomes, rather this study sought to evaluate existing educational practices.

Conclusions

Inpatient health education (even of low intensity, and lacking behavioural grounding) delivered during an acute admission has contributed to improved fasting blood glucose, and improved scores in ACS symptom management and diabetes management self-efficacy among patients with ACS and T2DM attending a Shanghai hospital. The findings of our study also showed that inpatient education related to T2DM and ACS delivered during an acute admission is associated with improved scores in ACS symptom management and diabetes self-management. The strength of the association between the perceived education received and ACS symptom management suggests that even the limited education delivered during acute admission with one to two telephone follow-up support calls, this education has impacted on the patients' ability to potentially manage their symptoms on discharge. For diabetes education, duration of diagnosis did not impact on diabetes management self-efficacy although existing diabetes knowledge was evident. Even in the presence of existing knowledge, there is still an impact on diabetes management self-efficacy from ongoing education being delivered during an initial or subsequent admission. Low intensity inpatient education has benefits for patients, although in this study, requiring increased emphasis on ACS symptom management, to adequately prepare patients for self-management in the home.

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References

1. Sanchis-Gomar F, Perez-Quilis C, Leischik R et al. Epidemiology of coronary heart disease and acute coronary syndrome. Ann Transl Med 2016; 13: 256. doi: 10.21037/atm.2016.06.33.

2. Cziraky MJ, Reddy VS, Luthra R, Xu Y, Wilhelm K, Power TP et al. Clinical outcomes and medication adherence in acute coronary syndrome patients with and without type 2 diabetes mellitus: a longitudinal analysis 2006-2011. J. Manag Care Spec Pharm 2015; 21: 470-477.

3. Giraldez RR, Clare RM, Lopes RD et al. Prevalence and clinical outcomes of undiagnosed diabetes mellitus and prediabetes among patients with high-risk non–ST-segment elevation acute coronary syndrome. Am Heart J 2013;165: 918-925.e2. doi: 10.1016/j.ahj.2013.01.005.

4. Emerging Risk Factors Collaboration. Diabetes mellitus, fasting blood glucose concentration, and risk of vascular disease: a collaborative meta-analysis of 102 prospective studies. Lancet. 375 (2010) 2215-22. doi: 10.1016/S0140-6736(10)60484-9.

5. Ahmed N, Kazmi S, Nawaz H et al. Frequency of diabetes mellitus in patients with acute coronary syndrome. J. Ayub Med Coll Abbottabad 2014; 26: 57-60.

6. Karamat MA, Raja UY, Manley SE et al. Prevalence of undiagnosed type 2 diabetes in patients admitted with acute coronary syndrome: the utility of easily reproducible screening methods. BMC Endocr Disord 2017;17: 3. doi: 10.1186/s12902-017-0153-y.

7. Duan JG, Chen XY, Wang L et al. Sex differences in epidemiology and risk factors of acute coronary syndrome in Chinese patients with type 2 diabetes: A long-term prospective cohort study. PLoS One 2015; 10: e0122031. doi: 10.1371/journal.pone.0122031

8. Yu L, Tan H, Zhu J et al. Clinical characteristics, treatments and outcome of diabetic patients with non-ST elevation acute coronary syndromes in China. Zhonghua xin xue guan bing za zhi 2011; 39: 390-396.

9. Uchmanowicz I, Loboz-Grudzien K, Jankowska-Polanska B et al. Influence of diabetes on health-related quality of life results in patients with acute coronary syndrome treated with coronary angioplasty. Acta Diabetol 2013; 50: 217-225. doi: 10.1007/s00592-011-0280-2.

10. Lakerveld J, Bot SD, Chinapaw MJ et al. Primary prevention of diabetes mellitus type 2 and cardiovascular diseases using a cognitive behavior program aimed at lifestyle changes in people at risk: Design of a randomized controlled trial. BMC Endocr Disord 2008; 24: 8:6. doi: 10.1186/1472-6823-8-6.

11. Ko G, Li J, Kan E et al. Effects of a structured health education programme by a diabetic education nurse on cardiovascular risk factors in Chinese Type 2 diabetic patients: a 1-year prospective randomized study. Diabet Med 2004: 21: 1274-1279.

12. Mampuya WM.Cardiac rehabilitation past, present and future: an overview, Cardiovasc Diagn Ther 2012; 2: 38-49. doi: 10.3978/j.issn.2223-3652.2012.01.02.

13. Tanash MaI, Fitzsimons D, Coates V et al. An evaluation of the effectiveness of self-management interventions for people with type 2 diabetes after an acute coronary syndrome: a systematic review. J. Clin Nurs 2017; 26: 1458-1472. doi: 10.1111/jocn.13487. Epub 2017 Jan 30.

14. Wu CJJ, Chang AM, Courtney M et al. Using user-friendly telecommunications to improve cardiac and diabetes self-management programme: a pilot study. J. Eval Clin Pract 2012; 18: 695-697. doi: 10.1111/j.1365-2753.2010.01621.x.

15. Wu CJJ, Chang AM, McDowell J. Innovative self-management programme for diabetics following coronary care unit admission. Int Nurs Rev 2009; 56: 396-399. doi: 10.1111/j.1466-7657.2009.00725.x.

16. Wu CJJ. Promoting self-management for patients with type 2 diabetes following a critical cardiac event: Queensland University of Technology; 2007.

17. Soja AMB, Zwisler A-DO, Frederiksen M et al. Use of intensified comprehensive cardiac rehabilitation to improve risk factor control in patients with type 2 diabetes mellitus or impaired glucose tolerance—the randomized DANish StUdy of impaired glucose metabolism in the settings of cardiac rehabilitation (DANSUK) study. Am Heart J 2007; 153: 621-628.

18. Wu CJJ, Chang AM, Courtney M et al. Peer supporters for cardiac patients with diabetes: a randomized controlled trial. Int Nurs Rev 2012; 59: 345-52. doi: 10.1111/j.1466-7657.2012.00998.x

19. Barber SL, Borowitz M, Bekedam H et al. The hospital of the future in China: China's reform of public hospitals and trends from industrialized countries. Health Policy Plan 2014; 29: 367-78. doi: 10.1093/heapol/czt023.

20. Bhattacharyya O, Delu Y, Wong ST et al. Evolution of primary care in China 1997–2009. Health Policy 2011; 100: 174-80. doi: 10.1016/j.healthpol.2010.11.005.

21. Pan X, Dib HH, Wang X et al. Service utilization in community health centers in China: a comparison analysis with local hospitals. BMC Health Serv Res 2006; 6: 93.

22. Yang S, Kong W, Hsue C et al. Knowledge of A1c Predicts Diabetes Self-Management and A1c Level among Chinese Patients with Type 2 Diabetes. PLoS One 2016;11: e0150753. doi: 10.1371/journal.pone.0150753.

23. Lou Q, Wu L, Dai X et al. Diabetes education in mainland China—A systematic review of the literature. Patient Educ Couns 2011; 85: 336-47. doi: 10.1016/j.pec.2011.01.006.

24. Wilson A, Gyi AA. The status and perspective of diabetes health education in China: inspiration from Australia. Int J Nurs Pract 2010; 16: 92-8. doi: 10.1111/j.1440-172X.2010.01817.x.

25. Australia Diabetes. National Evidence Based Guideline for Patient Education in Type 2 Diabetes. Sydney: Diabetes Australia Guideline Development Consortium (DAGD). 2009. http://static.diabetesaustralia.com.au/s/fileassets/diabetes-australia/b9b8789d-c7ba-473d-bd49-0b7d793a0835.pdf (accessed 16.08.28).

26. Health Queensland. Best practice guidelines for health professionals: outpatient cardiac rehabilitation. Brisbane 2003. http://www.healthinfonet.ecu.edu.au/key-resources/promotion-resources?lid=17436. (accessed 16.08.28).

27. Chew DP, Scott IA, Cullen L et al. National Heart Foundation of Australia and Cardiac Society of Australia and New Zealand: Australian clinical guidelines for the management of acute coronary syndromes. Med J. Aust 2016; 205: 128-133.

28. Amsterdam EA, Wenger NK, Brindis RG et al. 2014 AHA/ACC Guideline for the Management of Patients With Non-ST-Elevation Acute Coronary Syndromes A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines, Circulation 2014; 130: E344-E426. doi: 10.1161/Cir.0000000000000134.

29. Montalescot G, Sechtem U, Achenbach S et al. 2013 ESC guidelines on the management of stable coronary artery disease. Eur Heart J 2013; 34: 2949-3003.

30. Haas L, Maryniuk M, Beck J et al. National Standards for Diabetes Self-Management Education and Support. Diabetes Care 2013; 36: S100-S8. doi: 10.2337/dc13-S100.

31.Chinese Society of Cardiology of Chinese Medical Association. Chinese experts consensus on cardiac rehabilitation/secondary prevention for coronary artery disease. Zhonghua Xin Xue Guan Bing Za Zhi 2013; 41: 267-275.

32. Diabetes Association of Chinese Medical Association. Guideline of prevention and treatment for type 2 diabetes in China (2013 edition). Chin J. Diabetes Mellitus 2014; 30: 893-942.

33. Hjermstad MJ, Fayers PM, Haugen DF et al. Studies comparing Numerical Rating Scales, Verbal Rating Scales, and Visual Analogue Scales for assessment of pain intensity in adults: a systematic literature review. J. Pain Symptom Manage 2011; 41: 1073-93. doi: 10.1016/j.jpainsymman.

34. Machón M, Larrañaga I, Dorronsoro M et al. Health-related quality of life and associated factors in functionally independent older people. BMC Geriatr 2017; 17: 19.

35. Gencer B, Rodondi N, Auer R et al. Health utility indexes in patients with acute coronary syndromes. Open Heart 2016: 23: e000419. doi: 10.1136/openhrt-2016-000419.

36. Schweikert B, Hahmann H, Leidl R. Validation of the EuroQol questionnaire in cardiac rehabilitation. Heart 2006; 92: 62-67.

37. Wu C-JJ, Sung H-C, Chang AM et al. Protocol for a randomised blocked design study using telephone and text-messaging to support cardiac patients with diabetes: a cross cultural international collaborative project. BMC Health Serv Res 2013; 13: 402.doi: 10.1186/1472-6963-13-402.

38. Persell SD, Keating NL, Landrum MB et al. Relationship of diabetes-specific knowledge to self-management activities, ambulatory preventive care, and metabolic outcomes. Prev Med 2004; 39: 746-752.

39. Riegel B, McKinley S, Moser DK et al. Psychometric evaluation of the acute coronary syndrome (ACS) response index. Res Nurs Health 2007; 30: 584-594.

40. Cao X, Cao Y, Salamonson Y et al. Translation and validation of the Chinese version of the Acute Coronary Syndrome Response Index (C-ACSRI). Int J. Nurs Stud 2012; 49: 1277-1290. doi: 10.1016/j.ijnurstu.

41. Wu S-FV, Courtney M, Edwards H et al. Development and validation of the Chinese version of the Diabetes Management Self-efficacy Scale. Int J. Nurs Stud 2008; 45: 534-542.

42. National Prescribing Service. DMACS (discharge management of acute coronary syndromes) e-DUE (drug use evaluation) audit tools 2012. http://www.nps.org.au/health-professionals/cpd/activities/due-for-hospitals/discharge-management-of-acute-coronary-syndromes/dmacs-due/dmacs-e-due-audit-tool. (accessed 16.08.28).

43. Roffi M, Patrono C, Collet JP et al.2015 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation: Task Force for the Management of Acute Coronary Syndromes in Patients Presenting without Persistent ST-Segment Elevation of the European Society of Cardiology (ESC). Eur Heart J 2016; 37: 267-315. doi: 10.1093/eurheartj/ehv320.

44. Wu CJ, Chang AM. Audit of patients with type 2 diabetes following a critical cardiac event. Int Nurs Rev 2008; 55: 327-332. doi: 10.1111/j.1466-7657.2008.00636.x.

45. Fanaroff AC, Rymer JA, Goldstein SA et al. Does This Patient With Chest Pain Have Acute Coronary Syndrome? The Rational Clinical Examination Systematic Review. JAMA 2015; 314: 1955-1665.

46. Woodruffe S, Neubeck L, Clark RA et al. Australian Cardiovascular Health and Rehabilitation Association (ACRA) core components of cardiovascular disease secondary prevention and cardiac rehabilitation. Heart Lung Circ 2015; 24: 430-41. doi: 10.1016/j.hlc.

47. Ho PM, Lambert-Kerzner A, Carey EP et al. Multifaceted intervention to improve medication adherence and secondary prevention measures after acute coronary syndrome hospital

discharge: a randomized clinical trial. JAMA Intern Med 2014; 174: 186-93. doi: 10.1001/jamainternmed.

48. Abdo NM, Mohamed ME. Effectiveness of health education program for type 2 diabetes mellitus patients attending Zagazig University Diabetes Clinic. J. Egypt Public Health Assoc 2010; 85: 113-130.

49. Roffi M, Patrono C, Collet J-P et al. 2015 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation. Eur Heart J. 2015:ehv320.

50. Wu D, Lam TP. Underuse of Primary Care in China: The Scale, Causes, and Solutions. J. Am Board Fam Med 2016; 29: 240-247. doi: 10.3122/jabfm.2016.02.150159.

51. Singh D, Sukhbeer K, Ahmad A et al. Nurse-led intervention on knowledge, attitude and beliefs towards acute coronary syndrome. Nurs Crit Care 2016; doi: 10.1111/nicc.12240.

52. de Melo Ghisi GL, Abdallah F, Grace SL et al. A systematic review of patient education in cardiac patients: Do they increase knowledge and promote health behavior change?. Patient Educ Couns 2014; 95: 160-174. doi: 10.1016/j.pec.2014.01.012.

53. Ha M, Hu J, Petrini MA et al. The effects of an educational self-efficacy intervention on osteoporosis prevention and diabetes self-management among adults with type 2 diabetes mellitus. Biol Res Nurs 2014; 16: 357-367. doi: 10.1177/1099800413512019.

54. O'Brien F, McKee G, Mooney M et al. Improving knowledge, attitudes and beliefs about acute coronary syndrome through an individualized educational intervention: A randomized controlled trial. Patient Educ Couns 2014; 96: 179-187. doi: 10.1016/j.pec.2014.05.022

55. Mooney M, McKee G, Fealy G et al. A randomized controlled trial to reduce prehospital delay time in patients with acute coronary syndrome (ACS). J. Emerg Med 2014; 46: 495-506. doi: 10.1016/j.jemermed.2013.08.114.

56. Ku GMV, Kegels G. Effects of the First Line Diabetes Care (FiLDCare) self-management education and support project on knowledge, attitudes, perceptions, self-management practices and glycaemic control: a quasi-experimental study conducted in the Northern Philippines. BMJ Open 2014; 4: e005317. doi: 10.1136/bmjopen-2014-005317.

57. Choi TS, Davidson ZE, Walker KZ et al. Diabetes education for Chinese adults with type 2 diabetes: A systematic review and meta-analysis of the effect on glycemic control. Diabetes Res Clin Pract 2016; 116: 218-229. doi: 10.1016/j.diabres.2016.04.001.

58. American Diabetes Association. Standards of medical care in diabetes—2013. Diabetes Care 2013; 36: S11 -S66.

59. Clement S, Braithwaite SS, Magee MF et al. Management of diabetes and hyperglycemia in hospitals. Diabetes Care 2004; 27:553-591.

5.6 Internal consistency of instruments

The attitudes subscale of C-ASCRI and C-DMSES were found to have good internal consistency in this sample, with a Cronbach's alpha of 0.826 and 0.932, respectively. But C-DKS exhibited low internal consistency in this sample, with a Kuder-Richardson 20 (KR20) coefficient of 0.422 (Kuder-Richardson Reliability Analysis). C-ACSRI, C-DMSES and C-DKS have an overall cumulative variance contribution rate of 59.31%, 60.11% and 50.29%, respectively. See Appendix T1-3 (page 329-331).

5.7 Summary

This Chapter presented a cross-sectional study of 160 patients conducted in a major hospital in Shanghai. Patient education received was measured using a VAS, which allows participants more freedom to express a uniquely subjective experience from a set of categories (e.g., pain, anxiety and other subjective phenomena) compared to use of standardised scales. Therefore, VAS was selected because it provides a better measurement of perceived health education. The most important advantages of using a VAS are that it requires no specialist knowledge and is simple to use (Torrance, Feeny, & Furlong, 2001). The survey included valid and reliable measures of diabetes knowledge, self-efficacy, ACS symptom management and clinical outcomes. Inpatient education (even of low intensity, and lacking theoretical grounding) relating to ACS and T2DM delivered during an acute admission improved scores in ACS symptom management and T2DM self-management. The findings of the study supported the hypothesis of this study.

Only 30.63% of the participants (n = 49) were identified as having sufficient levels of heart disease education (VAS score > 50) and nearly half of the participants (n = 77, 48.13%) were identified having sufficient levels of diabetes education (VAS score > 50). A high proportion (131 of 160) of participants reported low self-efficacy in relation to managing ACS symptoms and 125 of 154 participants reported low diabetes self-management self-efficacy, or potentially that they may not be able to manage diabetes at home. Therefore, inpatient education was beneficial but not sufficient to deliver confidence to manage either diabetes or ACS in the entire sample. The recommendations resulting from this study have the potential to enhance

health education for patients with ACS and T2DM to improve their ACS symptom management and diabetes management self-efficacy.

Self-efficacy is proposed as a mediating variable, that is self-efficacy leads to behaviour change and then behaviour change leads to certain clinical outcomes. A cross-sectional study was conducted that did not support causal modelling or path analysis that could identify the role of self-efficacy as a mediating variable. In addition key outcome variables such as HbA1C were not available for the enactment of path analysis or structural equation modelling. Further research in similar clinical populations is recommended.

The next Chapter will explore, qualitatively, the experiences of patients with ACS and T2DM receiving health education during their acute admission period with research conducted during admission with a follow up interview on their return to the community.

Chapter 6 Study 2b: Patients' perceptions of the health education received during an admission to a Shanghai hospital relating to acute coronary syndrome and type 2 diabetes mellitus: A mixed methods study

6.1 Study 2b: Introduction

In the previous Chapter 4, the experience of delivering health education to patients with acute coronary syndrome (ACS) and type 2 diabetes mellitus (T2DM), was described, and the scope of the content delivered, the approach to delivering education was outlined by nurses and physicians. Chapter 5 also outlined the relationship between the health education received by patients, and other key concepts such as self-efficacy, and the relationship between education received, diabetes knowledge, and self-efficacy and key clinical outcomes was supported. Current health educational practices for patients with ACS and T2DM during their acute admission period were beneficial but not sufficient to deliver confidence to manage either diabetes or ACS at home in all patients.

This Chapter now presents a convergent, embedded, mixed methods study to explore using data integration, how health education influences self-efficacy and self-management abilities for patients with ACS and T2DM living in Shanghai (Study 2b). Self-management is a pivotal group of behaviours that potentially modify risk factors and complications for patients with ACS and T2DM. It was important to understand whether patients being discharged to home, believed they were able to display key health behaviours required for self-management on discharge and later within the community. Findings from a subset of participants (21/160) who completed the survey and two interviews are reported in this Chapter.

6.2 Study 2b: Research question

How does inpatient health education received by patients with ACS and T2DM admitted to a Shanghai hospital, influence patients' or individuals' self-efficacy, self-management and changes in behaviour, on discharge and at follow-up in the community based on patients' perspectives?

6.3 Study 2b: Methods

This study used a mixed methods approach, including survey, interviews, and patient health care record review to evaluate knowledge levels, self-management abilities, and risk factors associated with patients with ACS and T2DM in a Shanghai hospital. The qualitative component is made up to two interviews: one within the hospital and another follow up telephone interview with patients up to four weeks after discharge from hospital.

Study 2b focused on patients' perspectives on cardiac and diabetes health education and its effectiveness in increasing patient knowledge and awareness, improving abilities related to their self-efficacy, making changes to key ACS and T2DM outcome measures and broadening patients' experiences by their learning about cardiac disease and diabetes. A mixed methods approach allows for the varying methods to be applied to addressing these complex research questions (Lewis, 2011).

6.3.1 Study 2b: Procedure

This study comprised of two components: 1) survey and health record review (quantitative) and; 2) two semi-structured interviews (qualitative), 1 on discharge and 1 up to 4 weeks after discharge. The survey data were collected prior to discharge.

An item in the survey also asked participants if they were interested in being interviewed for 20 to 30 minutes at two later time points. If they agreed, another item requested information on when and where they would like to be interviewed. The investigator then contacted the participant to arrange a time suitable to the individual. Interviews were conducted at a mutually agreeable location in the hospital. Before interview participants were informed of aspects of the interview listed on the consent form (see Appendix F, page 298). Interviews were conducted before discharge from the hospital. A subsequent telephone interview was also undertaken four weeks after discharge to ask participants how they were managing at home. These two interviews were based on two semi-structured schedules (Appendix P, page 322 and Appendix Q, page 324).

6.4 Study 2b: Description of study sample and findings

Participants comprised of 18 males and 3 females ranging in age from 35 to 79 years old (M=60.6, SD=11.6), whose experience with T2DM ranged from 0.5 year to 20 years (M=7.7, SD=6.0). For the principal diagnosis, 13 participants were diagnosed with ST-elevation myocardial infarction (STEMI), 6 participants were diagnosed with non-ST-elevation myocardial infarction (Non-STEMI) and 2 participants were diagnosed with unstable angina.

Health education provided to this subgroup of patients with ACS and T2DM was limited and these patients demonstrated low self-efficacy for the management their health conditions. Participants' self-management was a dynamic and complex process. Lifestyle changes for patients with ACS and T2DM were often linked to their social environment. Participants also described that maintaining harmony was an important concept to understanding and managing their multiple health conditions. Further findings are presented in the relevant publication (Liu et al., 2018c). This paper has been submitted to Health & Social Care in the Community.

6.5 Study 2b: Publication relevant to this thesis

Liu, X. L., Willis, K., Wu, C-J (Jo)., Fulbrook, P., Shi, Y., & Johnson, M. (2018c). Preparing Chinese patients to manage their diabetes and heart disease at home: a mixed methods study. Manuscript submitted for publication in Health & Social Care in the Community.

Preparing Chinese patients to manage their diabetes and heart disease at home: a mixed methods study

Abstract

The aim of this study was to explore how health education received by patients with acute coronary syndrome and type 2 diabetes mellitus influences their self-efficacy and self-management and changes in behaviour at, and following, hospital discharge. This study used a convergent, embedded, mixed methods design. Twenty-one participants with completed surveys and two interviews were included in the analysis. Most of the participants (n = 17) did not perceive they had sufficient education or ability to manage both conditions. More concerning was that most participants (n = 16), reported low self-efficacy in management of acute coronary syndrome symptoms. Several major themes were identified: self-management of acute coronary syndrome and type 2 diabetes mellitus represented a complex interplay between individual self-efficacy and knowledge and skills, and how to manage the conditions with changing priorities; social environment was integral to lifestyle and behaviour change: developing good habits; and managing multiple health conditions requires body and mind systems harmony. The inpatient education received was not found to be supportive of participants' confidence to manage either condition on discharge. An unhealthy lifestyle was embedded within social roles and norms, but social activities, such as square dancing, was a positive socially influenced behaviour. Culturally-appropriate education for Chinese people with diabetes and acute coronary syndrome, should consider a focus on maintaining mind and body harmony. Family members should be involved in the formal education.

Keywords: health education; acute coronary syndrome; type 2 diabetes mellitus; mixed-methods study; China

What is already known about the topic?

- Health education is established as an essential component in the treatment of patients with ACS and T2DM with goals focusing on transforming risk.
- Self-management barriers include lack of knowledge, poor access to care, and inadequate contact with health professionals, as well as a lack of self-efficacy.

What this paper adds

- Patients with ACS and T2DM received limited health education and reported low self-efficacy.
- Self-management and behavioural changes among Chinese patients with ACS and T2DM were significantly influenced by individuals' health priorities, social environment, and cultural values.
- Healthy and unhealthy behaviours, that reduced or increased risk factors, were formed and sustained through social interaction and support within the local community.

Introduction

Patients presenting with multiple chronic conditions are frequently encountered within clinical practice; often experiencing poorer health outcomes than those with a single condition (Hung et al., 2011). Acute coronary syndrome (ACS) and type 2 diabetes mellitus (T2DM) frequently present as co-morbid diseases that require coordinated management and health education (Kasteleyn et al., 2014). Globally, the prevalence of T2DM in ACS patients ranges from one in four (Burke et al., 2017) to more than a half (Saleh et al., 2012). ACS patients with diabetes have more severe types of coronary lesions compared with those without diabetes (Paneni et al., 2013).

ACS and T2DM are often associated with similar or related risk factors including low physical activity, obesity, smoking, and high sugar and fat intake (Lakerveld et al., 2008). Health education is established as an essential component in the treatment of patients with ACS and T2DM with goals focusing on transforming risk factors by developing a healthy lifestyle, combined with self-management to achieve targeted clinical outcomes (Tanash et al., 2016). Education programs for ACS patients with T2DM attempt to increase patients' confidence and management skills rather than simply educating them about the disease process and value of healthy living (Wu et al., 2017).

Social cognitive theory emphasizes the importance of developing patient self-efficacy by supporting and sustaining self-management of chronic conditions (Jang and Yoo, 2012). However, low self-efficacy and multiple health conditions have been found to be barriers for active self-management or accessing self-management support resources (Fort et al., 2013). This is particularly relevant to patients with ACS and T2DM as previous research has identified concerns in the areas of self-efficacy and confidence (Wu et al., 2008). Patients may also experience a sense of hopelessness and fatigue after an ACS event (Wu et al., 2008).

Self-efficacy, or an individual's belief in their potential ability to manage their symptoms, can motivate them to overcome barriers to behavioural change (Mohebi et al., 2013) and higher levels of self -efficacy are associated with better attendance in cardiac rehabilitation (Fraser and Rodgers, 2012), increased maintenance of medication, diet and physical activity regimes and

are a predictor of future health status (Al-Khawaldeh et al., 2012, Ha et al., 2014). Furthermore, self-efficacy and self-management behaviour also directly impact glycemic regulation among T2DM patients (Lin et al., 2017).

Self-management is a common construct in patient education settings, and refers to patient engagement in activities related to medical regimen adherence, symptom monitoring, psychosocial regulation, and lifestyle change (Been-Dahmen et al., 2015). The successful self-manager takes responsibility, is knowledgeable, and active in using knowledge to make decisions related to their health (Ellis et al., 2017). For patients experiencing comorbid disease, the barriers to self-management include lack of knowledge, poor access to care, and inadequate contact with health professionals (Liddy et al., 2014), as well as lack of self-efficacy and social support (Murphy et al., 2015).

Diabetes self-management education (DSME) and support is proposed as the cornerstone of care and management for all people with diabetes and is necessary to prevent or delay complications (Powers et al., 2017). Similarly, ACS patients also require support during their cardiac rehabilitation and recovery period, particularly when discharged from hospital (Guo and Harris, 2016). Earlier pilot studies suggest that cardiac-diabetes self-management (CDSM) programs may improve knowledge, self-efficacy and self-management behaviors among T2DM patients following an ACS event (Wu et al., 2012a, Wu et al., 2012b), but further research is required.

The challenge for individuals to manage comorbid disease is substantial (Tanash et al., 2016), and may require a re-evaluation of their health goals and self-management needs (Kasteleyn et al., 2014). Lifestyle guidelines and recommendations provided to T2DM patients following an ACS event are often presented separately for each disease and not tailored to comorbid disease (Wu et al., 2011). When discharged from hospital, this can cause confusion and uncertainty regarding disease management priorities and strategies for patients with comorbid disease (Liddy et al., 2014).

Within China, health education is provided principally during the acute hospital admission with limited support provided within the community. Current education focuses on prescribed topics that reflect the content advised by existing Chinese guidelines (Chinese Society of Cardiology of Chinese Medical Association, 2013, Diabetes Association of Chinese Medical Association, 2014). However, there has been little research investigating patients from the inpatient experience into the community (Twinn and Lee, 1997) and little is known about the influence of health education on self-efficacy and self-management of patients with comorbid ACS and T2DM (Tanash et al., 2016).

AIM

The aim of this mixed methods study was to explore how inpatient health education received by patients with ACS and T2DM, influenced their perceptions of self-efficacy, self-management and behaviour changes, on discharge and at follow-up in the community.

Methods

Design

This study used a convergent, embedded, mixed methods design (Fetters et al., 2013) comprised of two components: a quantitative survey and health record review and qualitative interviews (see Figure 1). To ensure consistency survey and interview data were collected by a single researcher.

The research was approved by the relevant university and hospital human research ethics committees (2016-148R; SHSY-IEC-3.0/16-20/01) and was conducted in accordance with ethical principles set out in the Helsinki Declaration.

Setting and sample

The study was conducted at a major hospital in Shanghai, China. The inclusion criteria were: diagnosis of ACS and T2DM, over eighteen years of age, and able to understand, speak and write Mandarin Chinese. Patients with severe debilitating medical or related conditions, for example physician-diagnosed persistent muscle spasms, cognitive problems or severe mental

illness were excluded. The initial survey comprised a non-probability sample of 160 participants. Of these, twenty-one participants were also interviewed.

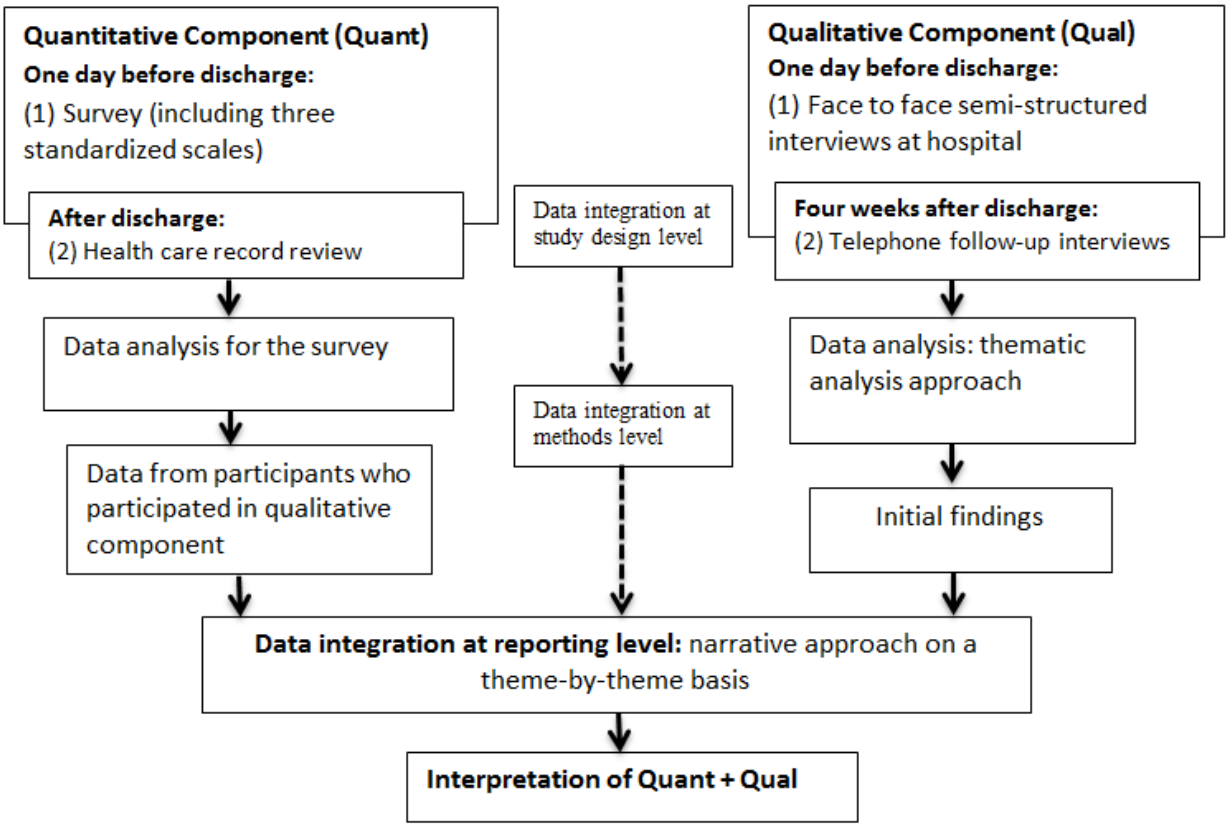

Fig. 1. Flow chart of the implementation of a convergent mixed methods design for this study.

Note. QUAL = Qualitative study; Quant = Quantitative; VAS = Visual Analogue Scale. Adapted from: Lewis, J. (2011). Mixed methods research. In S. Jirojwong, M. Johnson, & A. Welch (Eds.), Research methods in nursing and midwifery: Pathways to evidence-based practice (pp. 268-285). Oxford: Oxford University Press.

Survey instruments

Surveys: Within the survey, perceptions of education that had been received were measured using a visual analogue scale (VAS) ranging from 1 (little or no education) to 100 (comprehensive education). Diabetes knowledge was measured using the Chinese version of

Diabetes Knowledge Scale (C-DKS); self-efficacy was measured using the Chinese versions of the Acute Coronary Syndrome Response Index (C-ACSRI) (attitudes subscale only) and the Diabetes Management Self-Efficacy Scale (C-DMSES). All scales demonstrate satisfactory reliability and validity (Liu et al., 2018).

Interviews

The interviews were conducted using semi-structured schedules (see Appendices 1 and 2) to ensure participants' focus on perceptions of the education they had received, their understanding of their conditions and management, and their perceptions of actual or expected behavioural change associated with their comorbid disease. The telephone interview focused on how participants were managing their health conditions at home.

Patient health care record review

A patient health care record review tool was developed to assist data collection after participants were discharged from hospital. Inter-rater reliability was satisfactory and is described in previously reported cross-sectional survey (Liu et al., 2018).

Procedures

Following initial consent, participants were invited to complete the self-administered survey, which was administered one day before hospital discharge. An item in the survey asked participants to express interest to be interviewed for the study. If so, they were invited to participate in a semi-structured interview conducted prior to discharge, followed by a telephone interview up to four weeks later.

Initial interviews were conducted at a mutually agreeable location within the hospital, and ranged from 16-47 minutes. The follow-up telephone interviews were somewhat shorter (range 4-22 minutes). During the interview, notes on important points were taken. Interviews were conducted until data saturation was achieved i.e., when no new themes or ideas were identified (Welch, 2011). All interviews were conducted by a male registered nurse researcher, fluent in Mandarin Chinese. They were digitally audio recorded, and transcribed verbatim.

Data analysis

Quantitative data were analysed using the Statistical Package for the Social Sciences (SPSS™) Version 22. Descriptive statistics were used to describe demographic variables and responses on different scales. A cut-off point of 50 scores on the VAS for health education was taken with participants classified into received limited (≤ 50) or sufficient (> 50) education. A cut-off point of 4 was used to classify participants with inadequate (≤ 4) or adequate (> 4) diabetes knowledge (range 0-8), which has been used previously (Abdo and Mohamed, 2010; Williams et al., 1998).

For the purposes of providing meaningful groups for data integration, participants were classified into a high (≥ 15) or low (< 15) level of ACS symptom management self-efficacy (range 0-20). Similarly, cut-off points of 150 were taken with participants classified into high (≥150) or low (<150) level of diabetes self-management self-efficacy (maximum score 200). Similar approaches have been used previously (Nyunt et al., 2010).

The first five interviews, including five face to face interviews and five telephone-based follow-up interviews were transcribed in full in Chinese and translated into English. The remaining interviews were transcribed and coded in Chinese and were validated by a second bilingual researcher. Regular meetings with all researchers enabled questioning of any potential assumptions.

Interviews data were analysed using thematic analysis (Castro et al., 2010; Vaismoradi et al., 2013). Initially, an open coding process was used, with codes entered into NVivo 11 (QSR International, 2017). Use of NVivo software enabled integration of qualitative and quantitative data (Fielding, 2012) by systematically matching interview data to demographic data and information from survey responses.

Data integration

At the study design level, qualitative data were embedded in, or linked with, quantitative data. At the methods level, a merging approach was used to bring the two databases together for analysis and comparison (Creswell et al., 2011). Qualitative data were collected drawing on

parallel questions included in the three standardized scales (Fetters et al., 2013). At the level of interpretation and reporting, two kinds of data were compared, participants' responses to the scales with their interview transcript (Castro et al., 2010). Finally, a narrative approach was used to report integrated quantitative and qualitative results on a theme-by-theme basis (Fetters et al., 2013).

Results

Participant characteristics

Quantitative data were utilized from a sub-set of 18 males and 3 females that completed the initial survey and participated in the interviews. Participants ranged in age from 35 to 79 years, and had been diagnosed with T2DM for between 0.5 to 20 years (See table 1).

Table 1 Demographic characteristic of participants

	N (%)	Mean ± SD
Gender		
Female	3 (14.3)	--------
Male	18 (85.3)	
Age (years)		
35-44	3 (14.3)	
45-54	2 (9.5)	
55-64	8 (38.1)	60.6 ± 11.6
65-74	6 (28.6)	
75-84	2 (9.5)	
Diagnosis		
NSTEMI	12 (57.1)	
STEM	7 (33.3)	
Unstable angina	2 (9.5)	
Hypertension	17 (81.0)	--------
Hyperlipoidemia	3 (14.3)	
Atrial Fibrillatio	2 (9.5)	
Artificial Knee Joint	1 (4.8)	
Hepatic adipose infiltration	1 (4.8)	
Diagnosed with T2DM (years)		

0-5		
6-10	10 (47.6)	
11-15	5 (23.8)	7.7 ± 6.0
16-20	4 (19.0)	
	2 (9.5)	
BMI (kg/m^2)	--------	median, 25.1; IQR, 23.7 to 29.9 (BMI from one participant missing)
HBA1C (%)	--------	7.8 ± 1.7 (HBA1C from one participant missing)
LDL (mmol/L)	--------	2.3 ± 0.9 (LDL from two participant missing)
C-ACSRI (Total 20)		
< 15	17(81.0)	12.7 ± 2.7
≥15	4 (19.0)	
C-DKS (Total 8)		
< 4	0	median, 7; IQR, 6 to 7
≥4	21 (100.0)	
C-DMSES (Total 200)		
< 150	13 (61.9)	137.2 ± 34.1
≥150	8 (38.1)	
VAS Scores (BL)	--------	58.3 ± 24.8
VAS Scores (HD)	--------	47.1 ± 27.2

NOTE: SD=standard deviation; NSTEMI = Non-ST-elevation Myocardial Infarction; STEMI = ST-elevation Myocardial Infarction T2DM= Type 2 Diabetes Mellitus; BMI=Body Mass Index; HbA1c = Hemoglobin A1c; C-ACSRI = Chinese version of Acute Coronary Syndrome Response Index; C-DKS = Chinese version of Diabetes Knowledge Scale; C-DMSES = Chinese version of Diabetes Management Self efficacy Scale; LDL = Low-density lipoprotein cholesterol; visual analogue scale=VAS; BL= education relating to blood sugar problems; HD = education relating to heart disease; IQR = interquartile range.

Connecting perceived health education, knowledge to perceived self-management self-efficacy

In order to understand the experiences and perspectives of participants with high and low self-efficacy or sufficient and limited health education, the participants were divided into eight groups (see Table 2): only 4 participants (A, B, E, J) (in Group 1 and Group 5) reported both receiving sufficient education (VAS score > 50) and believed they had high self-management self-efficacy in both ACS and diabetes. These data were then integrated within the major themes identified through the qualitative analysis (included in the indicative quotes provided).

Arbitrary cut off points were selected based on the distribution of the data and other existing literature (Abdo & Mohamed, 2010).

Table 2 Grouping of the participants

	ACS related self-efficacy			Diabetes related self-efficacy	
	Scores	**Patient**		**Scores**	**Patient**
Group 1	High self-efficacy (C-ACSRI score ≥15) with sufficient cardiac education (VAS score > 50)	A, B, E, J	**Group 5**	High self-efficacy (C-DMSES score ≥150) with sufficient diabetes education (VAS score > 50)	A, B, E, F, G, J, K, O, Q
Group 2	High self-efficacy (C-ACSRI score ≥15) with limited cardiac education (VAS score ≤ 50)	O	**Group 6**	High self-efficacy (C-DMSES score ≥150) with limited diabetes education (VAS score ≤ 50)	
Group 3	Low self-efficacy (C-ACSRI score < 15) with sufficient cardiac education (VAS score > 50)	F, I, L, Q, R	**Group 7**	Low self-efficacy (C-DMSES score < 150) with sufficient diabetes education (VAS score > 50)	I, L, M, R, S, T
Group 4	Low self-efficacy (C-ACSRI score < 15) with limited cardiac education (VAS score ≤ 50)	C, D, G, H, K, M, N, P, S, T, U	**Group 8**	Low self-efficacy (C-DMSES score < 150) with limited diabetes education (VAS score ≤ 50)	C, D, H, N, P, U

Thematic analysis with data integration

Three major themes and seven subthemes were identified (see Table 3).

Table 3 Themes and subthemes

Themes	Sub-themes
Self-managing ACS and T2DM was a complex interplay between individual self-efficacy, and knowledge and skills about how to manage the conditions within changing priorities (n=21)	Optimal self-management is difficult to attain and maintain requiring knowledge of disease and health threat, and prioritizing of treatment and healthy behaviours, often with no symptoms
	Strong desire to live longer and well and manage their diabetes, after a critical cardiac event
Social environment is integral to lifestyle and behaviour change: developing good habits (n=20)	Healthy and unhealthy behaviours were formed and sustained through social interaction and support within the local community
	Family as a support and decision-making system
Managing multiple health	"Three Brothers": familial inheritance and close interrelations exist

conditions requires systems harmony in body and mind (n=20)	between ACS, T2DM and hypertension
	"Human body like a factory (system)": Health was achieved by forming an harmonious state
	Balancing the use of both Eastern and Western medicine to manage multiple conditions

Theme 1: Self-management of ACS and T2DM represented a complex interplay between individual self-efficacy and knowledge and skills, and how to manage the conditions with changing priorities

A key finding was that participants' self-management was a dynamic and complex process, including an interplay of factors relating to threat and health priorities. Within this theme, two sub themes were identified.

Sub-theme 1: Optimal self-management is difficult to attain and maintain requiring knowledge of disease and health threat, and prioritizing of treatment and healthy behaviours, often with no symptoms

Participants emphasised the difficulties in achieving metabolic control, exercise and adopting a healthy lifestyle, in their follow-up interviews.

Managing a condition with concealed symptoms and/or feeling well

Participants with low self-efficacy were more likely to report that they neglected their condition, particularly for diabetes. As the most common symptom of diabetes is "*no symptoms*", feeling well could be viewed as a point where good behaviours are lost, or becoming "off guard", which could also be seen in the confidence displayed from "being stable" which was a time for not "strictly" adhering to advice, as Participant I with low self-efficacy, notes:

> *"But sometimes these problems are ignored when I feel better, it is easier to ignore when my health conditions were relatively stable, easier to be off guard. I don't think it's necessary to strictly follow the physician's advices when my health conditions were relatively stable." (Patient I, interview in hospital)*

Whether feeling good or being stable, these situations were seen as an opportunity to deviate from recommended treatment or behavior, with the potential to return the participant to feeling unwell and becoming unstable.

Identifying cardiac symptoms and seeking medical attention

For ACS, participants with high C-ACSRI scores, who perceived they received more cardiac health education, they were more likely to initiate their own help-seeking behaviours when needed. But participants with low C-ACSRI scores indicated a lack of awareness of symptom recognition and treatment for an ACS event. For example, Patient N who perceived he received limited health education and had low self-efficacy in ACS symptom management, said:

> *"I never thought I would have heart disease, even when I had severe chest pain. I thought it was just muscular spasm or nerve pain." (Patient N, interview in hospital)*

Blood glucose self-monitoring

Participants who perceived they received sufficient health education or had high self-efficacy were more likely to have lower to normal HbA1c (on admission). However, participants generally reported that they did not check their blood glucose level regularly at home, even those participants who bought a glucometer machine. Those participants without a glucometer at home reported that they only checked their blood glucose when they visited the hospital. Patient O with a high C-DMSES score, stated he checked his blood glucose once per half year due to health insurance coverage, thus necessitating that he manages his health conditions by his "*feelings*":

> *"Basically did not [check the blood sugar level]. I rarely came to the hospital because we don't have health insurance cover for going to see doctors in the outpatient clinic here. I would go for regular check-ups about every half a year when I go back to Yangzhou. I now monitor my health by my own feelings." (Patient O, interview at home)*

Most participants do not monitor their blood glucose level unless they were unstable. Ongoing blood glucose self-monitoring is recommended for individuals with diabetes who are using insulin and the method and frequency of self-monitoring should reflect their individual

circumstances and aims of treatment (International Diabetes Federation Guideline Development Group, 2014).

Diet regulation

Participants reported several strategies to manage diet although they also identified that this was difficult to achieve. Reducing the food amount especially carbohydrates and sugar as well as reducing salt intake ("*light diet"*) and meat ("*more vegetables instead of meat"*) were commonly reported. Even so, some participants with low C-DMSES scores were more likely to not adopt a healthy diet at home. For example, Patient L described knowing that he needed to reduce his salt intake but he did not adhere to this:

> *"They know my taste is heavy [I like salt]. When ..the food [is] on [the] dining table, I said I was not hungry. Then I would add some salt into the dishes when they finished eating." (Patient L, interview in hospital)*

Regular physical exercise

Despite the benefits of physical exercise, many participants who perceived they received limited health education or had a low C-DMSES score, did not undertake regular exercise describing lack of motivation, poor health conditions and unwillingness or fear of exercise. However, after experiencing an ACS event, participants were more likely to exercise and most participants described that they will increase their intensity of exercise gradually at home. As one participant with limited health education and low C-DMSES score, notes:

> *"It is impossible for me to run for two hours daily. I will increase my exercise level gradually." (Patient N, interview at home)*

Sub-theme 2: Strong desire to live longer and well and manage their diabetes, after a critical cardiac event

ACS is an acute life-threatening condition and most participants were more motivated to change their lifestyle and improve their self-management of diabetes after experiencing an ACS event. The desire to live longer is illustrated in the following quote:

> *"In order to live longer and live well…saving [my] life is the most important thing for me" (Patient P, interview in hospital)*

ACS was described by most participants as a *"serious consequence"* of having diabetes. Participants presented that they should pay more attention to diabetes as they were "*already sick*" or found diabetes could lead to serious cardiac problems. For example, Patient N who perceived he received limited health education and had low self-efficacy, described that:

> *"I didn't feel any symptoms…so I didn't control it [diabetes] at all. However, I should pay more attention since I am already sick [have ACS]. Now I am serious when looking at the health problems and the life habits [I] need to pay more attention." (Patient N, interview in hospital)*

Theme 2: Social environment is integral to lifestyle and behaviour change: developing good habits

Participants described ACS and diabetes related healthy and unhealthy behaviors and lifestyle changes were always intricately linked to their social environment. Within this theme, two sub themes were identified.

Sub-theme 1: Healthy and unhealthy behaviors were formed and sustained through social interaction and support within the local community

While participants understood the need to change their lifestyle they identified the impact of social factors on attempts to adopt health promoting behaviours. For example, Patient J who received sufficient health education and had high self-efficacy, described the work culture where social occasions that promoted poor diet, related to his occupation were frequent:

> *"I was the purchasing department manager, purchasing department had a lot of social events, the customer if you did not have a meal with the customer, he would worry about his business, (you) have to go to these business dinners… Eating very greasy food; I do not eat at restaurant now, oil, (artificial) colours too much." (Patient J, interview in hospital)*

Some health promoting behaviors, such as exercise were part of socializing within their local community. One example discussed by participants is square dancing, which is very popular in China, particularly for elderly people. For example, Patient O who perceived he received sufficient diabetes education described he had adopted square dancing with an appropriate intensity as their daily exercise training:

> *"I usually do some dancing with music with other older persons for about one to one and a half hour in ... Park in the morning. It is around eight ... to nine o'clock or nine thirty after breakfast. At around*

a quarter past seven after dinner, I have two-hours dancing on the square." (Patient O, interview in hospital)

Participants also discussed the difficulty of smoking cessation and related this to social norms, particularly for participants with low self-efficacy. Patient L with low self-efficacy discussed the different environments of hospital and home and how this could result in a return to smoking after discharge:

"I haven't smoked for a week since being in hospital. But being at home is different. It is mainly due to the environment, which is very important. If everyone around doesn't smoke, I can stop smoking. However, it is difficult to quit smoking when everyone else still smokes." (Patient L, interview in hospital)

Sub-theme 2: Family as a support and decision-making system

Chinese culture has strong familial ties with family members and this was evident among all participants. Family 'supervision' was perceived as very important for helping individuals change unhealthy habits even for participants with high perceived diabetes management self-efficacy, for example, Patient Q described that:

"I need family supervision, especially men, my wife supervises me, first to change the bad habit of smoking, I have not drank wine for a long time…. some parties, playing cards, these cannot be changed but now, completely [do]not attend. Family supervision is very important; develop good habits, maintain good habits, and change bad habits". (Patient Q, interview in hospital)

Family members were involved in the decision-making about seeking medical treatment, particularly for patients with perceived limited health education or with low perceived self-efficacy. For example, Patient S described that:

"My children always told me go to the hospital, I do not want to go to the hospital because I do not know which department that I need to visit, I have this disease, and also have that [disease]. I do not like to go to the hospital, I just like to endure it and it's okay for me." (Patient S, interview in hospital)

Theme 3: Managing multiple health conditions requires body and mind systems harmony

Participants described that maintaining harmony was an important concept to understanding and managing their multiple health conditions. Harmony is a cultural value for Chinese society,

harmony is one of the key elements of Traditional Chinese medicine (TCM) that lead to good health (Lai and Surood, 2009). Within this theme, three sub themes were identified.

Sub-theme 1: "Three Brothers": familial inheritance and close interrelations exist between ACS, T2DM and hypertension

Participants who perceived they received sufficient health education were more likely to have a sophisticated understanding of their health conditions. For example, Patient J who perceived he had received sufficient health education refers to his conditions—ACS, T2DM and hypertension— as the *"three brothers"* to describe the link between the conditions as well as the connection to the inheritance of genetic predisposition to the conditions. The three brothers analogy also implies that the conditions are closely connected to each other, and share common features (similar risk factors).

> *"My… trouble is inherited from my father, family disease, diabetes, hypertension, and another one is coronary heart disease. People call them 'three brothers', I have them all." (Patient J, interview in hospital)*

Many participants described that ACS and hypertension were the complications of T2DM, the consequences of atherosclerosis or arteriosclerosis within blood vessels was considered just like "*corrupting the mechanical piping system*" as described by Patient Q who perceived he received sufficient health education.

> *"Pipeline corrosion is a strong corrosion, the corrosion [of blood sugar] slowly leads to vascular corrosion, then the blood vessels are not very smooth, along with high fat in blood vessels are more and more narrow, therefore the blood flow is small, but the pressure is big, and the blood supply to the heart is insufficient". (Patient Q, interview in hospital)*

Sub-theme 2: "Human body like a factory (system)": Health was achieved by forming an harmonious state

One important Chinese health beliefs is the holism principle which emphasizes harmony within the universe, such as disturbing the balance or harmony within nature will result in illness according TCM and Taoism (Lai and Surood, 2009). Restoring "*Harmony within the human body system*" is an important approach to resolving the health concerns. As Patient Q described that:

"Our endocrine system and circulatory system, the human body consist of several systems, such as cardiac, brain and vascular system, nervous system, like a factory there are a lot of systems, mechanical system, computer system…functions of one system and cooperate with other systems and then no problems, this can be an harmonious whole." (Patient Q, interview in hospital)

Sub-theme 3: Balancing the use of both Eastern and Western medicine (WM) to manage multiple conditions

TCM typically uses non-invasive and natural therapies such as herbal medicine, but WM is perceived as using more invasive or chemically-based treatments such as surgery or pharmaceuticals (Kwok and Sullivan, 2007). Participants emphasized that treatment of ACS and T2DM was based on WM, but they also did describe preferring TCM products in the early stages of an illness. For example, Patient J described that:

"My two friends asked me to choose conservative treatment, I said it was best [to] not put the heart stent [in]. Heart stents in foreign countries have been less popular, they say your condition is not very severe, should use conservative treatment." (Patient J, interview in hospital)

Moreover, the complications of diabetes, such as peripheral vascular disease, prompted patients to engage in various health practices. But participants who perceived they received limited health education or with low perceived self-efficacy, were more passive when using both TCM and WM. Patient U describes when WM failed then tried TCM (or vice-versa):

"[Diabetic foot] was just to see Western medicine first and did not cure, then go to see traditional Chinese medicine." (Patient U, interview in hospital).

Discussion

This study aimed to explore how the health education received by patients with comorbid ACS and T2DM, influenced their self-efficacy, self-management and behaviour changes on discharge and follow-up at home. Most of the participants in this study were male. The prevalence of ACS is lower for females than males and the percentage of females diagnosed is reported as 23% (Hersi et al., 2013). Moreover, female patients with ACS have a poorer prognosis including

higher mortality than men (Cabrerizo-García et al., 2015), as well as tend to be older at presentation (Pancholy et al., 2014).

Health education and perceived self-efficacy remain essential factors in supporting self-management behaviors among people with ACS and T2DM. Both self-management and changes in behaviour among patients with ACS and T2DM were influenced by the individuals' priorities, social roles and norms and cultural values. In addition, maintaining harmony was an important concept to understanding and managing multiple health conditions among Chinese patients with ACS and T2DM.

Providing ongoing education and regular follow-up with patients and their family is essential (Kasteleyn et al., 2014, Powers et al., 2017), including ongoing measurement of patients' self-efficacy and their achievement of goals (Powers et al., 2017). Within this sample of study participants with both ACS and T2DM, only 4 participants perceived they received sufficient education and believed they had high self-efficacy to manage their conditions, even though all participants had adequate diabetes knowledge. Further to this just over half of the participants with either sufficient or limited diabetes education reported low diabetes self-management self-efficacy, or potentially that they may not be able to manage their diabetes. Similarly, a very high proportion (16 of 21) of participants reported low self-efficacy in relation to managing ACS symptoms with either limited or sufficient cardiac education.

In this study, although many participants had had diabetes for a significant number of years (mean 8 years), the damage to blood vessels caused from poor lifestyle or diabetes management, was made acutely aware to participants when they experienced their ACS event. When participants either had no symptoms or when they did feel well they stopped doing the required behaviours, or they perceived the threat was diminished (Berenguera et al., 2016). In one way, experiencing the ACS event, may be creating for the first time, the level of threat (or perceived severity of condition) that should have been understood when the individual was first diagnosed with T2DM (Karimy et al., 2016). Educational interventions should consider how these approaches could be adapted to deliver educational messages that unmask the real threat to health of diabetes and related poor lifestyle factors.

Participants reported that social interaction influenced them, including positive as well as negative effects. Specifically, social activities, such as square dancing were reported as beneficial for participants. Dancing is an appropriate exercise promoting regular physical activity and improving patients' clinical outcomes among diabetes patients (Martyn-Nemeth et al., 2010, Murrock et al., 2009).

Social influences were also a barrier for participants to change their unhealthy behaviours, such as smoking. The high prevalence of smoking in China within the community makes it difficult to quit as described by many participants. Chinese smokers are aware of the benefits of quitting smoking to protect their children's health, and health education could emphasise this potential (Saw et al., 2016). Moreover, community-based or national anti-smoking campaigns are urgently needed (Jiang and Beaudoin, 2016).

ACS, T2DM and hypertension, referred to as the "Three Brothers" provides a platform for focusing treatment and self-management to include hypertension as an important third, related, somewhat less emphasised, condition. These three conditions highlight the inheritance of genetic predisposition and the close connection to each other in terms of risk factors and required lifestyle change (Nicoll et al., 2016). Familial risk factors among these three health conditions further support the need for a family-oriented approach to health education. Family-oriented educational interventions consider the context in which the health condition occurs, including the familial risk factors (Baig et al., 2015), and are recommended.

Traditionally, Chinese people emphasize harmony within the universe and disturbing the balance or harmony within nature will result in illness (Lai and Surood, 2009). The aim of medicine is to restore the balance of Yin and Yang within a body (Tai, 2012). To achieve these, individuals have to follow a healthy lifestyle, spiritual toning, and other approaches to keep all the elements in life in balance (Tai, 2012). For Chinese patients, health professionals should consider the use of maintaining mind and body harmony, and analogies of systems (whole body) to promote engagement by participants.

The study was conducted at one major hospital in Shanghai, and represents a small number of participants who are mainly male. Difficulties were encountered in recruiting often very unwell females to this study. The findings may therefore be applicable to other similar samples or contexts or conditions, but do not represent findings that are generalizable to the population. Further research on women with T2DM and ACS is recommended.

Conclusions

The limited inpatient education was not found to be supportive of the participants' confidence to manage either their diabetes or ACS on discharge. In particular, very low self-efficacy was evident in relation to managing symptoms and seeking help relating to ACS, and this should be a major focus of any education program. Healthy lifestyle changes such as square dancing provided a positive socially enhanced behavior. Health education programs, that deliver culturally-appropriate content for Chinese people (particularly men) experiencing both diabetes and ACS, should consider the use of the need to restore and maintain mind and body harmony after an ACS event, include family members, and the 'Three Brothers" (ACS, T2DM, hypertension.

Community-based public health programs, which deliver appropriate messages on the seriousness of the hidden effects of smoking and high sugar diets or diabetes on cardiovascular health, are urgently needed. Further research testing these constructs within an educational interventions is recommended.

Declarations

Competing interests: The authors declare that they have no competing interests.

Authors' contributions: Study conception and design: XL-L MJ KW C-JW YS PF. Data collection: XL-L YS. Data analysis: XL-L MJ KW C-JW PF YS. Manuscript drafts and revisions: XL-L MJ KW C-JW PF YS. ICMJE criteria for authorship read and met: XL-L KW C-JW YS PF MJ. Agree with manuscript results and conclusions: XL-L KW C-JW YS PF MJ. All authors approved the final manuscript and act as guarantors for the study, the named authors meet the ICMJE criteria for authorship.

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Availability of data and materials: The datasets generated and/or analysed during the current study are not publicly available due to the Ethics Committee requires that the database remain anonymous. However, the materials are available from the corresponding author on reasonable request.

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References

Abdo, N.M., Mohamed, M.E., 2010. Effectiveness of health education program for type 2 diabetes mellitus patients attending Zagazig University Diabetes Clinic, Egypt. J Egypt Public Health Assoc 85 (3-4), 113-130.

Al-Khawaldeh, O.A., Al-Hassan, M.A., Froelicher, E.S., 2012. Self-efficacy, self-management, and glycemic control in adults with type 2 diabetes mellitus. J Diabetes Complications 26 (1), 10-16. doi: 10.1016/j.jdiacomp.2011.11.002.

Baig, A.A., Benitez, A., Quinn, M.T., Burnet, D.L., 2015. Family interventions to improve diabetes outcomes for adults. Ann N Y Acad Sci 1353 (1), 89-112. doi: 10.1111/nyas.12844

Been-Dahmen, J.M., Dwarswaard, J., Hazes, J.M., Staa, A., Ista, E., 2015. Nurses' views on patient self-management: a qualitative study. J Adv Nurs 71 (12), 2834-2845. doi: 10.1111/jan.12767

Berenguera, A., Molló-Inesta, À., Mata-Cases, M., Franch-Nadal, J., Bolíbar, B., Rubinat, E., Mauricio, D., 2016. Understanding the physical, social, and emotional experiences of people with uncontrolled Type 2 diabetes: a qualitative study. Patient Prefer Adherence 10, 2323.

Burke, L.A., Rosenfeld, A.G., Daya, M.R., Vuckovic, K.M., Zegre-Hemsey, J.K., Felix Diaz, M., Tosta Daiube Santos, J., Mirzaei, S., DeVon, H.A., 2017. Impact of comorbidities by age on symptom presentation for suspected acute coronary syndromes in the emergency department. Eur J Cardiovasc Nurs 16(6):511-521. doi: 10.1177/1474515117693891.

Cabrerizo-García, J.L., Pérez-Calvo, J.I., Zalba-Etayo, B., 2015. Influence of gender on prognosis of acute coronary syndromes. Revista Portuguesa de Cardiologia (English Edition) 34 (1), 43-50.

Castro, F.G., Kellison, J.G., Boyd, S.J., Kopak, A., 2010. A methodology for conducting integrative mixed methods research and data analyses. J Mix Methods Res 4 (4), 342-360.

Chinese Society of Cardiology of Chinese Medical Association, 2013. Chinese experts consensus on cardiac rehabilitation/secondary prevention for coronary artery disease. Zhonghua Xin Xue Guan Bing Za Zhi. 41 (4), 267-275.

Creswell, J.W., Klassen, A.C., Plano Clark, V.L., Smith, K.C., 2011. Best practices for mixed methods research in the health sciences. Bethesda (Maryland): National Institutes of Health, 2094-2103.

Diabetes Association of Chinese Medical Association, 2014. Guideline of prevention and treatment for type 2 diabetes in China (2013 edition). Chin J Diab Mell 30 (10), 893-942.

Ellis, J., Boger, E., Latter, S., Kennedy, A., Jones, F., Foster, C., Demain, S., 2017. Conceptualisation of the 'good'self-manager: A qualitative investigation of stakeholder views on the self-management of long-term health conditions. Social Science & Medicine 176, 25-33. doi: 10.1016/j.socscimed.2017.01.018.

Fetters, M.D., Curry, L.A., Creswell, J.W., 2013. Achieving integration in mixed methods designs—principles and practices. Health Serv Res 48 (6pt2), 2134-2156. doi: 10.1111/1475-6773.

Fielding, N.G., 2012. Triangulation and mixed methods designs: Data integration with new research technologies. J Mix Methods Res 6 (2), 124-136.

Fort, M.P., Alvarado-Molina, N., Peña, L., Montano, C.M., Murrillo, S., Martínez, H., 2013. Barriers and facilitating factors for disease self-management: a qualitative analysis of perceptions of patients receiving care for type 2 diabetes and/or hypertension in San José, Costa Rica and Tuxtla Gutiérrez, Mexico. BMC Fam Pract 14 (1), 131. doi: 10.1186/1471-2296-14-131.

Fraser, S.N., Rodgers, W.M., 2012. The Influence of General and Exercise Specific Social Support on Self-Efficacy for Overcoming Barriers to Cardiac Rehabilitation. J Appl Soc Psychol 42 (8), 1811-1829.

Guo, P., Harris, R., 2016. The effectiveness and experience of self-management following acute coronary syndrome: A review of the literature. Int J Nurs Stud 61, 29-51. doi: 10.1016/j.ijnurstu.2016.05.008.

Ha, M., Hu, J., Petrini, M.A., McCoy, T.P., 2014. The effects of an educational self-efficacy intervention on osteoporosis prevention and diabetes self-management among adults with type 2 diabetes mellitus. Biol Res Nurs 16 (4), 357-367. doi: 10.1177/1099800413512019.

Hersi, A., Al-Habib, K., Al-Faleh, H., Al-Nemer, K., AlSaif, S., Taraben, A., Kashour, T., Abuosa, A.M., Al-Murayehg, M.A., 2013. Gender inequality in the clinical outcomes of equally treated acute coronary syndrome patients in Saudi Arabia. Ann Saudi Med 33 (4), 339. doi: 10.5144/0256-4947.

Hung, W.W., Ross, J.S., Boockvar, K.S., Siu, A.L., 2011. Recent trends in chronic disease, impairment and disability among older adults in the United States. BMC Geriatr 11 (1), 47. doi: 10.1186/1471-2318-11-47.

International Diabetes Federation Guideline Development Group, 2014. Global guideline for type 2 diabetes. Diabetes Res Clin Pract 104 (1), 1. doi: 10.1016/j.diabres.2012.10.001.

Jang, Y., Yoo, H., 2012. Self-management programs based on the social cognitive theory for Koreans with chronic disease: a systematic review. Contemp Nurse 40 (2), 147-159. doi: 10.5172/conu.2012.40.2.147.

Jiang, S., Beaudoin, C.E., 2016. Smoking prevention in china: a content analysis of an anti-smoking social media campaign. J Health Commun 21 (7), 755-764. doi: 10.1080/10810730.2016.

Karimy, M., Araban, M., Zareban, I., Taher, M., Abedi, A., 2016. Determinants of adherence to self-care behavior among women with type 2 diabetes: an explanation based on health belief model. Med J Islam Repub Iran 30, 368.

Kasteleyn, M.J., Gorter, K.J., van Puffelen, A.L., Heijmans, M., Vos, R.C., Jansen, H., Rutten, G.E., 2014. What follow-up care and self-management support do patients with type 2 diabetes want after their first acute coronary event? A qualitative study. Prim Care Diabetes 8 (3), 195-206. doi: 10.1016/j.pcd.2013.12.001.

Kwok, C., Sullivan, G., 2007. Health seeking behaviours among Chinese-Australian women: implications for health promotion programmes. Health: 11 (3), 401-415.

Lai, D.W., Surood, S., 2009. Chinese health beliefs of older Chinese in Canada. J Aging Health 21 (1), 38-62. doi: 10.1177/0898264308328636.

Lakerveld, J., Bot, S.D., Chinapaw, M.J., van Tulder, M.W., van Oppen, P., Dekker, J.M., Nijpels, G., 2008. Primary prevention of diabetes mellitus type 2 and cardiovascular diseases using a cognitive behavior program aimed at lifestyle changes in people at risk: Design of a randomized controlled trial. BMC Endocr Disord 8 (1), 6. doi: 10.1186/1472-6823-8-6.

Liddy, C., Blazkho, V., Mill, K., 2014. Challenges of self-management when living with multiple chronic conditions. Can Fam Physician 60 (12), 1123-1133.

Lin, K., Park, C., Li, M., Wang, X., Li, X., Li, W., Quinn, L., 2017. Effects of Depression, Diabetes Distress, Self-efficacy, and Self-management on Glycemic Control among Chinese Population with Type 2 Diabetes Mellitus. Diabetes Res Clin Pract 131:179-186. doi: 10.1016/j.diabres.2017.03.013.

Liu, X. L., Wu, C. J. J., Willis, K., Shi, Y., & Johnson, M. (2018). The impact of inpatient education on self-management for patients with acute coronary syndrome and type 2 diabetes mellitus: a cross-sectional study in China. Health education research, cyy023, https://doi.org/10.1093/her/cyy023.

Martyn-Nemeth, P.A., Vitale, G.A., Cowger, D.R., 2010. A culturally focused exercise program in Hispanic adults with type 2 diabetes: a pilot study. Diabetes Educ 36 (2), 258-267.

Mohebi, S., Azadbakht, L., Feizi, A., Sharifirad, G., Kargar, M., 2013. Review the key role of self-efficacy in diabetes care. J Educ Health Promot 2:36. doi: 10.4103/2277-9531.115827.

Murphy, K., Chuma, T., Mathews, C., Steyn, K., Levitt, N., 2015. A qualitative study of the experiences of care and motivation for effective self-management among diabetic and hypertensive patients attending public sector primary health care services in South Africa. BMC Health Serv Res 15:303. doi: 10.1186/s12913-015-0969-y.

Murrock, C.J., Higgins, P.A., Killion, C., 2009. Dance and peer support to improve diabetes outcomes in African American women. Diabetes Educ 35 (6), 995-1003.

Nicoll, R., Zhao, Y., Ibrahimi, P., Olivecrona, G., Henein, M., 2016. Diabetes and hypertension consistently predict the presence and extent of coronary artery calcification in symptomatic patients: a systematic review and meta-analysis. Int J Mol Sci 17(9). pii: E1481. doi: 10.3390/ijms17091481.

Nyunt, S.W., Howteerakul, N., Suwannapong, N., Rajatanun, T., 2010. Self-efficacy, self-care behaviors and glycemic control among type-2 diabetes patients attending two private clinics in Yangon, Myanmar. Southeast Asian J Trop Med Public Health 41(4):943-51.

Pancholy, S.B., Shantha, G.P.S., Patel, T., Cheskin, L.J., 2014. Sex differences in short-term and long-term all-cause mortality among patients with ST-segment elevation myocardial infarction treated by primary percutaneous intervention: a meta-analysis. JAMA Intern Med 174(11):1822-30. doi: 10.1001/jamainternmed.2014.4762.

Paneni, F., Beckman, J.A., Creager, M.A., Cosentino, F., 2013. Diabetes and vascular disease: pathophysiology, clinical consequences, and medical therapy: part I. Eur Heart J 34(31):2436-43. doi: 10.1093/eurheartj/eht149.

Powers, M.A., Bardsley, J., Cypress, M., Duker, P., Funnell, M.M., Fischl, A.H., Maryniuk, M.D., Siminerio, L., Vivian, E., 2017. Diabetes self-management education and support in type 2 diabetes: a joint position statement of the American Diabetes Association, the American Association of Diabetes Educators, and the Academy of Nutrition and Dietetics. Diabetes Educ 43 (1), 40-53.

QSR International. NVivo qualitative data analysis software | QSR International 2017 [cited 2017 22/08]. Available from: http://www.qsrinternational.com/.

Saleh, A., Hammoudeh, A.J., Hamam, I., Khader, Y.S., Alhaddad, I., Nammas, A., Tarawneh, H., Tabbalat, R., Harassis, A., Bakri, M., 2012. Prevalence and impact on prognosis of glucometabolic states in acute coronary syndrome in a middle eastern country: The GLucometabolic abnOrmalities in patients with acute coronaRY syndrome in Jordan (GLORY) study. Int J Diabetes Dev Ctries 32 (1), 37-43.

Saw, A., Paterniti, D., Fung, L.-C., Tsoh, J.Y., Chen, M.S., Tong, E.K., 2016. Social environmental influences on smoking and cessation: qualitative perspectives among Chinese-speaking smokers and nonsmokers in California. J Immigr Minor Health, 1-8.

Tai, M.C.-T., 2012. An oriental understanding of health. Ci Ji Yi Xue Za Zhi 24 (2), 92-95.

Tanash, M.a.I., Fitzsimons, D., Coates, V., Deaton, C., 2016. An evaluation of the effectiveness of self-management interventions for people with type 2 diabetes after an acute coronary syndrome: a systematic review. J Clin Nurs 26(11-12):1458-1472. doi: 10.1111/jocn.13487.

Twinn, S.F., Lee, D.T., 1997. The practice of health education in acute care setting in Hong Kong: an exploratory study of the contribution of registered nurses. J Adv Nurs 25 (1), 178-185.

Vaismoradi, M., Turunen, H., Bondas, T., 2013. Content analysis and thematic analysis: Implications for conducting a qualitative descriptive study. Nurs Health Sci 15(3):398-405. doi: 10.1111/nhs.

Welch, A., 2011. Sampling in qualitative research. In: Jirojwong, S., Johnson, M., Welch, A. (Eds.), Research methods in nursing and midwifery: Pathways to evidence-based practice. Oxford University Press, Oxford, pp. 87-97.

Williams, M.V., Baker, D.W., Parker, R.M., Nurss, J.R., 1998. Relationship of functional health literacy to patients' knowledge of their chronic disease: a study of patients with hypertension and diabetes. Arch Intern Med 158 (2), 166-172.

Wu, C.J.J., Atherton, J.J., MacIsaac, R.J., Courtney, M., Chang, A.M., Thompson, D.R., Kostner, K., MacIsaac, A.I., d'Emden, M., Graves, N., 2017. Effectiveness of the cardiac-diabetes transcare program: protocol for a randomised controlled trial. BMC Health Serv Res 17(1):109. doi: 10.1186/s12913-017-2043-4.

Wu, C.J.J., Chang, A.M., Courtney, M., Shortridge-Baggett, L.M., Kostner, K., 2011. Development and pilot test of a peer-support based Cardiac-Diabetes Self-Management Program: A study protocol. BMC Health Serv Res. 2011; 11:74. doi: 10.1186/1472-6963-11-74.

Wu, C.J., Chang, A.M., Courtney, M., Ramis, M.A., 2012a. Using user-friendly telecommunications to improve cardiac and diabetes self-management programme: a pilot study. J Eval Clin Pract 18 (3), 695-697.

Wu, C.J.J., Chang, A.M., Courtney, M., Kostner, K., 2012b. Peer supporters for cardiac patients with diabetes: a randomized controlled trial. Int Nurs Rev 59(3):345-52. doi: 10.1111/j.1466-7657.2012.00998.x.

Wu, C.J.J., Chang, A.M., McDowell, J., 2008. Perspectives of patients with type 2 diabetes following a critical cardiac event–an interpretative approach. J Clin Nurs 17 (5a), 16-24.

6.6 Summary

This Chapter presented a mixed methods study exploring how the health education received by patients with ACS and T2DM, influenced their self-efficacy, self-management and behaviour on discharge and follow-up at home. Interviews were conducted until data saturation (where no new themes or ideas were identified) was achieved. Twenty-one participants were interviewed. Self-managing ACS and T2DM was a complex interplay between individual self-efficacy, and knowledge and skills about how to manage the conditions, within changing priorities. As well, participants' social environment was found to be integral to their lifestyle and behaviour change. Furthermore, participants perceived that their management of multiple health conditions required systems harmony in body and mind, reflecting unique cultural interpretations of these comorbid conditions. The recommendations resulting from this study are that future educational programs should include culturally-appropriate interpretations of health and illness (mind and body harmony), be theoretically derived, and include family members of patients with ACS and T2DM.

The next chapter discussed the findings and new knowledge gained by this series of studies. All findings are considered in relation to existing literature and recommendations are made regarding future educational intervention and the role of health professionals in the delivery of health education.

Chapter 7 Discussion and Conclusion

7.1 Introduction

The overall aim of the research conducted was to gain an understanding of current health education delivered by health professionals and received by patients with acute coronary syndrome (ACS) and type 2 diabetes mellitus (T2DM) within this unique cultural setting. The purpose of this Chapter is to discuss the findings and the new knowledge gained by the series of studies addressing the defined research questions. Within this discussion, findings from each of the studies were considered to pose recommendations for developing inpatient health education for patients with ACS and T2DM within China. This Chapter also outlines the strengths and limitations of the studies, and the implications for practice and policy.

7.1.1 Setting and health system context

It is important to interpret the findings of this thesis in light of the study health setting within Shanghai, China. How this unique health system differs from westernized health systems provides important background information when exploring the implications for policy and practice. Primary care is fundamental to an effective health system and is the core component of the healthcare system in developed countries, such as Australia and New Zealand (Mazumdar, Feng, Konings, McRae, & Girosi, 2014). Almost 70% of all health care is delivered in the primary care in Spain (Borkan, Eaton, Novillo-Ortiz, Rivero Corte, & Jadad, 2010). Health education is one of the key services offered by primary care facilities including self-management support of chronic disease, through healthy lifestyle and risk factor modification programs in Western countries (Keleher & Parker, 2013; Smith, McNaughton, & Meyer, 2016).

With the diminishing length of hospital stay for ACS patients much of the responsibility for post-discharge management of ACS is left to the primary care sector in Western health care systems (Bhagwat, Woods, Dronavalli, Hamilton, & Thompson, 2016). With a shorter length of hospital stay for ACS patients within Western countries (3 to 4 days for patients experiencing myocardial infarction, and 1 to 2 day for patients with unstable angina), primary care services play a major role in the long-term management of individuals with ACS (Chew et al., 2013). Most health

education for individuals with ACS is provided by general practitioners (GPs), nurse practitioners or other health providers in primary care settings (Bhagwat et al., 2016).

Similarly, individuals with diabetes are frequently managed and monitored by GPs, medical specialists and allied health professionals from primary care and diabetes centers provide services such as diabetes education for people with diabetes in Australia (Wilson & Gyi, 2010). Patient education provided in primary care settings has been found to be effective in cardiovascular risk factor management and in stabilizing HbA1c levels among individuals with diabetes (Seitz, Rosemann, Gensichen, & Huber, 2011). Standards for diabetes management in Western countries include the use of evidence-based recommendations and are focused upon the primary care setting (American Diabetes Association, 2016).

In China, the health system is centralised to the acute hospital setting with a small primary care health sector (Barber et al., 2013). Human resources for healthcare in China are distributed predominantly to hospitals that focus on inpatient care and treatment, and the results of recent health system reform remain unclear (Deng, Lv, Wang, Gao, & Zhou, 2017). The service utilization of primary care facilities in China is very low compared with the acute hospitals (Zhou et al., 2013). The role and importance of primary care remains minimal in China at the time of these studies, with substantial investments in hospitals rather than primary care facilities (Cheng, Yuan, Lu, & Yang, 2017).

Moreover, the length of hospital stay for patients experiencing a myocardial infarction in China was 14.6 days in 2001, 12.6 days in 2006 and 11.9 days in 2011 (Li et al., 2015). Another recent study reported the length of hospital stay was 8 days for ACS patients (Yang et al., 2017), which is consistent with our study (length of hospital stay, mean = 7.91 days). The length of hospital stay among patients with ACS has declined in China over the past decade but remains much longer than Western countries' reported median of 3 to 4 days in the US or European countries (Kragholm et al., 2016; Vavalle et al., 2012). Therefore, utilizing the in-hospital period in China is the best opportunity to deliver health education to assist patients with ACS and T2DM to get the essential knowledge and skills, as well as support the achievement of a healthy lifestyle when returning home (Eshah, 2013).

7.1.2 Sampling issues

While understanding the setting, issues of health professionals' roles and how they are enacted within China also are worthy of note. In Study 1, a qualitative study included health professionals, physicians and registered nurses who routinely worked in the CCU. There were no other identified health professional who provided health education to patients with ACS and T2DM. One physician and two registered nurses told the researcher that dietitians from the nutritional department were not providing health education for patients, even though these were key health professionals within the hospital. Although the sample does represent the health professionals currently delivering education no other health professionals were interviewed and multidisciplinary approaches were not evident.

Similarly, there were some limitations in the sample of patients for Study 2. Most patients with ACS and T2DM were willing to participant in this study (6 patients met the selection criteria but were unwilling to participate in this study). Registered nurses within CCU introduced the study to patients and may have influenced the participation rate positively (160/166, 96.39%). Nonetheless, the sample was biased, as only those who were without severe debilitating medical or related condition were likely to participate in these studies (Etikan, Musa, & Alkassim, 2016). Therefore, the qualitative perspectives and thoughts of those who declined or were unwilling to participate or with severe debilitating medical or related condition were not represented in this study, due to ethical requirements.

A high proportion (110/160, 68.8% in the survey; 18/21, 85.7% attended the interviews) of the patients in this study were male. The percentage of males diagnosed with ACS was 77% and the prevalence of ACS is higher for males than females (Hersi et al., 2013). The qualitative findings were primarily reflecting the perceptions of men. Male patients with ACS have a better prognosis including lower mortality than women (Cabrerizo-García, Pérez-Calvo, & Zalba-Etayo, 2015), as well as better cardiac risk profiles. Men are usually younger at presentation (Pancholy, Shantha, Patel, & Cheskin, 2014). Female patients in this study were more likely to refuse to be interviewed after completing the survey often due to fatigue. For some women who refused

(n= 5) there was no reason given. Future research should consider the disease characteristics of female patients and how these can be accommodated in research.

7.1.3 Using the mixed methods study design

Qualitative perspectives of health professionals were obtained at the outset (Study 1), followed by a mixed methods approach for patients with ACS and T2DM to establish a more complete understanding (Creswell et al., 2011). The use of both qualitative and quantitative methods was particularly beneficial as it addressed the research aims of the present series of studies, which was to obtain a deep understanding of current health education delivery to patients with both ACS and T2DM within China. Health professionals provided critical insights into the type and scope of health information provided to these patients.

The mixed methods design, focusing on symptom management for ACS and self-management for T2DM has provided data about the diabetes knowledge, self-efficacy, attitudes to ACS (symptom management) and clinical outcomes of patients with ACS and T2DM who received health education during their inpatient hospital period. In addition, the perceptions and experiences of the health education received by patients with ACS and T2DM were explored. Mixed methods research offers the potential to complement findings from different approaches and sources, as well as to confirm and contrast the interpretations (Creswell et al., 2011). In this thesis, the narrative integration of the quantitative survey data and patient health care record data provided an important context to explore the behavioural changes that followed.

The selection of two time points for the interviews at discharge (Study 2b) and in the community did support the identification of behavioural changes (eg., smoking cessation as inpatient but continuation of smoking when in community) that may not have been found otherwise and we support the use of repeated interviews for these patients through longitudinal qualitative research. The telephone-based follow-up interview with patients was conducted within four weeks following discharge. Participants reported that they had not made many behavioural changes. This was primarily due to the relatively short period of time since the first interview, during which their main focus was on recovery from the ACS event. It was

evident from the transcripts that some negative changes did occur such as returning to smoking. The length of time allocated for this thesis did not allow for a longer follow-up period which is recommended. Behaviour change may occur from 2 to 8 months and the follow-up interview may not have captured behaviour changes that may have occurred at a later date (Powers et al., 2017). Conducting follow-up interviews at 3- and 6-month periods would be advantageous for future research, but was beyond the scope of this thesis.

A directed content analysis (for key content topics) and further thematic analysis of the qualitative data from the interviews with health professionals confirmed the patients' perceptions of received health education as described by patients in their interviews (O'Cathain et al., 2010). Interviews with the patients also identified contrasting views about the health education delivered, with some nurses describing the "dietitians" (diet assistant) from nutritional department providing health education for patients admitted in CCU, which was not evident in patients' interviews.

Triangulation of data involves employing multiple approaches to collect and analyze data to explore different levels and perspectives of the same phenomenon (Denzin, 2012). Triangulation of data in this thesis, included semi-structured interviews, surveys and patient health care record reviews. The perspective would have been limited if only one source of data was used. The series of studies has developed an overall picture of the health education for patients with ACS and T2DM using triangulation of data from a number of different sources and different participants.

7.1.4 Instruments reliability and validity

The psychometric properties of the Chinese version of the Acute Coronary Syndrome Response Index (C-ASCRI) (Cao et al., 2012) and Chinese version of Diabetes Management Self efficacy Scale (C-DMSES) (Wu et al., 2008) have been shown to be satisfactory in previous ACS or diabetes studies. Permission to use these scales was granted by the original authors. The attitudes subscale of C-ASCRI and C-DMSES were found to have good internal consistency in this sample, with a Cronbach's alpha of 0.826 and 0.932, respectively. Perceived health education received was measured using a visual analogue scale (VAS) and VAS has been used to

measure pain intensity, quality of life and stress within large clinical trials (Hjermstad et al., 2011). A VAS scale is easily understood and accepted by ACS patients, and is a sensitive instrument for measuring differences such as loss of ability in ACS patients (Gencer et al., 2016; Schweikert, Hahmann, & Leidl, 2006).

The acute life-threatening nature of ACS requires using simple or short scales for this group of patients. For example, only the attitudes subscale of C-ASCRI was included in in Study 2. Completion of short scales can be a factor contributing to high response rate (153/160, 95.6%) and enhanced participation in Study 2. A weakness of the Chinese version of Diabetes Knowledge Scale (C-DKS) was the limited testing of psychometric properties among Chinese patients with diabetes (Wu et al., 2013). The scale exhibited low internal consistency in this sample, with a Kuder-Richardson 20 (KR20) coefficient of 0.422. C-DKS includes eight questions and four questions were related diabetes complications (item 5-8). There are two issues that may have contributed to this outcome (Tavakol & Dennick, 2011). First, a larger number of items could have been required. Second, a larger sample may improve the overall internal consistency.

Decisions about instruments to include in Study 2 were based on the *Modified Social Cognitive Conceptual Model for ACS Patients with T2DM* and findings were understood and explained within this framework. It is unclear whether an instrument combining aspects of both conditions would be more suitable, rather than the use of single-condition instruments. Future qualitative research should be undertaken to assess how patient assess self-efficacy as a construct in relation to the multi-morbid conditions, and potentially a new instrument is recommended. Moreover, qualitative data from patients identified a key construct that perceived severity and threat of disease (T2DM) appeared to interact with diabetes self-management activities about whether or not to manage their health conditions. An instrument which considers key aspects of perceived severity and threat of disease within the multi-morbid conditions is recommended.

7.2 Overview of the study findings

7.2.1 Health educational content delivered

According to the umbrella review (Liu et al., 2017) within this thesis, health education for patients with ACS and T2DM was recommended to be provided by nurses and multidisciplinary teams, delivering educational content including specific clinical issues (blood pressure, glycemic level, and medication), modifiable risk factors (unhealthy diet, inactivity, and smoking), and other psychological support (anxiety and depression). The educational content described by health professionals reflects most of the topics described in the guidelines in China (Chinese Society of Cardiology of Chinese Medical Association, 2013; Diabetes Association of Chinese Medical Association, 2014) and from other Western countries (Australia and USA) (Amsterdam et al., 2014; Australia Diabetes, 2009; Haas et al., 2013; Montalescot et al., 2013), as well as in the umbrella review (Liu et al., 2017). However, health education for patients with ACS and T2DM in this study did not include sexual counselling, as it was not mentioned by health professionals.

There is a high prevalence of sexual dysfunction among patients with ACS (Justo et al., 2010) and only 17.3% of patients with coronary heart disease (CHD) received sexual information before discharge (Shi et al., 2007). Although this has been changing since the 20th century, providing sex education and discussing sex-related issues are traditionally taboo in Chinese culture (Zhang, Li, & Shah, 2007). The role of health professionals (e.g. nurses) in comprehensive sex education needs to be recognized and improved. Health professionals need to be trained in how to be comfortable and skilful in delivering sex education to patients. For example, health professionals could provide adequate sex education and guidance to patients by WeChat, video or written materials, allowing patients to remain anonymous.

Educational content delivered relative to recovery within hospital

Following on from the umbrella review (Liu et al., 2017), qualitative data from health professionals confirmed that health education is an essential embedded component of treatment from admission to discharge into the community. Health professionals described the organisation of considerable content (related to ACS, T2DM and hypertension), being delivered

relative to the stage of recovery of the patient from acute episode to returning to the community. Inpatient health education is recommended to begin after surgery (where required) such as angioplasty or bypass surgery (Anchah et al., 2017). The "upstream-downstream" metaphor (acute [inpatient] versus long-term [community-based]) model is a useful approach to organise educational content and develop educational materials for patients with ACS and T2DM.

Future educational interventions should consider the stage of recovery of the patient and ensure specific educational content is delivered in a manner that reflects the gradual progression to recovery, ie., initial 1 to 2 days of admission to evidence of recovery from operative intervention, focus on the pre and post-operative care and anticoagulant therapy only. Day 3 post-procedure, could begin with education that increases exercise and introduces issues of medications, diet, blood glucose monitoring and other topics based on patients' learning needs. When patients are in a stable state, health professionals would then focus on the long term care and more comprehensive management (including ACS, T2DM and hypertension). The cardiac-diabetes self-management programs (CDSMP) for patients with ACS and T2DM provides education about the relationship between ACS and diabetes, shares other patients' stories, teaches about monitoring blood glucose and patients' health status, and also includes follow-up on ongoing support (Wu & Chang, 2014; Wu, Chang, Courtney & Ramis, 2012; Wu et al., 2017).

Similarly, health education is the key element of cardiac rehabilitation (CR) program in developed countries and CR is divided into three phases from inpatient phase – inpatient phase, to lifetime maintenance phase – back to community (Mampuya, 2012). Qualitative data from health professionals in China was consistent with other Western health system approaches where health education is delivered reflective of progressive recovery from an acute episode to returning to the community. The provision of the majority of health education within the acute inpatient phase was pronounced within China (Pan, Dib, Wang, & Zhang, 2006; Zhou et al., 2013). This is in contrast to other westernised health systems. Although there was

some limited education provided in the community by medical practitioners, a long-term program of education and support was not evidenced.

7.2.2 Teaching strategies and intensity

An umbrella review provided recommendations that health education for patients with ACS and T2DM should be delivered in multiple modes, such as face-to-face, phone contact, online or web-based, or video (Liu et al., 2017). Qualitative data from health professionals, found health education delivered to patients with ACS and T2DM used varied teaching approaches and strategies for education delivery for patients with ACS and T2DM. Face-to-face and individual teaching is the most commonly used approach, and patients are supplied brochures during admission or at discharge, as well as WeChat contact during admission or after discharge. Telephone based follow up by nurses and limited outpatients' education by physicians occurred for patients with ACS and T2DM when they were discharged. Teaching strategies such as powerpoint presentations (PPT) and education manuals, were described by nurses as assisting new nurses when providing education for patients with ACS and T2DM in the CCU, implying that experienced nurses did not require such a structure. One study reported that preparing the tools and materials for nursing students (new nurses) was highly practical and specifically targeted to patients' learning needs (Choi, Hui, Lee, & Chui, 2010).

The estimated total education time was limited, about 30 mins per patient according the interviews with the health professionals. No time measurements through observation were conducted, rather this was estimated from health professionals' recall. One or two limited telephone based follow ups occurred for patients 2 or 4 weeks after their discharge of 5 to 10 mins duration. Educational interventions (CDSMP) reported in other trials for patients with ACS and T2DM included 1.5 hours of face to face educational sessions during the inpatient stay plus telephone calls and text messages or home visit during the follow up period, but the outcomes found no significant changes between the intervention and control groups (Wu et al., 2017). This would suggest that current education programs for patients with ACS and T2DM would need to increase in intensity. The current education received by the participants would represent a very low intensity; educational programs with more than 10 contact sessions (high

intensity) delivered over a longer duration (longer than 6 months), being recommended for T2DM (Glazier, Bajcar, Kennie, & Willson, 2006) and more than 30 min per time per week, with at least 6 months follow-up, being recommended for ACS (Liu et al., 2017).

Although the survey data did demonstrate that participants who perceived they received sufficient education, were able to manage their conditions, that is, they obtained high scores for self-efficacy for T2DM, the qualitative interviews with a subgroup of these participants highlighted a different position, with most perceiving they were not able to manage their T2DM or their ACS symptoms. It is acknowledged that the participants at interview may have self-selected because of these limitations, or it may be that the perspective changes once the patients were discharged into the community, ie., decreasing confidence after discharge.

It is recommended that a higher intensity program (10 contact sessions delivered over at least 6 months duration) covering topics related to ACS and T2DM, delivered within the inpatient and community, is required to improve the likelihood of patients leaving the hospital being able to manage their symptoms and self-management within the community. There is a need for additional education to be provided either from outpatient services or new clinics within the acute hospital sector to address this demand, or use on-line chat services to meet this demand.

7.2.3 Three conditions as content

ACS, T2DM and hypertension (symptom), were described as the “Three Brothers” by participants. Coronary disease risk factors management, such as hypertension, was essential to reduce the risk of further cardiac events among patients with a recent ACS event (Bellman, Hambraeus, Lindbäck, & Lindahl, 2009; Shah et al., 2011). The American College of Cardiology/American Heart Association note a Class I (procedure or treatment should be performed or administered) recommendation that patients with ACS should be educated about blood pressure management as risk reduction strategies for secondary prevention (Amsterdam et al., 2014). Blood pressure control was an essential element of a decision-making program executed by diabetes educators on the prevention of ACS among patients with T2DM (Buhse et al., 2015). Within the CDSMP for ACS patients with T2DM, basic self-management skills were taught, such as how to monitor blood pressure, but did not include hypertension as a distinct

entity and no specific strategies of blood pressure regulation were described in this program (Wu & Chang, 2014; Wu et al., 2017). Health education interventions should include all three conditions within their content.

According to the qualitative data from patients or individuals, the real difference between trying to manage multiple health conditions versus a single health condition was the complexity of managing changing priorities of multiple conditions, which is a compounded by the difficulty in managing the multiple treatments and monitoring demands of their health conditions. This was consistent with a previous review (Koch et al., 2015). This review had summarized the 9 categories of barriers to effective management among patients with multiple health conditions, including adhering to different medication administrations, communicating with health professionals, complexity of managing multiple conditions, financial constraints, inability to physical exercise, lack of social and family support, logistical challenges, lifestyle changes and negative emotions. The authors of this review also suggested that enhancing health system support, having personal emotional and mental strength, providing individualized education and knowledge and informal support from family were the facilitators to help patients overcome the difficulty in managing their health conditions (Koch et al., 2015).

Health professionals have limited evidence or guidance as to how to care for and treat patients with multiple conditions because the clinical guidelines are developed for a single specific condition (Barnett et al., 2012). Consequently, individuals with comorbidities are prone to receive fragmented, incomplete, inefficient, and ineffective treatment and care (Boyd & Martin Fortin, 2010). Health professionals need to recognize specific connections between the multiple health conditions and treatment regimens (Liddy, Blazkho, & Mill, 2014). Co-morbidity was a motivator and most patients were more motivated to change their lifestyle and improve their self-management of diabetes after experiencing an ACS event in this study and a previous study (Beverly, Wray, Chiu, & Weinger, 2011). Health professionals also could help patients prioritizing their health conditions to reduce complexity of disease management, and enhance engagement of multiple condition management (Liddy et al., 2014; Morris, Sanders, Kennedy, & Rogers, 2011).

Due to the acute life-threatening nature of ACS, all health professionals admitted to prioritizing ACS over their diabetes in this study. Health education related to ACS and supporting the patient to survive is the highest priority when health professionals provided health education to patients with ACS and T2DM during the acute hospital admission. Health education supported the patient's return to the community from an acute episode to long term care and management. Health professionals' priority for disease management thus influenced the direction of health education. Diabetes education and management is one of the ways to help patients recover and prevent further ACS events according to the qualitative data from health professionals.

Similarly, one previous study reported that for patients with T2DM and co-morbidities, patients selectively attended to the self-management of the condition when they perceived this condition as more serious than diabetes (Liddy et al., 2014). In this study, patients described that they will manage diabetes when they get back home because they want to live longer and live well. Therefore, patients were re-prioritizing self-management tasks relative to the perceived severity and adjusting self-management practices at home. This is consistent with a previous study that patients prioritized and reprioritized health conditions and their management when the perceived importance of conditions and different self-management requirements changed due to prior negative or positive experiences (Morris et al., 2011).

7.2.4 Supporting the need for family involvement in education

ACS, T2DM and hypertension are often associated with similar risk factors and linked to family history, low physical activity, obesity, smoking and fat intake (Bolbrinker, Touis, Gohlke, Weisser, & Kreutz, 2017; Lu & Harris, 2013). Including a family member, who is living with the patient and has a close relationship, to be involved in the education process at the initial stage when patients are first diagnosed with T2DM may be beneficial. Some health professionals did describe including family members within the education provided during the acute admission, although in an irregular manner.

Family members and relatives of a patient with ACS themselves have a substantially higher risk of ACS, sharing genetic and environmental components which might explain the particularly

high risk for family members and relatives of a patient with ACS (Nielsen et al., 2013). Familial risk factors among these three health conditions further support the need for a family-oriented approach to health education which is formal teaching for the patients and their family. Family-oriented approaches have promise as an adjunct to traditional education because they consider the context in which the health condition occurs, including the familial risk factors (Baig, Benitez, Quinn, & Burnet, 2015).

In addition, the Chinese culture has strong familial ties and this was evident among most participants. Family members provide a communication bridge of interaction between health professionals and patients and play an essential role in improving the self-management and behaviours of patients (Shi et al., 2016). Management of the three interrelated conditions of ACS, T2DM and hypertension occurs in the context of routine family activities. In this study, there was limited data supporting the role of family members in health education for patients with T2DM. Another study has also noted that the participation rate of family members in health education has been reported as less than 10% in China (Shi et al., 2016).

Family members may also be a source of resistance to behavioural change (Denham, Ware, Raffle, & Leach, 2011), and this also presents some challenges to the individual with T2DM and ACS. The “three brothers” could be considered as the family diseases rather than individual diseases and lifestyle changes required for effective self-management as the required behaviours are often in opposition to established family routines (Denham et al., 2011; Kim et al., 2016). Approaches to change family routines, information on self-management and strategies to deal with negative emotions are “required for the entire family” (Hu, Amirehsani, Wallace, McCoy, & Silva, 2016, p.698). Family members may engage in obstructive behaviours, which make patients’ self-management more difficult (Mayberry, Rothman, & Osborn, 2014). Future education for patients with ACS and T2DM, should seek to take a family approach to supporting behavioural change, while raising awareness within the family unit as to the nature of the risk factors that are present in some or potentially all family members. Garnering family support for the patient or family member with ACS and T2DM, not only can transform the individuals health but also the health of the whole family.

7.2.5 Use of theories and frameworks

The umbrella review reported in this thesis, suggested that health education programs based on theories were more effective than non-theoretical based educational programs (Liu et al., 2017). Health education-related interventions that are based on social and behavioural theories can produce enhanced and more long-lasting effects than those lacking a theoretical framework (Glanz & Bishop, 2010; Nutbeam et al., 2010; van Vugt et al, 2013). Theoretical frameworks have been minimally used in the design, evaluation and implementation of educational programs for patients with ACS and theoretical frameworks were briefly described in part of the relevant studies (Guo & Harris, 2016). Theory-based educational programs for patients with T2DM showed beneficial outcomes on self-efficacy, diabetes knowledge and HbA1c levels (Zhao et al., 2017). The Self-efficacy Concept (within Social Cognitive Theory [SCT]), Health Belief Model (HBM) and empowerment theories were the most frequently applied theoretical frameworks reported in health education programs for ACS (Guo & Harris, 2016) or T2DM patients (Zhao et al., 2017), or both conditions (Wu & Chang, 2014). The CDSMP for ACS patients with T2DM was developed based on Bandura's Self-efficacy Concept (Wu et al., 2017) and another study used behavioural strategies but no specific theoretical model used, such as goal setting to deliver education for patients with ACS and T2DM (Soja et al., 2007).

The Self-efficacy Concept describes that enhancing an individual's self-efficacy can be acquired using four sources ("mastery experiences, social modeling, social persuasion, physical and emotional states") of gaining information or influence and transforming efficacy-expectations described in the introductory Chapter (Bandura, 2004b, p.622-623). Health professionals provided some educational content in relation to sources the information, such as reinforce the successful experiences of self-monitoring blood glucose levels (mastery experiences); providing tips to monitor their exercise intensity and diet (social modelling); answering patients' questions and encouragement to patients of self-management at home during daily ward rounds (social persuasion) and emotional support (physical and emotional states).

However, health professionals did not use the sources of information or influence to enhance efficacy-expectations within a structured educational program and sources of information were

not used in a systematic or structured manner. Patients participating in this study may not have a high level of specific knowledge regarding their diabetes such as complications, but they did know general health information about their conditions. A theory-based approach which incorporates a combination of all components from SCT and HBM, including the use of the four sources of information from SCT and the perceived severity or threat from HBM within which health education for Chinese people with ACS and T2DM, should be developed (Bandura, 2004b; Bandura, 1994), see Appendix U1 (page 332).

There was no evidence of the use of theoretical frameworks to direct health education according to the qualitative data from health professionals. However, a series of behavioural and psychological strategies were used, such as such as goal setting, acknowledging and supporting psychological recovery. Behavioural and psychological strategies that have reported effectiveness in chronic health conditions include: goal setting, problem solving, social support, patient-centered communication and exploration of feelings (Funnell, 2010). Goal setting components in health education are associated with goal attainment and behavioural change, because these offer new directions for patients and define and reinforce success with the original goal (Malemute, Shultz, Ballejos, Butkus, & Early, 2011). Psychological problems, such as stress, were associated with all-cause hospital readmission among ACS patients (Edmondson, Green, Ye, Halazun, & Davidson, 2014). Psychosocial factors such as depression can worsen the prognosis of ACS (Lichtman et al., 2014). Both physicians and nurses acknowledged the need for emotional support for patients.

Individuals facing threatening situations require more information and support to improve their self-efficacy level to cope with threatening situations (Bandura, 1977). After experiencing a critical ACS event (realistic threat), most patients attending the interviews were highly motivated to stay alive and live well, by managing their T2DM and modifying their risk factors. This aspect of threat appears to differ from the experience of say, T2DM alone or ACS uniquely. The interaction of the heightened sensitivity to the threat of death or expectancies about environmental cues in SCT or perceived severity in HBM, strengthens the links between perceived threat and modifying behaviour described in the HBM and SCT (Rosenstock et al.,

1988) and does provide an important aspect for a blended theoretical or philosophical framework for health education programs for Chinese people with multi-morbidities.

Participants referred to the difficulties of managing a condition (referring to diabetes alone) that either had no symptoms or when patients did feel well they stopped doing the required behaviours, due to perception of diminished threat (Berenguera et al., 2016). In one way, experiencing the ACS event, may be creating for the first time, the level of threat (or perceived severity [HBM] of condition) that should have been understood when the individual was first diagnosed with T2DM (Karimy, Araban, Zareban, Taher, & Abedi, 2016). This would suggest that diabetes education programs need to provide a realistic experience of having an ACS event, early within the education of individual with T2DM (Vassilev, Rogers, Kennedy, & Koetsenruijter, 2014). In this era of advanced educational mediums, an interactive experience that safely allows patients to experience an ACS event, or connecting with other persons who have experienced an ACS event, may provide key aspects of threat that are missing for many people with diabetes (Buhse et al., 2015).

Smoking is a similar behaviour when individuals remain obscured from the threat of smoking, there are limited or no symptoms experienced until the damaged has occurred (Horn & Waingrow, 1966). Anti-smoking campaigns have focused on making visual what is hidden (Gallopel-Morvan, Gabriel, Le Gall-Ely, Rieunier, & Urien, 2011). Educational interventions should consider how these approaches could be adapted to deliver educational messages that unmask the real threat to health of diabetes and related poor lifestyle factors.

The adaptation of the HBM and SCT, when applied to the health education of individuals with T2DM, should therefore consider escalating the perceived threat or perceived severity of diabetes or expectancies about environmental cues, to promote improved and sustainable behavioural change (Karimy et al., 2016). Without this emphasis on the threat to life, the true perceived severity of condition, remains obscured and potentially not acted upon.

Moreover, maintaining harmony in the body and mind, as well as a holistic view was described by participants as important concepts to understanding and managing multiple health

conditions. A blended approach which incorporates a combination of theoretical frameworks from Western and Eastern philosophies would acknowledge the unique culturally context within which health education for Chinese people experiencing ACS and T2DM, should be developed. Specifically, self-efficacy concept demonstrated that individual behaviours are determined by their self-efficacy level or a judgment of their own abilities to change behaviours (Bandura, 1977); and maintaining harmony in the body and mind or holistic view would also direct that patients need to keep all the elements in life in balance to achieve a good health.

7.2.6 Social environment is integral to lifestyle and behavioural changes

Patients with ACS andT2DM may experience restrictions in their social environment and role fulfilment. A positive social environment is related to personal well-being and reduces mortality risks, although the evidence was limited (Ter Hoeve et al., 2015). A previous study identified the beneficial effects from social networks, and social cohesion on health for patients with chronic diseases (Wen et al., 2010). Participants in this study reported that social and family environment in Chinese society has significant influences for their disease management, including positive and negative impacts. Specifically, social network support including family and friends support was reported to have beneficial impacts for patients or individuals, while the social environment also was a barrier to changing negative behaviours or developing good habits.

Participants in this study reported attending square dancing exercise as their regular exercise within their local community and this activity is suitable for participants to increase regular physical exercise with appropriate intensity. Square dancing is a collective physical exercise and an increasingly popular exercise form in China, especially favoured by middle-aged and old people (Zhou, 2014). It integrates the advantages of social engagement, physical and psychological recreation (Gao, Zhang, Qi, & Petridis, 2016). Previous studies reported dancing as an appropriate exercise intervention for patients with T2DM, in promoting regular physical activity and improving patients' clinical outcomes, such as HbA1c, lipids and psychological wellbeing (Martyn-Nemeth, Vitale, & Cowger, 2010; Murrock, Higgins, & Killion, 2009). Moreover, dance therapy could also be considered for inclusion in CR programs, because it may

improve exercise capacity (VO_2 peak) and quality of life among patients with heart disease (Gomes Neto, Menezes, & Oliveira Carvalho, 2014).

However, smoking is significantly affected by the social and environmental context in China, such as cultural and gender norms (Ma et al., 2013). Smoking with others supports relationships between friends and business associates, particularly for men in Chinese society (Mao, Bristow, & Robinson, 2012). The high prevalence of smoking in China within the community makes it difficult to quit as described by many participants. Chinese smokers are aware of the benefits of quitting smoking to protect their children's health, and health education could emphasise this potential (Saw et al., 2016). Therefore, health educational program should incorporate the relationships among environmental influences (or social norms) and behavioural changes. Moreover, community-based or national anti-smoking campaigns are urgently needed to reduce smoking rates in the Chinese population and unmask the real threat to health of smoking (Jiang & Beaudoin, 2016).

7.3 Design of a health education intervention for people living in Shanghai to be delivered during an inpatient admission

Authors from one previous review summarized how to develop self-management education programs in health services and included three aspects: preparation of health system, preparation of patients and payment mechanisms (Lorig & Holman, 2003). Health care systems should identify the patients that would benefit from self-management education programs, decide which education programs health care systems want to support and develop a pool of dedicated trained educators (Lorig & Holman, 2003). The effectiveness of health education is determined by what is taught (educational content), how the content is taught (educational process), teaching format and patient characteristics (Lorig & Holman, 2003).

Health education for patients with ACS and T2DM during the inpatient admission was largely delivered in an unstructured manner (no planned topics or curriculum and no mandated length of training time) in this Shanghai hospital. Structured health education, that is a planned program with comprehensive content during a fixed length of educational time, responsive to patients' needs and background (Scain, Friedman, & Gross, 2009), is recommended during the

inpatient admission and follow-up period. According to NICE standard, structured education programs must: be evidence-based and tailored to the needs of patients, have specific learning aims and objectives; be theory-driven, with resource-effective written curriculum, trained educators to deliver content, and built-in quality assurance with regular auditing of outcomes (National Institute for Health and Care Excellence [NICE], 2015). Based on the results and findings from this thesis and previous studies in Shanghai (Dongbo, Ding, McGowan, & Fu, 2006; Fu et al., 2003), as well as the CDSMP for ACS patients with T2DM (Tanash et al., 2017; Wu & Chang, 2014; Wu, Chang, Courtney, & Ramis, 2012), key aspects of a proposed education program for patients with ACS and T2DM is presented in Appendix U2 (page 334).

A comprehensive learning needs assessment is also a key part of the wider educational program and should have a clearly defined purpose and outlined methods, and should be a formal, regular assessment of needs (Department of Health & Diabetes UK, 2005), especially for patients with multiple health conditions. The highest priority learning needs for ACS patients included complications and symptoms, illness-related concerns, medications, treatment and everyday living activities, and support resources from the local community (Eshah, 2011; Mosleh, Eshah, & Almalik, 2017). Patients with T2DM and their families also have high ongoing learning needs despite attending a structured health education. Ongoing systematic assessment of family member learning needs is also needed (Richards et al., 2013).

Due to the serious nature of ACS and T2DM and the very short time during the inpatient admission, learning needs assessment could begin once patients were stabilised and able to communicate. Health professionals could design a self-administered questionnaire to assess learning needs among patients with ACS and T2DM, or use some developed tools, such as Cardiac Patients Leaning Needs Inventory (CPLNI) (Galdeano, Furuya, Rodrigues, Dantas, & Rossi, 2014) and information needs in diabetes (IND) questionnaire (Chernyak et al., 2016).

The knowledge and skills needed to deliver health education for coronary heart disease (CHD) patients could include capturing learning needs of patients, facilitating an effective dialogue and providing individualized health education and lifestyle counselling (Svavarsdóttir, Sigurðardóttir, & Steinsbekk, 2016). Patient education training programs based on a patient-

centred model and interactive learning methods should be furnished for health practitioners to establish their skills and ability to provide effective health education for their patients (Fidyk, Ventura, & Green, 2014).

Inpatient health education also needs to contain built-in quality assurance and regular auditing procedures of outcomes for patients or individuals with both conditions. One approach to quality assurance of health education comprised of certification at the individual level and program-specific accreditation or approval of professional preparation degree programs at the institutional level (Allegrante, Barry, Auld, & Lamarre, 2012; Cottrell et al., 2009). "Certified Health Education Specialist (CHES)", teachers certification for health in schools, and "Certified in Public Health (CPH)" were the three forms of certification at the individual level for health education professionals (Cottrell et al., 2009, p.452), that could be considered in China and suitable for registered nurses and physicians. Programs at the institutional level also need to be developed in China to promote health education for Chinese patients, such as the National Task Forces on Accreditation in Health Education (Cottrell et al., 2009).

Three main elements to the quality assurance process for health education are to: develop a defined education program with clear content and structure, develop quality assurance tools and assess the internal and external process (Department of Health & Diabetes UK, 2005). In China, the Centre of Nursing Quality Control could develop clear standards to monitor whether the health education for patients with ACS and T2DM is being delivered to a high standard. A national quality assurance tool relating to inpatient health education delivered to patients with ACS and T2DM in China is needed and the ongoing educator training should be linked to the results of the quality assurance process.

Moreover, the UK Medical Research Council (MRC) developed a framework based on the cyclical sequenced four phases — development, feasibility or piloting, evaluation, and implementation — for use of complex interventions (Craig et al., 2013). The MRC framework directs the phases that health care researchers should use to develop a sound complex intervention, including aspects of effectiveness and cost-effectiveness, feasibility and acceptability, sustainability and theory (Craig et al., 2008). The steps in the MRC process

provide a systematic way to develop a health education intervention for people living in Shanghai for delivery during an inpatient admission and in the community. Within this series of studies the best evidence has been provided, health consumers' beliefs and attitudes have been explored, health professional current practice was outlined, and appropriate theories have been identified (Craig et al., 2008). Future research should continue to use this framework to conduct rigorous testing of the developed education program, including cost effectiveness prior to being adapted into clinical practice (Moore et al., 2015). Therefore, the cyclical sequenced phases of the MRC framework could be a valuable framework when implementing a health education intervention for people with ACS and T2DM living in Shanghai.

7.4 Health professionals and their role in delivering health education during an acute admission

Health education for patients with ACS and T2DM is provided by physicians and registered nurses, and medical students in CCU, but nurses and physicians vary in their foci as described in their interviews. Nurses and physicians play a central role in education programs although tensions exist in fulfilling this role (Svavarsdóttir, Sigurdardottir, & Steinsbekk, 2016). However, because of the complex role of physicians, and nurses being present with the patients 24 hours a day, nurses take on greater health education responsibilities during patients' acute admission period (Chandler et al., 2015). But as reported by other researchers, nurses' role in patient education in critical care settings was minimal and many available chances for patient education were often missed (Lee & Lee, 2013; Twinn & Lee, 1997). Barriers for nurses to provide health education during patients' acute admission period may include inadequate time and human resources, lack of teaching materials, insufficient knowledge, ineffective communication between health professionals and poor patient receptivity (Barber-Parker, 2002; Livne, Peterfreund, & Sheps, 2017; Nosbusch, Weiss, & Bobay, 2011).

It is essential for nursing managers and policy makers to periodically review the existing clinical resources and human resources issues so that sufficient education can be provided in the critical care environment. Adequate numbers of nurses with patient education training are required in order to enhance the quality of patient education in critical care settings. To

reinforce education in critical care settings, nurse managers might also consider: creating education reminders, “encouraging nurses to participate in developing teaching programs”, or participate in patient education conferences, and “providing nurses with feedback about patient needs for knowledge and skills” (Barber-Parker, 2002, p.112).

Physicians also have a crucial role in educating patients and patients informed by their physicians are reported as more satisfied with their care (Terry & Healey, 2000). Physicians are in a unique position to affect health education because of their ability to reinforce behavioural changes over the acute admission period (Amin, 2006). The ward round is characterised by interaction among healthcare providers and patients. Information is exchanged in ward rounds so that the healthcare providers can encourage the patients to actively participate in care and management (Swenne & Skytt, 2014). The time assigned for cardiologists to conduct ward rounds was limited. The time allotted to each individual during the ward round has been reported as 4.6 minutes in a single room or 2.6 minutes in a four-bed room, as found in one study (van de Glind, van Dulmen, & Goossensen, 2008). Moreover, the main communication barriers to patient education in cardiac inpatient care were the insufficient and problematic communication between the health professionals, patients and their families (Farahani, Sahragard, Carroll, & Mohammadi, 2011). More research is required into how to build trusting and friendly relationship and deliver effective communication (Shafipour, Mohammad, & Ahmadi, 2014).

Multidisciplinary teams including nurses, physicians, dieticians, pharmacists, psychologists, physiotherapists and social workers were also recommended to provide health education delivery for patients with ACS and T2DM (Wood et al., 2008). Multidisciplinary teams have been found to provide more knowledge and experience as a collaborative and integrated team and each discipline can take an active role in the education process for CHD patients (Beck et al., 2017). “A patient-centered approach within a trained multidisciplinary team” is viewed as an efficient and rewarding way to deliver health education (Lelorain, Bachelet, Bertin, & Bourgoin, 2017, p.331).

7.5 Applying Eastern interpretation of health illness (harmony and balance) as an overarching framework

When confronting the universe and nature, handling interpersonal matters and cultivating one's self, Chinese people have a deep-rooted cultural value to pursue "harmony" or "balance" (Huang, 2016). Chinese culture is based on pursuing "harmony" or "balance" and maintaining them within these three levels: nature (heaven), organisms (human body) and interpersonal relationships (society). People are not isolated beings (Huang, 2016). Individuals have multiple relations with nature, with others, with themselves based on Chinese culture (Xiao, Zhong, Tsang, Lin, & Bian, 2015), and disturbing the balance or harmony within nature will result in illness (Lai & Surood, 2009). Maintaining harmony in the body and mind, as well as a holistic view was described by patients with ACS and T2DM as important concepts to understanding and managing their multiple health conditions in this study. Health education for patients with ACS and T2DM could encourage individuals to pursue "harmony" or "balance" by healthy diet, exercise and other self-management behaviours.

Traditional Chinese Medicine (TCM) uses dynamic, holistic, functional and spiritual unity to explain life and treat diseases, such as Yin-Yang harmony (Sun et al., 2013). Yin and Yang suggests that all universal phenomena, including human beings, intrinsically crave harmony for their healthy development (Fang, 2012). Each phenomenon will always have two integral elements in a holistic and dynamic balance, no matter how unique or generic (Li, 2012). Yin and Yang could be represented as any pair of dichotomous categories as a symbol, such as good and bad, right and left, and black and white, but the two contrary components can be mutually transformed (Huang, 2016).

To achieve a good health status, individuals have to follow a healthy lifestyle, spiritual toning, and other approaches to keep all the elements in life in balance or harmony (Tai, 2012). For Chinese patients with ACS and T2DM, health professionals should consider the use of the need to restore and maintain mind and body harmony. This approach could be used to organise health content (divide into Yin and Yang) and design appropriate teaching strategies when developing a health education program for patients with ACS and T2DM.

TCM body constitution is divided into nine types with balanced constitution, “Phlegm-damp and Damp-heat TCM body constitution” could potentially consider as a predictor of T2DM in people with impaired glucose regulation (You, Zhang, Feng, & Gai, 2017, p.6). ACS is similar to the “wind syndrome” of TCM, the pathogen is located in the heart, which is wind-cold intrusion into the heart, when physically weak as old age or “unbalanced or irregular diet and emotion” (Wang et al., 2014, p.122). TCM body constitution of diabetes and ACS is a dynamic process and could be used to guide patients’ lifestyle when educating patients, such as diet, exercise and medications to change their current TCM body constitution and achieve a harmony status in their body.

Disease-states (ACS and T2DM) are the disharmony and imbalance status according to TCM and the aim of health care is to address disharmonies and imbalances to return to a state of homeostasis as close as possible not just regarding ACS and T2DM but in the whole body and mind (Covington, 2001). The TCM understanding of balance and harmony focuses on holism and this could be used for health education for patients with ACS and T2DM, such as maintain blood glucose balance by combination exercise, diet and medications in balance (Ho, Tran, & Chesla, 2015). Health education of balance or harmony for Chinese patients with ACS and T2DM may fit more easily into their cultural health beliefs and expectations.

These concepts and approaches should be introduced into health education for patients with multiple conditions. Culturally-appropriate health education programs for Chinese people should treat the multiple health conditions as complete “whole” and to restore and maintain harmony. This means the health education for patients with multiple conditions needs to consider all conditions and also should consider the use of the need to restore and maintain harmony to deliver health information relating to the risk factors, healthy lifestyle or other issues.

These principles could direct the development of health education using a “harmony based” health education program. Briefly, the “harmony based” health education program consists of several components that reflect how to change the “disharmonies” or “imbalances” return to a state of “harmony” or “balance” by diet regulation, lifestyle changes and risk factor

modifications. For example, the “harmony based” health education program could be aimed to let patients adequately perceive the following elements based on “harmony”: *“disharmonies”* including seriousness of diabetes or ACS, their genetic and environmental susceptibility to diabetes or ACS; *“achieve harmonies”* including lifestyle change in genetically predisposed people for modifying risk factors, and guidance on favourable lifestyle change.

However, very little research appears to have been done on “harmony based” interventions. One previous study suggested that “harmony” is an important element to develop culturally appropriate smoking cessation program for Chinese Americans as maintaining harmony and respect with their families (Ma, Shive, Tan, Thomas, & Man, 2004). Another study used yoga to promote and achieve a state of balance and harmony among patients with allergic respiratory symptoms (Chukumnerd, Hatthakit, & Chuaprapaisilp, 2011). No similar programs were found for patients with ACS or diabetes in current literature.

Moreover, a “harmony based” health education program can also provide an interesting conceptual understanding of the relationship between key constructs within HBM (Janz & Becker, 1984). “Disharmonies” and “imbalances” are approaches to help Chinese people to understand the “perceived threat” and “perceived severity” from HBM. The level of threat (or perceived severity of condition) could be understood as the level of the “disharmonies” or “imbalances”. In addition, the “perceived benefits” could be understood as the benefits for return to a state of “harmony” or “balance”. Therefore, “harmony based” health education program can link with HBM to direct developing health education programs for patients with ACS and T2DM.

7.6 Understanding the relationship between self-efficacy and self-management for patients with ACS and T2DM, preparing patients for home

Self-management refers to individuals’ engagement in activities related to medical regimen adherence, symptom monitoring, psychosocial regulation and lifestyle change (Been-Dahmen, Dwarswaard, Hazes, Staa, & Ista, 2015; Lorig & Holman, 2003). The good self-manager takes responsibility, is knowledgeable, and active in using knowledge to make decisions about their health conditions (Ellis et al., 2017). For individuals with multiple health conditions, the barriers

to self-management include lack of knowledge, inadequate health care resources and lack of self-efficacy and social support (Liddy et al., 2014; Murphy, Chuma, Mathews, Steyn, & Levitt, 2015). Therefore, ongoing education and support is needed after experiencing an ACS event when returning home. Health professionals need to provide more feedback combined with realistic experiences from patients with ACS and T2DM who successfully self-manage at home. Health professionals could develop a WeChat group as a platform to let patients communicate with each other and provide professional and timely guidance from health professionals when individuals return to home.

Health education and perceived self-efficacy remain important factors supporting self-management behaviours among people with ACS and T2DM. Self-management of multiple health conditions was a dynamic and complex process, including an interplay of factors relating to individuals' perceived threat and health priorities. The findings from our study provided useful elements and proposed potential strategies that can be applied to increase self-management for individuals with ACS and T2DM. Self-management education interventions for patients with ACS and T2DM should target not only self-efficacy, but also consider their perceived threat and health priorities. These factors could be used in design and delivery formats, content, facilitators and settings to develop health education interventions for patients with ACS and T2DM. All of the factors influencing self-management (which are self-efficacy, perceived threat and health priorities) are necessary considerations in understanding what affects patients' self-management behaviours. In addition, family members could also provide effective support for ACS patients with T2DM to increase confidence and assist them to set the right health priorities, as well as assist them performing self-management activities at home.

Our study's findings have demonstrated that inpatient education was beneficial for patients with ACS and T2DM, improved self-efficacy in T2DM self-management and ACS symptom management. However, there was insufficient confidence in their ability to manage either diabetes or ACS at home found in their interviews. Previous studies emphasize the importance of developing self-efficacy as being fundamental to supporting and sustaining self-management

behaviours of chronic conditions (Jang & Yoo, 2012; Lorig & Holman, 2003). Self-efficacy is the individual's potential ability to manage their health conditions, and can motivate individuals to overcome barriers to behavioural and lifestyle change (Mohebi, Azadbakht, Feizi, Sharifirad, & Kargar, 2013). Self-management behaviour requires the capabilities and confidence of individuals, and high self-efficacy leads to perseverance with self-management (Chin, Huang, & Hsu, 2013). Low self-efficacy in the presence of multiple diseases has been found to be a barrier for active self-management or accessing self-management support resources (Fort et al., 2013).

Although 82.05% (128/156) of the patients had adequate (C-DKS score >4) diabetes knowledge, patients participating in this study may lack the specific knowledge and self-management skills including monitoring their blood glucose levels, diet, exercise and medication. For example, "many patients reported not having enough specific details on what kinds of food would be appropriate" and "did not know how to respond to high glucose levels in their diet" (Sohal, Sohal, King-Shier, & Khan, 2015, p.9). Patients' did know the "normal blood sugar" (Item 1 of DKS), but they still were not confident to control their glucose levels by diet regulation. Health education should focus on the problem-solving aspects in more detail, particularly after returning to home.

Previous studies used an integrated CDSMP incorporating telephone contact and text message follow-up for patients with ACS and T2DM and showed a positive effect on diabetes management self-efficacy (Tanash et al., 2017; Wu, Chang, Courtney, & Ramis, 2012). However, this CDSMP, in a recent study, did not find a significant change in self-efficacy among participants from Taiwan and Australian, which was attributed by authors to the cultural context, older age of participants and short-term follow up (Wu et al., 2017). There is limited research in the area of developing integrated health education programs for patients with ACS and T2DM to improve self-efficacy and promote self-management behaviours at home. There is an urgent need to address this area of clinical practice.

Person-centered care (Fors et al., 2015), eHealth tool (Wolf et al., 2016) and self-efficacy enhancement program (Vibulchai, Thanasilp, & Preechawong, 2016) were effective in improving self-efficacy among patients after experiencing an ACS event. Shared experiences,

defining goals and taking actions with specific strategies, and providing positive feedback were the common strategies used in these three programs to enhance patients' self-efficacy after experiencing an ACS event (Fors et al., 2015; Vibulchai et al., 2016; Wolf et al., 2016). Similarly, CDSMP for patients with ACS and T2DM also used similar strategies and found a positive effect on diabetes management self-efficacy (Tanash et al., 2017; Wu, Chang, Courtney, & Ramis, 2012), but did not find a significant change in self-efficacy in a recent study (Wu et al., 2017). There is a clear need to move from delivering information or enhancing knowledge about disease, to problem-solving, goal setting, and ongoing interaction in educational intervention.

7.7 Implications for practice

7.7.1 Implications for health policy

The findings from this series of studies have significant implications for health education for patients with multiple health conditions during their admission period. Hospital directors and government bodies, should consider an increase in the support for the implementation of comprehensive health education policy for patients with ACS and T2DM, through the establishment of specialist services, to improve individuals' knowledge, self-efficacy and self-management skills through the delivery of a standardized comprehensive health education in the critical care settings, and outpatient settings.

A national standard of structured education program for patients with ACS and T2DM is recommended during the acute admission period. There are no existing policies developed by professional academic organizations about the roles and responsibilities of health professionals (physicians and registered nurses) in health education in China. This series of studies have shown that inpatient health education delivered by physicians and registered nurses through diverse approaches is beneficial for patients with ACS and T2DM. Policymakers should develop national policies and guidelines on the role and responsibilities of health professionals (physicians and registered nurses) in health education during an acute admission to guide clinical practice.

Patient education training programs should provide continuing education or medical education courses based on theories and interactive learning strategies should be furnished for health

practitioners and medical students to establish their skills and abilities in delivering health education. Multidisciplinary teams including physicians, registered nurses, dieticians, pharmacists, psychologists, physiotherapists and social workers are also recommended.

7.7.2 Implications for the patients and their families

For patients with ACS and T2DM in China, the acute admission period is the best opportunity for interactions and communication with health professionals to clarify and set treatment goals together, exchange information or receive health information. Patients can actively participate in the care and management process during the acute admission and follow-up period, and prompt the health professionals for more health information when required, by asking questions, giving opinions and expressing health related concerns. After discharge, patients also can be more active in attending the health lectures and other educational activities held by health professionals, as well as contact the health professionals by WeChat.

Family members should be involved in the health education at the initial stage when patients were first diagnosed with T2DM. These family members can provide support for patients to help them to modify their lifestyle and perform self-management activities at home. Family members also could encourage the patients to attend to the health promoting behaviours, such as square dancing, which was reported as beneficial for individuals with ACS and T2DM.

7.7.3 Implications for health professionals

Health professionals need to improve their capability to build trust and to individualize the education based on the patients' context and assessed learning needs for multiple health conditions. Health education is a core part of the management of patients with more than one health condition, and the content and focus should be specific and responsive to the stage of recovery of the patient from acute episode to returning to the community. Educational teaching methods and support strategies should be tailored for patients' learning needs during the admission or community follow-up phase.

Inpatient education was beneficial for patients with ACS and T2DM but not sufficient to deliver confidence to manage either diabetes or ACS at home, or alternately, the home environment

provided new challenges that diminished existing confidence. Health professionals should provide ongoing education and regular follow-up with patients or individuals and their family, including ongoing measurement of their achievement of goals, and their perceived self-efficacy. The content of the health education should be delivered in a structured manner and use theoretical frameworks as well as behavioural and psychological strategies to direct health education. Therefore, structured and theory-based (such as HBM, SCT and Eastern philosophies) health education is recommended for patients or individuals living with ACS and T2DM.

The masking of the effects of diabetes on vessels within the brain, heart and limbs, diminishes the perceived threat for individuals with diabetes, until the symptoms of ACS like chest pain, are manifest among the participants. Therefore, community-based health education programs, which deliver appropriate health information on the seriousness of the hidden effects of smoking and high sugar diets or diabetes on cardiovascular health, are urgently needed. Health education for patients with ACS and T2DM should increase their perceived severity of their condition, as increased perceived severity has been found to assist an individual to adhere to self-management behaviours (Karimy et al., 2016).

Family members should be included in any education program due to high familial aspects of ACS, T2DM, and hypertension. The use of term “Three Brothers” could also be used to deliver disease information and pathophysiology relating to the risk factors of the three conditions. Familial risk factors among these three health conditions further support the need for a family-oriented approach to health education.

Health education programs, that deliver culturally-appropriate content for Chinese people (particularly men) experiencing both diabetes and ACS, should consider the use of the need to restore and maintain mind and body harmony after an ACS event. A balanced or complementary approach to the use of traditional Chinese medicine and Western medicine is practiced, based on the severity and stage of disease, and the precise use of TCM medicines requires further research.

7.8 Strengths and limitations of this study

7.8.1 Strengths

The present series of studies have several strengths that make a valuable contribution to existing knowledge. This study provides an important contribution to the understanding of current health education provided to patients with both ACS and T2DM within Chinese society.

The present series of studies were informed by an umbrella review of the literature, which included 51 eligible reviews, identifying the current evidence on health education-related interventions for patients with ACS or T2DM; identifying the educational content, delivery methods, intensity, duration and setting required. For health professionals providing health education to patients with ACS or T2DM, the results from this review provided a contemporaneous perspective on current evidence on the effectiveness of health education (its content, and delivery methods) for this high risk patient group.

This series of studies are the first to examine the impact and the experiences of current health education delivered for patients with both ACS and T2DM within China. The research therefore adds to the current knowledge base. The acute in-hospital period for patients with ACS and T2DM may provide the best opportunity to deliver effective health education to these patients within acute settings in China. Within this unique setting, the findings of this thesis now direct recommendations for the design of health education for patients with multiple health conditions living in China, nuanced to this unique cultural context and values.

Another significant feature of the present series of studies is that it provides a rationale for a mixed methods approach for a more comprehensive cultural understanding of current health education delivering to patients with both ACS and T2DM within China. A mixed methods approach combining qualitative and quantitative approaches, has facilitated an in-depth analysis of health education for patients with ACS and T2DM that would have been limited if only one research approach was used. Triangulation of data in this thesis, including semi-structured interviews, surveys and health record reviews facilitated the understanding of how health education impacted patients with ACS and T2DM and this understanding would have been limited if only one source of data was used.

7.8.2 Limitations

Although this series of studies provided a complete picture of current health education delivered by health care professionals and received by patients with ACS and T2DM within this unique cultural setting, several limitations are noteworthy.

First, there has been no attempt to intervene or provide education in this study, and the health education provided has been determined through accounts of health professionals and patients.

Second, the study findings reflect predominantly male perspectives and further research capturing women's perspectives is required.

Third, the findings of the present series of studies may not be generalizable to other cultures or dissimilar health systems. The present series of studies were conducted at one major hospital in Shanghai, these patients with ACS and T2DM cannot be considered to be representative of all patients in other parts of China or other countries.

Fourth, the telephone-based follow-up interview with the patients was conducted within four weeks after discharge and focused on how participants were managing their health conditions at home. However, changing behaviour may occur from 2 to 8 months (Powers et al., 2017). The timing of the follow-up interview may not have captured the behaviour change that might of occurred at a later time.

Moreover, the quantitative element in these series of studies does not provide evidence of cause and effect, rather an association between the perceived education received and key outcomes. There was also no baseline data collected on behavioural or clinical outcomes, rather this study sought to evaluate the impact on existing educational practices. Further clinical trials with defined educational interventions, should be conducted, with continuous evaluation, to determine the effectiveness of specific teaching strategies and content on individuals' self-management.

The semi-structured interviews did not ask the questions related to sources of information (mastery experiences, social modeling, social persuasion, physical and emotional states) or influence to improve patients' self-efficacy. Further research could combine the application of a theory-based program with teaching strategies that are derived from the sources of influence.

Finally, the VAS and other self-report scales used in the survey may have been responded to by participants in a socially desirable manner or may not have answered in a manner reflective of the reality. In addition, only the attitudes subscale of the Chinese language version of the ACSRI was included in the survey. One of the measures used in this study, did demonstrate low internal consistency (C-DKS with a Kuder-Richardson 20 (KR20) coefficient of 0.422) in this sample.

7.9 Conclusion

The aims of this research were to gain an understanding of current health education delivered by health professionals and received by patients with ACS and T2DM within this unique cultural setting. A convergent, embedded, mixed method design was used to achieve the research aims and answer the research questions.

- The educational content described by health professionals as being provided to patients with ACS and T2DM reflects the topics described in guidelines in China and other Western countries. This content was being delivered relative to the stage of recovery of the patient from acute episode to returning to the community. Diverse approaches were identified to education delivery for patients with ACS and T2DM. The education provided represents an unstructured, low intensity approach, which could be improved by increasing the contact sessions to 10 and delivery health education and/or support over a 6 months period.
- There was no evidence of the use of theoretical frameworks to direct health education. Theoretical frameworks, such as HMB and SCT, should be incorporated in future development and evaluation of health education programs for Chinese patients with ACS and T2DM. Health education also should target components of self-efficacy to increase patients' self-efficacy, including the use of the four sources of self-efficacy,

mastery experiences, social modeling, social persuasion, physical and emotional states. Community-based public health programs, which deliver appropriate messages on the seriousness of the hidden effects of smoking and high sugar diets or diabetes on cardiovascular health, are urgently needed.

- Inpatient health education delivered during an acute admission has reduced fasting blood glucose, and improved scores in ACS symptom management and diabetes management self-efficacy among patients with ACS and T2DM. With the low intensity program received and a reduced self-efficacy for symptom management of ACS being found, a much higher focus on ACS health education within the admission and follow-up period is suggested.
- The most common barrier to providing increased health education was constraints of time to provide health education for patients with ACS and T2DM. Lack of resources at hospital, community, and national level was the second barrier in this study. Policymakers and hospital directors should provide more resources and support to promote health education during the acute admission period for patients with ACS and T2DM in China, or additional community resources or outpatient facilities or on-line interaction sites to enhance support during admission and after discharge.
- Both self-management and behavioural changes among patients with ACS and T2DM were influenced by the individuals' priorities, social roles and norms and cultural values. Self-management education interventions for patients with ACS and T2DM should target not only self-efficacy, but also consider their health priorities, social context and perceived threat. Positive social environment could be considered for inclusion of educational programs and also teaching for patients about how to avoid and address the negative social influences.
- Maintaining harmony was an important concept to understanding and managing multiple health conditions among Chinese patients with ACS and T2DM. A balanced or complementary approach to the use of traditional Chinese medicine and Western medicine is practiced, based on the severity and stage of disease, and the precise use of TCM medicines requires further research.

- Family members should be included in any education program due to high familial aspects of ACS, T2DM, and hypertension. At least one family member should be involved in the formal education process when patients are first diagnosed with T2DM. The use of the term “Three Brothers” (ACS, T2DM and Hypertension) could also be used to deliver disease information and pathophysiology relating to the risk factors of the three conditions. Three conditions could be considered as the “family diseases”, rather than individual diseases, when considering genetic and environmental components among these conditions.

Therefore, inpatient education was beneficial but not sufficient to deliver confidence to manage either diabetes or ACS at home. For patients with ACS and T2DM, health education, perceived self-efficacy, knowledge and skills about how to manage the conditions within changing priorities and social environment influenced the ability to self-manage. Health education for patients within Shanghai hospitals, should include culturally-appropriate interpretations of health and illness (mind and body harmony), be theoretically derived, and include family members.

Experiencing two or more conditions is frequently encountered within clinical practice and provides considerable challenges to health professionals delivering health education within acute settings. Living with multiple conditions also presents a complex environment for individuals with ACS and T2DM, with changing priorities from two or more conditions. The tailoring of educational interventions to meet these challenges, including what to teach and when (comprehensive educational content delivered relative to recovery from acute admission to returning to the community), how the content should be delivered (educational process with diverse teaching strategies and high intensity), the teaching format (structured programs based on health behaviour theories or Eastern philosophies with family involvement) and consideration of the individual context of learning (patient characteristics and cultural environments), will be essential for the epidemic of these multiple chronic diseases to be managed in the years ahead.

References

Abbaszadeh, A., Borhani, F., & Asadi, N. (2011). Effects of health belief model-based video training about risk factors on knowledge and attitude of myocardial infarction patients after discharge. *Journal of Research in Medical Sciences, 16*(2), 195-199.

Abdo, N. M., & Mohamed, M. E. (2010). Effectiveness of health education program for type 2 diabetes mellitus patients attending Zagazig University Diabetes Clinic, Egypt. *The Journal of the Egyptian Public Health Association*, 85(3-4), 113-130.

Ahmad, B., Ramadas, A., Kia Fatt, Q., & Md Zain, A. Z. (2014). A pilot study: the development of a culturally tailored Malaysian Diabetes Education Module (MY-DEMO) based on the Health Belief Model. *BMC Endocrine Disorders, 14*, 31. doi: 10.1186/1472-6823-14-31

Ahmed, B., Davis, H. T., & Laskey, W. K. (2014). In-hospital mortality among patients with type 2 diabetes mellitus and acute myocardial infarction: results from the national inpatient sample, 2000-2010. *Journal of the American Heart Association, 3*(4), e001090. doi: 10.1161/JAHA.114.001090.

Aldcroft, S. A., Taylor, N. F., Blackstock, F. C., & O'Halloran, P. D. (2011). Psychoeducational rehabilitation for health behavior change in coronary artery disease: a systematic review of controlled trials. *Journal of Cardiopulmonary Rehabilitation and Prevention*, 31(5), 273-281.

Aljasem, L. I., Peyrot, M., Wissow, L., & Rubin, R. R. (2001). The impact of barriers and self-efficacy on self-care behaviors in type 2 diabetes. *The Diabetes Educator, 27*(3), 393-404.

Allegrante, J. P., Barry, M. M., Auld, M. E., & Lamarre, M. C. (2012). Galway revisited: tracking global progress in core competencies and quality assurance for health education and health promotion: Sage Publications Sage CA: Los Angeles, CA.

Allen, J. K. (1996). Coronary risk factor modification in women after coronary artery bypass surgery. *Nursing Research*, 45(5), 260-265.

American Diabetes Association.(2010). Diagnosis and classification of diabetes mellitus. *Diabetes Care, 33*(Suppl1), S62-S69.

American Diabetes Association. (2014). Diagnosis and Classification of Diabetes Mellitus. *Diabetes Care, 37*, S81-S90. doi: 10.2337/dc14-S081

American Diabetes Association. (2016). Standards of medical care in diabetes—2016 abridged for primary care providers. *Clinical Diabetes., 34*(1), 3-21. doi: 10.2337/diaclin.34.1.3.

Amin, A. (2006). Improving the management of patients after myocardial infarction, from admission to discharge. *Clinical Therapeutics, 28*(10), 1509-1539.

Amsterdam, E. A., Wenger, Brindis, R. G., Casey, D. E., Ganiats, T. G., Holmes, D. R., . . . Kontos, M. C. (2014). 2014 AHA/ACC guideline for the management of patients with non-ST-elevation acute coronary syndromes: executive summary: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *Circulation, 130*(25), 2354-2394. doi: 10.1161/CIR.0000000000000133.

Anchah, L., Hassali, M. A., Lim, M. S. H., Ibrahim, M. I. M., Sim, K. H., & Ong, T. K. (2017). Health related quality of life assessment in acute coronary syndrome patients: the effectiveness of early phase I cardiac rehabilitation. *Health and Quality of Life Outcomes, 15*(1), 10. doi: 10.1186/s12955-016-0583-7.

Anderson, L., Brown, J. P., Clark, A. M., Dalal, H., Rossau, H. K., Bridges, C., & Taylor, R. S. (2017). Patient education in the management of coronary heart disease. *Cochrane Database Systematic Revew, 6*, Cd008895. doi: 10.1002/14651858.CD008895.pub3

Askham, J., Kuhn, L., Frederiksen, K., Davidson, P., Edward, K. L., & Worrall-Carter, L. (2010). The information and support needs of Faroese women hospitalised with an acute coronary syndrome. *Journal of Clinical Nursing, 19*(9-10), 1352-1361. doi: 10.1111/j.1365-2702.2009.03013.x.

Attridge, M., Creamer, J., Ramsden, M., Cannings-John, R., & Hawthorne, K. (2014). Culturally appropriate health education for people in ethnic minority groups with type 2 diabetes mellitus. *Cochrane Database Systematic Revew,* 4(9):CD006424. doi: 10.1002/14651858.CD006424.pub3.

Australia Diabetes. (2009). National Evidence Based Guideline for Patient Education in Type 2 Diabetes. *Sydney: Diabetes Australia Guideline Development Consortium (DAGD)*. Retrieved from http://static.diabetesaustralia.com.au/s/fileassets/diabetes-australia/b9b8789d-c7ba-473d-bd49-0b7d793a0835.pdf

Baig, A. A., Benitez, A., Quinn, M. T., & Burnet, D. L. (2015). Family interventions to improve diabetes outcomes for adults. *Annals of the New York Academy of Sciences, 1353*(1), 89-112. doi: 10.1111/nyas.12844.

Ballotari, P., Ferrari, F., Ballini, L., Chiarenza, A., Manicardi, V., & Rossi, P. G. (2017). Lifestyle-tailored interventions for South Asians with type 2 diabetes living in high-income countries: a systematic review. *Acta Diabetologica, 54*(8), 785-794. doi: 10.1007/s00592-017-1008-8.

Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191-215.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*: Englewood Cliffs, NJ, US: Prentice-Hall, Inc.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: Freeman.

Bandura, A. (2004a). Health promotion by social cognitive means. *Health Education & Behavior, 31*(2), 143-164.

Bandura, A. (2004b). Swimming against the mainstream: The early years from chilly tributary to transformative mainstream. *Behaviour Research and Therapy, 42*(6), 613-630.

Bandura, A. Social Learning Theory. Englewood Cliffs, NJ: Prentice Hall; 1977.

Bandura, A. (1994). Self-efficacy. In V. S. Ramachaudran (Ed.), Encyclopedia of human behavior (Vol. 4, pp. 71-81). New York: Academic Press.

Bannier, K., Lichtenauer, M., Franz, M., Fritzenwanger, M., Kabisch, B., Figulla, H. R., . . . Jung, C. (2015). Impact of diabetes mellitus and its complications: survival and quality-of-life in critically ill patients. *Journal of Diabetes and Its Complications, 29*(8), 1130-1135. doi: 10.1016/j.jdiacomp.2015.08.010.

Barber-Parker, E. D. (2002). Integrating patient teaching into bedside patient care: a participant-observation study of hospital nurses. *Patient Education and Counseling, 48*(2), 107-113.

Barber, S. L., Borowitz, M., Bekedam, H., & Ma, J. (2013). The hospital of the future in China: China's reform of public hospitals and trends from industrialized countries. *Health Policy and Planning*, 29(3):367-78. doi: 10.1093/heapol/czt023.

Barlow, J., Wright, C., Sheasby, J., Turner, A., & Hainsworth, J. (2002). Self-management approaches for people with chronic conditions: a review. *Patient Education and Counseling, 48*(2), 177-187.

Barnett, K., Mercer, S. W., Norbury, M., Watt, G., Wyke, S., & Guthrie, B. (2012). Epidemiology of multimorbidity and implications for health care, research, and medical education: a cross-sectional study. *The Lancet, 380*(9836), 37-43. doi: 10.1016/S0140-6736(12)60240-2.

Beck, J., Greenwood, D. A., Blanton, L., Bollinger, S. T., Butcher, M. K., Condon, J. E., . . . Francis, T. (2017). 2017 National Standards for Diabetes Self-Management Education and Support. *The Diabetes Educator, 43*(5), 449-464.

Becker, M. H., & Maiman, L. A. (1975). Sociobehavioral determinants of compliance with health and medical care recommendations. *Medical Care*, 13(1), 10-24.

Been-Dahmen, J. M., Dwarswaard, J., Hazes, J. M., Staa, A., & Ista, E. (2015). Nurses' views on patient self-management: a qualitative study. *Journal of Advanced Nursing, 71*(12), 2834-2845. doi: 10.1111/jan.12767.

Bellman, C., Hambraeus, K., Lindbäck, J., & Lindahl, B. (2009). Achievement of secondary preventive goals after acute myocardial infarction: a comparison between participants and nonparticipants in a routine patient education program in Sweden. *Journal of Cardiovascular Nursing, 24*(5), 362-368. doi: 10.1097/JCN.0b013e3181a9bf72.

Berenguera, A., Molló-Inesta, À., Mata-Cases, M., Franch-Nadal, J., Bolíbar, B., Rubinat, E., & Mauricio, D. (2016). Understanding the physical, social, and emotional experiences of people with uncontrolled Type 2 diabetes: a qualitative study. *Patient Preference and Adherence, 10*, 2323-2332.

Berra, K. (2010). Challenges of changing lifestyle to reduce risk for cardiovascular disease. *Journal of Cardiovascular Nursing, 25*(3), 223-227. doi: 10.1097/JCN.0b013e3181cec7e4.

Beverly, E., Wray, L., Chiu, C., & Weinger, K. (2011). Perceived challenges and priorities in co-morbidity management of older patients with Type 2 diabetes. *Diabetic Medicine, 28*(7), 781-784. doi: 10.1111/j.1464-5491.2011.03282.x.

Bhagwat, M. M., Woods, J. A., Dronavalli, M., Hamilton, S. J., & Thompson, S. C. (2016). Evidence-based interventions in primary care following acute coronary syndrome in Australia and New Zealand: a systematic scoping review. *BMC Cardiovascular Disorders, 16*(1), 214.

Bhattacharyya, O., Delu, Y., Wong, S. T., & Bowen, C. (2011). Evolution of primary care in China 1997–2009. *Health Policy, 100*(2-3), 174-180. doi: 10.1016/j.healthpol.

Bolbrinker, J., Touis, L. Z., Gohlke, H., Weisser, B., & Kreutz, R. (2017). European guidelines on lifestyle changes for management of hypertension. *Herz*, 1-7. doi: 10.1007/s00059-017-4575-0.

Bond, T. (2004). Ethical guidelines for researching counselling and psychotherapy. *Counselling and Psychotherapy Research, 4*(2), 10-19.

Borkan, J., Eaton, C. B., Novillo-Ortiz, D., Rivero Corte, P., & Jadad, A. R. (2010). Renewing primary care: lessons learned from the Spanish health care system. *Health Affairs, 29*(8), 1432-1441.

Boyd, C. M., & Fortin, M. (2010). Future of multimorbidity research: how should understanding of multimorbidity inform health system design? *Public Health Reviews*, 32(2), 451.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77-101.

Brown, J. P., Clark, A. M., Dalal, H., Welch, K., & Taylor, R. S. (2011). Patient education in the management of coronary heart disease. *Cochrane Database Systematic Revew, CD008895. DOI: 10.1002/14651858.CD008895.pub2.*

Bryman, A. (2006). Integrating quantitative and qualitative research: how is it done? *Qualitative Research, 6*(1), 97-113.

Bryman, A., Becker, S., & Sempik, J. (2008). Quality criteria for quantitative, qualitative and mixed methods research: A view from social policy. *International Journal of Social Research Methodology, 11*(4), 261-276.

Buckley, T., McKinley, S., Gallagher, R., Dracup, K., Moser, D. K., & Aitken, L. M. (2007). The effect of education and counselling on knowledge, attitudes and beliefs about responses to acute myocardial infarction symptoms. *European Journal of Cardiovascular Nursing, 6*(2), 105-111. doi: 10.1016/j.ejcnurse.2006.05.005.

Buhse, S., Muhlhauser, I., Heller, T., Kuniss, N., Muller, U. A., Kasper, J., . . . Lenz, M. (2015). Informed shared decision-making programme on the prevention of myocardial infarction in type 2 diabetes: a randomised controlled trial. *BMJ Open, 5*(11), e009116. doi: 10.1136/bmjopen-2015-009116.

Burke, H. S. (2015). The impact of familial experiences in nature: A qualitative study. California Institute of Integral Studies.

Cabrerizo-García, J. L., Pérez-Calvo, J. I., & Zalba-Etayo, B. (2015). Influence of gender on prognosis of acute coronary syndromes. *Revista Portuguesa de Cardiologia (English Edition), 34*(1), 43-50.

Cacciattolo, M. (2015). The Praxis of English Language Teaching and Learning (PELT). Ethical considerations in research. Sense Publishers, 61-79. doi: 10.1007/978-94-6300-112-0_4.

Cao, X., Cao, Y., Salamonson, Y., DiGiacomo, M., Chen, Y., Chang, S., . . . Davidson, P. M. (2012). Translation and validation of the Chinese version of the Acute Coronary Syndrome Response Index (C-ACSRI). *International Journal of Nursing Studies, 49*(10), 1277-1290. doi: 10.1016/j.ijnurstu.

Capobianco, E. (2013). Comorbidity: a multidimensional approach. *Trends in Molecular Medicine, 19*(9), 515-521.

Catherine, H., Dympna, C., & David, S. (2013). Rigour in qualitative case-study research. *Nurse Researcher, 20*(4), 12-17.

Chandler, E., Slade, D., Pun, J., Lock, G., Matthiessen, C. M., Espindola, E., & Ng, C. (2015). Communication in Hong Kong accident and emergency departments: the clinicians' perspectives. *Global Qualitative Nursing Research, 2*, 2333393615576714. doi: 10.1177/2333393615576714.

Chater, K. (2011). Etical and legal considerations in research. In S. Jirojwong, M. Johnson, & A. Welch (Eds.), *Research methods in nursing and midwifery: Pathways to evidence-based practice* (pp. 64-84). Oxford: Oxford University Press.

Chen, D., Liu, S., Tan, X., & Zhao, Q. (2017). Assessment of hospital length of stay and direct costs of type 2 diabetes in Hubei Province, China. *BMC Health Services Research, 17*(1), 199. doi: 10.1186/s12913-017-2140-4.

Chen, W. W., Gao, R. L., Liu, L. S., Zhu, M. L., Wang, W., Wang, Y. J., . . . Hu, S. S. (2017). China cardiovascular diseases report 2015: a summary. J Geriatr Cardiol, 14(1), 1-10. doi: 10.11909/j.issn.1671-5411.2017.01.012.

Cheng, J. M., Yuan, Y. X., Lu, W., & Yang, L. (2017). Primary health care in China: is China's health reform reform for the whole nation? *Primary Health Care Research & Development*, 18(4):398-403. doi: 10.1017/S1463423617000111.

Chernyak, N., Stephan, A., Bachle, C., Genz, J., Julich, F., & Icks, A. (2016). Assessment of information needs in diabetes: Development and evaluation of a questionnaire. *Primary Care Diabetes, 10*(4), 287-292. doi: 10.1016/j.pcd.2015.11.007.

Chew, D. P., French, J., Briffa, T. G., Hammett, C. J., Ellis, C. J., Ranasinghe, I., . . . Lefkovits, J. (2013). Acute coronary syndrome care across Australia and New Zealand: the SNAPSHOT ACS study. *The Medical journal of Australia, 199*(3), 185-191.

Chew, D. P., Scott, I. A., Cullen, L., French, J. K., Briffa, T. G., Tideman, P. A., . . . Aylward, P. E. (2016). National Heart Foundation of Australia & Cardiac Society of Australia and New Zealand: Australian Clinical Guidelines for the Management of Acute Coronary Syndromes 2016. *Heart, Lung & Circulation, 25*(9), 895-951. doi: 10.1016/j.hlc.2016.06.789.

Chin, Y. F., Huang, T. T., & Hsu, B. R. S. (2013). Impact of action cues, self-efficacy and perceived barriers on daily foot exam practice in type 2 diabetes mellitus patients with peripheral neuropathy. *Journal of Clinical Nursing, 22*(1-2), 61-68.

Chinese Society of Cardiology of Chinese Medical Association. (2013). Chinese experts consensus on cardiac rehabilitation/secondary prevention for coronary artery disease. *Zhonghua Xin Xue Guan Bing Za Zhi., 41*(4), 267-275.

Choi, W. H., Hui, G. K., Lee, A. C., & Chui, M. M. (2010). Student nurses' experiences and challenges in providing health education in Hong Kong. *Nurse Education Today, 30*(4), 355-359.

Chrvala, C. A., Sherr, D., & Lipman, R. D. (2016). Diabetes self-management education for adults with type 2 diabetes mellitus: A systematic review of the effect on glycemic control. *Patient Education and Counseling, 99*(6), 926-943. doi: 10.1016/j.pec.2015.11.003.

Chukumnerd, P., Hatthakit, U., & Chuaprapaisilp, A. (2011). The experience of persons with allergic respiratory symptoms: practicing yoga as a self-healing modality. *Holistic Nursing Practice, 25*(2), 63-70. doi: 10.1097/HNP.0b013e31820dbbae.

Cinar, A. B., & Schou, L. (2014). The role of self-efficacy in health coaching and health education for patients with type 2 diabetes. *International Dental Journal, 64*(3), 155-163.

Coakes, S. J. (2013). *SPSS version 20.0 for Windows : analysis without anguish*.

Cohen, A., Assyag, P., Boyer-Chatenet, L., Cohen-Solal, A., Perdrix, C., Dalichampt, M., . . . Steg, P. G. (2014). An education program for risk factor management after an acute coronary syndrome: a randomized clinical trial. *JAMA Internal Medicine, 174*(1), 40-48. doi: 10.1001/jamainternmed.2013.11342.

Cohen, J. (1992). A power primer. *Psychological Bulletin, 112*(1), 155-159.

Coleman, M. T., & Pasternak, R. H. (2012). Effective strategies for behavior change. Primary Care, 39(2), 281-305. doi: 10.1016/j.pop.2012.03.004.

Conaway, D. G., O'Keefe, J. H., Reid, K. J., & Spertus, J. (2005). Frequency of undiagnosed diabetes mellitus in patients with acute coronary syndrome. *American Journal of Cardiology, 96*(3), 363-365. doi: 10.1016/j.amjcard.2005.03.076.

Coppola, A., Sasso, L., Bagnasco, A., Giustina, A., & Gazzaruso, C. (2016). The role of patient education in the prevention and management of type 2 diabetes: an overview. *Endocrine, 53*(1), 18-27. doi: 10.1007/s12020-015-0775-7.

Cottrell, R. R., Lysoby, L., King, L. R., Airhihenbuwa, C. O., Roe, K. M., & Allegrante, J. P. (2009). Current developments in accreditation and certification for health promotion and health education: A perspective on systems of quality assurance in the United States. *Health Education & Behavior, 36*(3), 451-463. doi: 10.1177/1090198109333965.

Covington, M. B. (2001). Traditional Chinese medicine in the treatment of diabetes. *Diabetes Spectrum, 14*(3), 154-159.

Craig, P., Dieppe, P., Macintyre, S., Michie, S., Nazareth, I., & Petticrew, M. (2013). Developing and evaluating complex interventions: the new Medical Research Council guidance. *International Journal of Nursing Studies*, 50(5), 587-592. doi:10.1016/j.ijnurstu.2012.09.010

Craig, P., Dieppe, P., Macintyre, S., Michie, S., Nazareth, I., & Petticrew, M. (2008). Developing and evaluating complex interventions: the new Medical Research Council guidance. *BMJ*, 337, a1655.

Craig P, Petticrew M (2013) Developing and evaluating complex interventions: Reflections on the 2008 guidance. *International Journal of Nursing Studies* 50(5): 585–587.

Cradock, K. A., G, O. L., Finucane, F. M., Gainforth, H. L., Quinlan, L. R., & Ginis, K. A. (2017). Behaviour change techniques targeting both diet and physical activity in type 2 diabetes: A systematic review and meta-analysis. *The International Journal of Behavioral Nutrition and Physical Activity, 14*(1), 18. doi: 10.1186/s12966-016-0436-0.

Creswell, Klassen, Plano Clark, & Smith. (2011). Best practices for mixed methods research in the health sciences. *Bethesda (Maryland): National Institutes of Health*, 2094-2103.

Creswell, J. W., & Plano Clark, V. L. (2011). *Designing and conducting mixed methods research* (2nd edition.): Los Angeles: SAGE.

Davis, R., Campbell, R., Hildon, Z., Hobbs, L., & Michie, S. (2015). Theories of behaviour and behaviour change across the social and behavioural sciences: a scoping review. *Health Psychology Review, 9*(3), 323-344. doi: 10.1080/17437199.2014.941722.

de Casterle, B. D., Gastmans, C., Bryon, E., & Denier, Y. (2012). QUAGOL: a guide for qualitative data analysis. *International Journal of Nursing Studies, 49*(3), 360-371. doi: 10.1016/j.ijnurstu.

Deng, F., Lv, J., Wang, H., Gao, J., & Zhou, Z. (2017). Expanding public health in China: an empirical analysis of healthcare inputs and outputs. *Public Health, 142*, 73-84. doi: 10.1016/j.puhe.

Denham, S. A., Ware, L. J., Raffle, H., & Leach, K. (2011). Family inclusion in diabetes education: a nationwide survey of diabetes educators. *The Diabetes Educator, 37*(4), 528-535.

Denzin, N. K. (2012). Triangulation 2.0. *Journal of Mixed Methods Research, 6*(2), 80-88.

Department of Health, & Diabetes UK. (2005). Structured patient education in diabetes: Report from the Patient Education Working Group (pp. 1-70). Retrieved from http://webarchive.nationalarchives.gov.uk/20130105204013/http://webarchive.nationalarchives.gov.uk/20130105204013/http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_4113195

Derksen, S., & Keselman, H. J. (1992). Backward, forward and stepwise automated subset selection algorithms: Frequency of obtaining authentic and noise variables. British *Journal of Mathematical and Statistical Psychology*, 45(2), 265-282.

Diabetes Association of Chinese Medical Association. (2014). Guideline of prevention and treatment for type 2 diabetes in China (2013 edition). *Chinese Journal of Diabetes Mellitus, 30*(10), 893-942.

Donahoe, S. M., Stewart, G. C., McCabe, C. H., Mohanavelu, S., Murphy, S. A., Cannon, C. P., & Antman, E. M. (2007). Diabetes and mortality following acute coronary syndromes. *JAMA, 298*(7), 765-775.

Dongbo, F., Ding, Y., McGowan, P., & Fu, H. (2006). Qualitative evaluation of Chronic Disease Self Management Program (CDSMP) in Shanghai. *Patient Education and Counseling, 61*(3), 389-396. doi: 10.1016/j.pec.2005.05.002.

Doshmangir, P., Jahangiry, L., Farhangi, M. A., Doshmangir, L., & Faraji, L. (2018). The effectiveness of theory- and model-based lifestyle interventions on HbA1c among patients with type 2 diabetes: a systematic review and meta-analysis. *Public Health,* 155,133-141. doi: 10.1016/j.puhe.2017.11.022.

Duan, J. G., Chen, X. Y., Wang, L., Lau, A., Wong, A., Thomas, G. N., . . . Leung, T. W. (2015). Sex differences in epidemiology and risk factors of acute coronary syndrome in Chinese patients with type 2 diabetes: a long-term prospective cohort study. *PloS One, 10*(4), e0122031.

Duke, S. A. S., Colagiuri, S., & Colagiuri, R. (2009). Individual patient education for people with type 2 diabetes mellitus. *Cochrane Database Systmatic Review, (1):CD005268. doi: 10.1002/14651858.CD005268.pub2*.

Edmondson, D., Green, P., Ye, S., Halazun, H. J., & Davidson, K. W. (2014). Psychological stress and 30-day all-cause hospital readmission in acute coronary syndrome patients: an observational cohort study. *PLoS One, 9*(3), e91477. doi: 10.1371/journal.pone.0091477.

Egede, L. E., Williams, J. S., Voronca, D. C., Gebregziabher, M., & Lynch, C. P. (2017). Telephone-delivered behavioral skills intervention for African American adults with type 2 diabetes: a randomized controlled Trial. *Journal of General Internal Medicine*, 32(7):775-782. doi: 10.1007/s11606-017-4023-0.

Ellis, J., Boger, E., Latter, S., Kennedy, A., Jones, F., Foster, C., & Demain, S. (2017). Conceptualisation of the 'good'self-manager: A qualitative investigation of stakeholder views on the self-management of long-term health conditions. *Social Science & Medicine, 176*, 25-33. doi: 10.1016/j.socscimed.

Elo, S., & Kyngäs, H. (2008). The qualitative content analysis process. *Journal of Advanced Nursing, 62*(1), 107-115.

Eshah, N. F. (2011). Jordanian acute coronary syndrome patients' learning needs: Implications for cardiac rehabilitation and secondary prevention programs. *Nursing & Health Sciences, 13*(3), 238-245.

Eshah, N. F. (2013). Predischarge education improves adherence to a healthy lifestyle among Jordanian patients with acute coronary syndrome. *Nursing & Health Sciences, 15*(3), 273-279.

Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of convenience sampling and purposive sampling. *American Journal of Theoretical and Applied Statistics, 5*(1), 1-4.

Fan, L., & Sidani, S. (2009). Effectiveness of diabetes self-management education intervention elements: a meta-analysis. *Canadian Journal of Diabetes, 33*(1), 18-26.

Fang, T. (2012). Yin Yang: A new perspective on culture. *Management and Organization Review, 8*(1), 25-50.

Farahani, M. A., Sahragard, R., Carroll, J. K., & Mohammadi, E. (2011). Communication barriers to patient education in cardiac inpatient care: A qualitative study of multiple perspectives. *International Journal of Nursing Practice, 17*(3), 322-328.

Fetters, M. D., Curry, L. A., & Creswell, J. W. (2013). Achieving integration in mixed methods designs-principles and practices. *Health Services Research, 48*(6pt2), 2134-2156.

Fidyk, L., Ventura, K., & Green, K. (2014). Teaching nurses how to teach: Strategies to enhance the quality of patient education. *Journal for Nurses in Professional Development, 30*(5), 248-253.

Finegold, J. A., Asaria, P., & Francis, D. P. (2013). Mortality from ischaemic heart disease by country, region, and age: statistics from World Health Organisation and United Nations. *International Journal of Cardiology, 168*(2), 934-945.

Fisher, E. B., Fitzgibbon, M. L., Glasgow, R. E., Haire-Joshu, D., Hayman, L. L., Kaplan, R. M., . . . Ockene, J. K. (2011). Behavior matters. *American Journal of Preventive Medicine, 40*(5), e15-30. doi: 10.1016/j.amepre.2010.12.031.

Fors, A., Ekman, I., Taft, C., Björkelund, C., Frid, K., Larsson, M. E., . . . Swedberg, K. (2015). Person-centred care after acute coronary syndrome, from hospital to primary care — a randomised controlled trial. *International Journal of Cardiology, 187*, 693-699.

Fort, M. P., Alvarado-Molina, N., Peña, L., Montano, C. M., Murrillo, S., & Martínez, H. (2013). Barriers and facilitating factors for disease self-management: a qualitative analysis of perceptions of patients receiving care for type 2 diabetes and/or hypertension in San José, Costa Rica and Tuxtla Gutiérrez, Mexico. *BMC Family Practice, 14*(1), 131. doi: 10.1186/1471-2296-14-131.

Fu, D., Fu, H., McGowan, P., Shen, Y. E., Zhu, L., Yang, H., . . . Wei, Z. (2003). Implementation and quantitative evaluation of chronic disease self-management programme in Shanghai, China: randomized controlled trial. *Bull World Health Organ, 81*(3), 174-182.

Funnell, M. M. (2010). Peer-based behavioural strategies to improve chronic disease self-management and clinical outcomes: evidence, logistics, evaluation considerations and needs for future research. *Family Practice, 27 Suppl 1*, i17-22. doi: 10.1093/fampra/cmp027.

Funnell, M. M., Brown, T. L., Childs, B. P., Haas, L. B., Hosey, G. M., Jensen, B., . . . Weiss, M. A. (2009). National standards for diabetes self-management education. *Diabetes Care, 32 Suppl 1*, S87-94. doi: 10.2337/dc09-S087.

Galdeano, L. E., Furuya, R. K., Rodrigues, M. A., Dantas, R. A., & Rossi, L. A. (2014). Reliability of the Cardiac Patients Learning Needs Inventory (CPLNI) for use in Portugal. *Journal of Clinical Nursing, 23*(11-12), 1532-1540. doi: 10.1111/j.1365-2702.2012.04158.x.

Gale, N. K., Heath, G., Cameron, E., Rashid, S., & Redwood, S. (2013). Using the framework method for the analysis of qualitative data in multi-disciplinary health research. *BMC Medical Research Method*ology, 13(1), 117. doi: 10.1186/1471-2288-13-117.

Gallopel-Morvan, K., Gabriel, P., Le Gall-Ely, M., Rieunier, S., & Urien, B. (2011). The use of visual warnings in social marketing: The case of tobacco. *Journal of Business Research, 64*(1), 7-11.

Gao, L., Zhang, L., Qi, H., & Petridis, L. (2016). Middle-aged Female Depression in Perimenopausal Period and Square Dance Intervention. *Psychiatria Danubina, 28*(4), 372-378.

Gencer, B., Rodondi, N., Auer, R., Nanchen, D., Räber, L., Klingenberg, R., . . . Matter, C. M. (2016). Health utility indexes in patients with acute coronary syndromes. *Open Heart, 3*(1), e000419. doi: 10.1136/openhrt-2016-000419.

Gholap, N. N., Achana, F. A., Davies, M. J., Ray, K. K., Gray, L., & Khunti, K. (2017). Long-term mortality after acute myocardial infarction among individuals with and without diabetes: A systematic review and meta-analysis of studies in the post-reperfusion era. *Diabetes, Obesity & Metabolism, 19*(3), 364-374. doi: 10.1111/dom.12827.

Glanz, K., & Bishop, D. B. (2010). The role of behavioral science theory in development and implementation of public health interventions. *Annual Review of Public Health, 31*, 399-418. doi: 10.1146/annurev.publhealth.012809.103604.

Glanz, K., Rimer, B. K., & Viswanath, K. (2015). *Health behavior: theory, research, and practice* (5th edition): San Francisco, California: Jossey-Bass.

Glazier, R. H., Bajcar, J., Kennie, N. R., & Willson, K. (2006). A systematic review of interventions to improve diabetes care in socially disadvantaged populations. *Diabetes Care, 29*(7), 1675-1688.

Gomes Neto, M., Menezes, M. A., & Oliveira Carvalho, V. (2014). Dance therapy in patients with chronic heart failure: a systematic review and a meta-analysis. *Clinical Rehabilitation, 28*(12), 1172-1179. doi: 10.1177/0269215514534089.

Graneheim, U. H., & Lundman, B. (2004). Qualitative content analysis in nursing research: concepts, procedures and measures to achieve trustworthiness. *Nurse Education Today, 24*(2), 105-112.

Green, J., Willis, K., Hughes, E., Small, R., Welch, N., Gibbs, L., & Daly, J. (2007). Generating best evidence from qualitative research: the role of data analysis. *Australian and New Zealand Journal of Public Health, 31*(6), 545-550.

Guetterman, T. C., Fetters, M. D., & Creswell, J. W. (2015). Integrating quantitative and qualitative results in health science mixed methods research through joint displays. *The Annals of Family Medicine, 13*(6), 554-561. doi: 10.1370/afm.1865.

Guo, P., & Harris, R. (2016). The effectiveness and experience of self-management following acute coronary syndrome: A review of the literature. *International Journal of Nursing Studies, 61*, 29-51. doi: 10.1016/j.ijnurstu.2016.05.008.

Haas, L., Maryniuk, M., Beck, J., Cox, C. E., Duker, P., Edwards, L., . . . Force, S. R. T. (2013). National Standards for Diabetes Self-Management Education and Support. *Diabetes Care, 36*, S100-S108. doi: 10.2337/dc13-S100.

Hall, C., Murphy, M., & Scanlon, A. (2017). Cardiac rehabilitation in the acute care setting: Integrative review. *Australian Critical Care, 30*(2), 99-106. doi: 10.1016/j.aucc.2016.07.001.

Hair, J. F. Jr., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). Multivariate data analysis (7th ed.). USA: Prentice Hall.

He, X., Li, J., Wang, B., Yao, Q., Li, L., Song, R., . . . Zhang, J. A. (2017). Diabetes self-management education reduces risk of all-cause mortality in type 2 diabetes patients: a systematic review and meta-analysis. *Endocrine, 55*(3), 712-731. doi: 10.1007/s12020-016-1168-2.

Hersi, A., Al-Habib, K., Al-Faleh, H., Al-Nemer, K., AlSaif, S., Taraben, A., . . . Al-Murayehg, M. A. (2013). Gender inequality in the clinical outcomes of equally treated acute coronary syndrome patients in Saudi Arabia. *Annals of Saudi medicine, 33*(4), 339. doi: 10.5144/0256-4947.2013.339.

Hjermstad, M. J., Fayers, P. M., Haugen, D. F., Caraceni, A., Hanks, G. W., Loge, J. H., . . . Collaborative, E. P. C. R. (2011). Studies comparing Numerical Rating Scales, Verbal Rating Scales, and Visual Analogue Scales for assessment of pain intensity in adults: a systematic literature review. *Journal of Pain and Symptom Management, 41*(6), 1073-1093. doi: 10.1016/j.jpainsymman.2010.08.016.

Ho, E. Y., Tran, H., & Chesla, C. A. (2015). Assessing the cultural in culturally sensitive printed patient-education materials for Chinese Americans with type 2 diabetes. *Health Communication, 30*(1), 39-49. doi: 10.1080/10410236.2013.835216.

Horn, D., & Waingrow, S. (1966). Some dimensions of a model for smoking behavior change. *American Journal of Public Health and the Nations Health, 56*(12_Suppl), 21-26.

Houghton, C., Casey, D., Shaw, D., & Murphy, K. (2013). Rigour in qualitative case-study research. *Nurse Research, 20*(4), 12-17.

Hoving, C., Visser, A., Mullen, P. D., & van den Borne, B. (2010). A history of patient education by health professionals in Europe and North America: from authority to shared decision making education. *Patient Education and Counseling, 78*(3), 275-281. doi: 10.1016/j.pec.2010.01.015.

Hu, J., Amirehsani, K. A., Wallace, D. C., McCoy, T. P., & Silva, Z. (2016). A family-based, culturally tailored diabetes intervention for Hispanics and their family members. The Diabetes Educator, 42(3), 299-314. doi: 10.1177/0145721716636961.

Huang, L.L. (2016). Interpersonal Harmony and Conflict for Chinese People: A Yin-Yang Perspective. *Frontiers in psychology, 7*7:847. doi: 10.3389/fpsyg.

Huang, Y., Li, J., Zhu, X., Sun, J., Ji, L., Hu, D., . . . Tao, X. (2017). Relationship between healthy lifestyle behaviors and cardiovascular risk factors in Chinese patients with type 2 diabetes mellitus: a subanalysis of the CCMR-3B STUDY. *Acta Diabetologica, 54*(6), 569-579. doi: 10.1007/s00592-017-0981-2.

IBM Support. (2017). SPSS Statistics 22.0 2017, Retrieved from https://www-01.ibm.com/support/docview.wss?uid=swg21646821

Jang, Y., & Yoo, H. (2012). Self-management programs based on the social cognitive theory for Koreans with chronic disease: a systematic review. *Contemporary Nurse, 40*(2), 147-159. doi: 10.5172/conu.2012.40.2.147.

Janz, N. K., & Becker, M. H. (1984). The health belief model: A decade later. *Health Education Quarterly, 11*(1), 1-47.

Jiang, S., & Beaudoin, C. E. (2016). Smoking prevention in china: a content analysis of an anti-smoking social media campaign. *Journal of Health Communication, 21*(7), 755-764.

Joekes, K., van Elderen, T., & Schreurs, K. (2007). Self-efficacy and overprotection are related to quality of life, psychological well-being and self-management in cardiac patients. *Journal of Health Psychology, 12*(1), 4-16. doi: 10.1177/1359105306069096.

Johnson, R. B., Onwuegbuzie, A. J., & Turner, L. A. (2007). Toward a definition of mixed methods research. *Journal of Mixed Methods Research, 1*(2), 112-133.

Jorstad, H. T., von Birgelen, C., Alings, A. M. W., Liem, A., van Dantzig, J. M., Jaarsma, W., . . . de Milliano, P. A. (2013). Effect of a nurse-coordinated prevention programme on

cardiovascular risk after an acute coronary syndrome: main results of the RESPONSE randomised trial. *Heart, 99*(19), 1421-1430. doi: 10.1136/heartjnl-2013-303989.

Justo, D., Arbel, Y., Mulat, B., Mashav, N., Saar, N., Steinvil, A., . . . Lerman, Y. (2010). Sexual activity and erectile dysfunction in elderly men with angiographically documented coronary artery disease. *International Journal of Impotence Research, 22*(1), 40-44. doi: 10.1038/ijir.2009.45.

Kahn, M., & Wheatcroft, S. (2012). Acute coronary syndromes in diabetes. In: Fisher M (ed.). Heart Disease and Diabetes. Oxford University Press, Oxford

Karimy, M., Araban, M., Zareban, I., Taher, M., & Abedi, A. (2016). Determinants of adherence to self-care behavior among women with type 2 diabetes: an explanation based on health belief model. *Medical journal of the Islamic Republic of Iran, 30*, 368.

Kasteleyn, M. J., Gorter, K. J., van Puffelen, A. L., Heijmans, M., Vos, R. C., Jansen, H., & Rutten, G. E. (2014). What follow-up care and self-management support do patients with type 2 diabetes want after their first acute coronary event? A qualitative study. *Primary Care Diabetes, 8*(3), 195-206. doi: 10.1016/j.pcd.2013.12.001.

Keleher, H., & Parker, R. (2013). Health promotion by primary care nurses in Australian general practice. *Collegian, 20*(4), 215-221.

Kim, D., Yoon, S. J., Lim, D. S., Gong, Y. H., Ko, S., Lee, Y. H., . . . Kim, Y. A. (2016). The preventive effects of lifestyle intervention on the occurrence of diabetes mellitus and acute myocardial infarction in metabolic syndrome. *Public Health, 139*, 178-182. doi: 10.1016/j.puhe.2016.06.012.

Kirk, S. (2007). Methodological and ethical issues in conducting qualitative research with children and young people: A literature review. *International Journal of Nursing Studies, 44*(7), 1250-1260.

Koch, G., Wakefield, B. J., & Wakefield, D. S. (2015). Barriers and facilitators to managing multiple chronic conditions: a systematic literature review. *Western Journal of Nursing Research, 37*(4), 498-516. doi: 10.1177/0193945914549058.

Koch, J. (2002). The role of exercise in the African-American woman with type 2 diabetes mellitus: application of the health belief model. *Journal of the American Association of Nurse Practitioners, 14*(3), 126-129.

Kragholm, K., Goldstein, S. A., Yang, Q., Lopes, R. D., Schulte, P. J., Bernacki, G. M., . . . Armstrong, P. W. (2016). Trends in Enrollment, Clinical Characteristics, Treatment, and Outcomes According to Age in Non-ST-Segment Elevation Acute Coronary Syndromes Clinical Trials. *Circulation*, 133(16):1560-73. doi: 10.1161/CIRCULATIONAHA.115.017299.

Krefting, L. (1991). Rigor in qualitative research: The assessment of trustworthiness. *American Journal of Occupational Therapy, 45*(3), 214-222.

Lai, D. W., & Surood, S. (2009). Chinese health beliefs of older Chinese in Canada. *Journal of Aging and Health, 21*(1), 38-62. doi: 10.1177/0898264308328636.

Lakens, D. (2013). Calculating and reporting effect sizes to facilitate cumulative science: a practical primer for t-tests and ANOVAs. *Frontiers in Psychology, 4*, 863. doi: 10.3389/fpsyg.2013.00863.

Lakerveld, J., Bot, S. D., Chinapaw, M. J., van Tulder, M. W., van Oppen, P., Dekker, J. M., & Nijpels, G. (2008). Primary prevention of diabetes mellitus type 2 and cardiovascular diseases using a cognitive behavior program aimed at lifestyle changes in people at risk: Design of a randomized controlled trial. *BMC Endocrine Disorders, 8*(1), 6. doi: 10.1186/1472-6823-8-6.

Lee, C. K., & Lee, I. F. K. (2013). Preoperative patient teaching: the practice and perceptions among surgical ward nurses. *Journal of Clinical Nursing, 22*(17-18), 2551-2561. doi: 10.1111/j.1365-2702.2012.04345.x.

Lee, Y. J., Shin, S. J., Wang, R.-H., Lin, K.-D., Lee, Y.-L., & Wang, Y.-H. (2016). Pathways of empowerment perceptions, health literacy, self-efficacy, and self-care behaviors to glycemic control in patients with type 2 diabetes mellitus. *Patient Education and Counseling, 99*(2), 287-294. doi: 10.1016/j.pec.2015.08.021.

Lelorain, S., Bachelet, A., Bertin, N., & Bourgoin, M. (2017). French healthcare professionals' perceived barriers to and motivation for therapeutic patient education: A qualitative study. *Nursing & Health Sciences, 19*(3), 331-339. doi: 10.1111/nhs.12350.

Lenzerini, M. (2002). *Data Integration: A Theoretical Perspective. In Proceedings of the Twenty-First ACM SIGMOD-SIGACT-SIGART Symposium on Principles of Database Systems. New York: Association for Computing Machinery*.

Lewis, J. (2011). Mixed methods research. In S. Jirojwong, M. Johnson, & A. Welch (Eds.), *Research methods in nursing and midwifery: Pathways to evidence-based practice* (pp. 268-285). Oxford: Oxford University Press.

Lewis, S. (2015). Qualitative inquiry and research design: Choosing among five approaches. *Health Promotion Practice*, 16(4), 473-475.

Li, P. P. (2012). Toward an integrative framework of indigenous research: The geocentric implications of Yin-Yang balance. *Asia Pacific Journal of Management, 29*(4), 849-872.

Li, W., Li, M., Gao, C., Wang, X., Qi, D., Liu, J., & Jin, Q. (2016). Impact of type 2 diabetes mellitus on recurrent myocardial infarction in China. *Diabetes & Vascular Disease Research, 13*(6), 395-404. doi: 10.1177/1479164116653606.

Li, Q., Lin, Z., Masoudi, F. A., Li, J., Li, X., Hernandez-Diaz, S., . . . Jiang, L. (2015). National trends in hospital length of stay for acute myocardial infarction in China. *BMC Cardiovasc Disord, 15*, 9. doi: 10.1186/1471-2261-15-9.

Lichtman, J. H., Froelicher, E. S., Blumenthal, J. A., Carney, R. M., Doering, L. V., Frasure-Smith, N., . . . Sheps, D. S. (2014). Depression as a risk factor for poor prognosis among patients with acute coronary syndrome: systematic review and recommendations. *Circulation*, 129(12), 1350-1369. doi: 10.1161/CIR.0000000000000019.

Liddy, C., Blazkho, V., & Mill, K. (2014). Challenges of self-management when living with multiple chronic conditions. *Canadian Family Physician, 60*(12), 1123-1133.

Liebreich, T., Plotnikoff, R. C., Courneya, K. S., & Boulé, N. (2009). Diabetes NetPLAY: A physical activity website and linked email counselling randomized intervention for individuals with type 2 diabetes. *International Journal of Behavioral Nutrition and Physical Activity*, 6(1), 18. doi: 10.1186/1479-5868-6-18.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry* (Vol. 75): Sage.

Liu, X.L., Shi, Y., Willis, K., Wu, C.-J. J., & Johnson, M. (2017). Health education for patients with acute coronary syndrome and type 2 diabetes mellitus: an umbrella review of systematic reviews and meta-analyses. *BMJ Open, 7*(10), e016857.

Liu, X. L., Willis, K., Wu, C. J. J., Shi, Y., & Johnson, M. (2018a). 'Better to save one life than build a seven-storied pagoda': a qualitative study of health education for patients with acute coronary syndrome and type 2 diabetes mellitus in Shanghai, China. *BMJ Open*, 8(8), e019351. doi: 10.1136/bmjopen-2017-019351.

Liu, X. L., Wu, C. J., Willis, K., Shi, Y., & Johnson, M. (2018b). The impact of inpatient education on self-management for patients with acute coronary syndrome and type 2 diabetes mellitus: a cross-sectional study in China. *Health Education Research*, 33(5), 389-401. doi: 10.1093/her/cyy023.

Livne, Y., Peterfreund, I., & Sheps, J. (2017). Barriers to patient education and their relationship to nurses' perceptions of patient education climate. *Clinical Nursing Studies, 5*(4), 65.

Lorig, K. R., & Holman, H. R. (2003). Self-management education: history, definition, outcomes, and mechanisms. *Annals of Behavioral Medicine, 26*(1), 1-7.

Lu, S., & Harris, M. F. (2013). Prevention of diabetes and heart disease: Patient perceptions on risk, risk assessment and the role of their GP in preventive care. *Australian Family Physician, 42*(5), 328-331.

Ma, G. X., Shive, S. E., Ma, X. S., Toubbeh, J. I., Tan, Y., Lan, Y. J., . . . Pei, X. (2013). Social influences on cigarette smoking among mainland Chinese and Chinese Americans: a comparative study. *American Journal of Health Studies, 28*(1), 12-20.

Ma, G. X., Shive, S. E., Tan, Y., Thomas, P., & Man, V. L. (2004). Development of a culturally appropriate smoking cessation program for Chinese-American youth. *Journal of Adolescent Health, 35*(3), 206-216.

Maher, C. A., Lewis, L. K., Ferrar, K., Marshall, S., De Bourdeaudhuij, I., & Vandelanotte, C. (2014). Are health behavior change interventions that use online social networks effective? A systematic review. *Journal of Medical Internet Research, 16*(2), e40. doi: 10.2196/jmir.2952.

Malemute, C. L., Shultz, J. A., Ballejos, M., Butkus, S., & Early, K. B. (2011). Goal setting education and counseling practices of diabetes educators. *The Diabetes Educator, 37*(4), 549-563. doi: 10.1177/0145721711410718.

Mampuya, W. M. (2012). Cardiac rehabilitation past, present and future: an overview. *Cardiovascular Diagnosis and Therapy, 2*(1), 38-49. doi: 10.3978/j.issn.2223-3652.

Mao, A., Bristow, K., & Robinson, J. (2012). Caught in a dilemma: why do non-smoking women in China support the smoking behaviors of men in their families? *Health Education Research, 28*(1), 153-164. doi: 10.1093/her/cys078.

Marks, R., & Allegrante, J. P. (2005). A review and synthesis of research evidence for self-efficacy-enhancing interventions for reducing chronic disability: implications for health education practice (part II). *Health Promotion Practice, 6*(2), 148-156.

Marks, R., Allegrante, J. P., & Lorig, K. (2005). A review and synthesis of research evidence for self-efficacy-enhancing interventions for reducing chronic disability: implications for health education practice (part I). *Health Promot Pract, 6*(1), 37-43. doi: 10.1177/1524839904266790.

Martyn-Nemeth, P. A., Vitale, G. A., & Cowger, D. R. (2010). A culturally focused exercise program in Hispanic adults with type 2 diabetes: a pilot study. *The Diabetes Educator, 36*(2), 258-267. doi: 10.1177/0145721709358462.

Mason, M. (2010). *Sample size and saturation in PhD studies using qualitative interviews.* Paper presented at the Forum Qualitative Sozialforschung/Forum: Qualitative Social Research.

Mayberry, L. S., Rothman, R. L., & Osborn, C. Y. (2014). Family members' obstructive behaviors appear to be more harmful among adults with type 2 diabetes and limited health literacy. *Journal of Health Communication, 19*(sup2), 132-143. doi: 10.1080/10810730.2014.938840.

Mazumdar, S., Feng, X., Konings, P., McRae, I., & Girosi, F. (2014). A brief report on primary care service area catchment geographies in New South Wales Australia. *International Journal of Health Geographics, 13*(1), 38. doi: 10.1186/1476-072X-13-38.

McBride, C. M., Emmons, K. M., & Lipkus, I. M. (2003). Understanding the potential of teachable moments: the case of smoking cessation. *Health Education Research, 18*(2), 156-170.

McConnell-Henry, T., Cooper, S., Endacott, R., Porter, J., Missen, K., & Sparks, L. (2015). Designing a medical records review tool: an instructional guide. *Contemporary Nurse, 50*(1), 72-79. doi: 10.1080/10376178.2015.1010260.

McKibbin, C. L., Patterson, T. L., Norman, G., Patrick, K., Jin, H., Roesch, S., . . . Griver, K. (2006). A lifestyle intervention for older schizophrenia patients with diabetes mellitus: a randomized controlled trial. *Schizophrenia Research*, 86(1-3), 36-44.

Medagama, A., Bandara, R., De Silva, C., & Galgomuwa, M. P. (2015). Management of acute coronary syndromes in a developing country; time for a paradigm shift? an observational study. *BMC Cardiovasc Disord, 15*, 133. doi: 10.1186/s12872-015-0125-y.

Meng, K., Seekatz, B., Haug, G., Mosler, G., Schwaab, B., Worringen, U., & Faller, H. (2014). Evaluation of a standardized patient education program for inpatient cardiac rehabilitation: impact on illness knowledge and self-management behaviors up to 1 year. *Health Education Research, 29*(2), 235-246. doi: 10.1093/her/cyt107.

Michie, S., West, R., Sheals, K., & Godinho, C. A. (2018). Evaluating the effectiveness of behavior change techniques in health-related behavior: a scoping review of methods used. *Translational Behavioral Medicine*, 8(2), 212-224. doi: 10.1093/tbm/ibx019.

Michie, SF; West, R; Campbell, R; Brown, J; Gainforth, H; (2014) ABC of Behaviour Change Theories. [Book]. (1st ed.). Silverback Publishing: Sutton, Surrey, UK.

Miller, C. K., Weinhold, K. R., & Nagaraja, H. N. (2016). Impact of a worksite diabetes prevention intervention on diet quality and social cognitive influences of health behavior: a randomized controlled trial. *Journal of Nutrition Education and Behavior, 48*(3), 160-169. e161. doi: 10.1016/j.jneb.2015.12.002.

Mohebi, S., Azadbakht, L., Feizi, A., Sharifirad, G., & Kargar, M. (2013). Review the key role of self-efficacy in diabetes care. *Journal of Education and Health Promotion, 2*, 36. doi: 10.4103/2277-9531.115827.

Moller, G., Andersen, H. K., & Snorgaard, O. (2017). A systematic review and meta-analysis of nutrition therapy compared with dietary advice in patients with type 2 diabetes. *Am J Clin Nutr, 106*(6), 1394-1400. doi: 10.3945/ajcn.116.139626.

Montalescot, G., Sechtem, U., Achenbach, S., Andreotti, F., Arden, C., Budaj, A., . . . Di Mario, C. (2013). 2013 ESC guidelines on the management of stable coronary artery disease. *European Heart Journal, 34*(38), 2949-3003. doi: 10.1093/eurheartj/eht296.

Mooney, M., McKee, G., Fealy, G., O'Brien, F., O'Donnell, S., & Moser, D. (2014). A randomized controlled trial to reduce prehospital delay time in patients with acute coronary

syndrome (ACS). *The Journal of Emergency Medicine, 46*(4), 495-506. doi: 10.1016/j.jemermed.2013.08.114.

Moore, G. F., Audrey, S., Barker, M., Bond, L., Bonell, C., Hardeman, W., . . . Wight, D. (2015). Process evaluation of complex interventions: Medical Research Council guidance. *BMJ*, 350, h1258.

Morris, R. L., Sanders, C., Kennedy, A. P., & Rogers, A. (2011). Shifting priorities in multimorbidity: a longitudinal qualitative study of patient's prioritization of multiple conditions. *Chronic Illness, 7*(2), 147-161. doi: 10.1177/1742395310393365.

Mosleh, S. M., Eshah, N. F., & Almalik, M. (2017). Perceived learning needs according to patients who have undergone major coronary interventions and their nurses. *Journal of Clinical Nursing, 26*(3-4), 418-426. doi: 10.1111/jocn.13417.

Murphy, K., Chuma, T., Mathews, C., Steyn, K., & Levitt, N. (2015). A qualitative study of the experiences of care and motivation for effective self-management among diabetic and hypertensive patients attending public sector primary health care services in South Africa. *BMC Health Services Research, 15*(1), 303. doi: 10.1186/s12913-015-0969-y.

Murray-Johnson, L., Witte, K., Boulay, M., Figueroa, M. E., Storey, D., & Tweedie, I. (2005). Using health education theories to explain behavior change: a cross-country analysis. 2000-2001. *International Quarterly of Community Health Education, 25*(1-2), 185-207. doi: 10.2190/1500-1461-44gk-m325.

Murrock, C. J., Higgins, P. A., & Killion, C. (2009). Dance and peer support to improve diabetes outcomes in African American women. *The Diabetes Educator, 35*(6), 995-1003. doi: 10.1177/0145721709343322.

National Bureau of Statistics of China. (2014). Retrieved from http://data.stats.gov.cn/

National Health and Medical Research Council. (2016). National Statement on Ethical Conduct in Human Research (2007) - Updated May 2015. Retrieved from https://www.nhmrc.gov.au/guidelines-publications/e72

National Institute for Health and Care Excellence. (2015). Structured Patient Education in Diabetes. 2017, Retrieved from http://webarchive.nationalarchives.gov.uk/20130105204013/http://webarchive.nationalarchives.gov.uk/20130105204013/http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_4113195

Nielsen, M., Andersson, C., Gerds, T. A., Andersen, P. K., Jensen, T. B., Køber, L., . . . Torp-Pedersen, C. (2013). Familial clustering of myocardial infarction in first-degree relatives: a nationwide study. *European Heart Journal, 34*(16), 1198-1203. doi: 10.1093/eurheartj/ehs475.

Nolan, C. J., Damm, P., & Prentki, M. (2011). Type 2 diabetes across generations: from pathophysiology to prevention and management. *Lancet, 378*(9786), 169-181. doi: 10.1016/S0140-6736(11)60614-4.

Nolte, S., Elsworth, G. R., Newman, S., & Osborne, R. H. (2013). Measurement issues in the evaluation of chronic disease self-management programs. *Quality of Life Research, 22*(7), 1655-1664. doi: 10.1007/s11136-012-0317-1.

Nosbusch, J. M., Weiss, M. E., & Bobay, K. L. (2011). An integrated review of the literature on challenges confronting the acute care staff nurse in discharge planning. *Journal of Clinical Nursing, 20*(5-6), 754-774. doi: 10.1111/j.1365-2702.2010.03257.x.

Nutbeam, D., Harris, E., & Wise, W. (2010). *Theory in a nutshell: a practical guide to health promotion theories*: McGraw-Hill.

O'Brien, R., Wyke, S., Guthrie, B., Watt, G., & Mercer, S. (2011). An 'endless struggle': a qualitative study of general practitioners' and practice nurses' experiences of managing multimorbidity in socio-economically deprived areas of Scotland. *Chronic Illness, 7*(1), 45-59.

O'Cathain, A., Murphy, E., & Nicholl, J. (2010). Three techniques for integrating data in mixed methods studies. *BMJ, 341*, c4587. doi: 10.1136/bmj.c4587.

Odgers-Jewell, K., Ball, L. E., Kelly, J. T., Isenring, E. A., Reidlinger, D. P., & Thomas, R. (2017). Effectiveness of group-based self-management education for individuals with Type 2 diabetes: a systematic review with meta-analyses and meta-regression. *Diabetic Medicine, 34*(8), 1027-1039. doi: 10.1111/dme.13340.

Olander, E. K., Fletcher, H., Williams, S., Atkinson, L., Turner, A., & French, D. P. (2013). What are the most effective techniques in changing obese individuals' physical activity self-efficacy and behaviour: a systematic review and meta-analysis. *The International Journal of Behavioral Nutrition and Physical Activity, 10*, 29. doi: 10.1186/1479-5868-10-29

Pajares, F. (1997). Current directions in self-efficacy research. *Advances in Motivation and Achievement, 10*(149), 1-49.

Pal, K., Eastwood, S. V., Michie, S., Farmer, A. J., Barnard, M. L., Peacock, R., . . . Murray, E. (2010). Computer-based diabetes self-management interventions for adults with type 2 diabetes mellitus. *Cochrane Database Systematic Review,* 2013, 28(3),CD008776. doi: 10.1002/14651858.CD008776.pub2.

Pan, X., Dib, H. H., Wang, X., & Zhang, H. (2006). Service utilization in community health centers in China: a comparison analysis with local hospitals. *BMC Health Services Research, 6*(1), 93.

Pancholy, S. B., Shantha, G. P. S., Patel, T., & Cheskin, L. J. (2014). Sex differences in short-term and long-term all-cause mortality among patients with ST-segment elevation myocardial infarction treated by primary percutaneous intervention: a meta-analysis. *JAMA Internal Medicine, 174*(11), 1822-1830. doi: 10.1001/jamainternmed.2014.4762.

Park, M. Y. (2005). Nurses' perception of performance and responsibility of patient education. *Journal of Korean Academy of Nursing, 35*(8), 1514-1521.

Patton, M. Q. (2015). *Qualitative research & evaluation methods : integrating theory and practice* (Fourth edition): Thousand Oaks, California : SAGE Publications, Inc.

Pencina, M. J., D'agostino, R. B., Pencina, K. M., Janssens, A. C. J., & Greenland, P. (2012). Interpreting incremental value of markers added to risk prediction models. *American Journal of Epidemiology*, 15;176(6):473-81.

Polit, D. F., & Beck, C. T. (2004). *Nursing research: Principles and methods*: Lippincott Williams & Wilkins.

Polit, D. F., & Beck, C. T. (2008). *Nursing research: Generating and assessing evidence for nursing practice*: Lippincott Williams & Wilkins.

Powers, M. A., Bardsley, J., Cypress, M., Duker, P., Funnell, M. M., Fischl, A. H., . . . Vivian, E. (2017). Diabetes Self-management Education and Support in Type 2 Diabetes. *The Diabetes Educator, 43*(1), 40-53. doi: 10.1177/0145721716689694.

QSR International. (2017). NVivo. 2017, Retrieved from http://www.qsrinternational.com/nvivo/what-is-nvivo

Rani, R., & Sharma, R. (2012). Ethical consideration in research. *International Journal of Nursing Education, 4*(1), 45-48.

Richards, D., Larkin, M., Milaszewski, K., Javier, E., Casey, T., & Grey, M. (2013). Learning needs of youth with type 2 diabetes. *The Diabetes Educator, 39*(3), 314-319. doi: 10.1177/0145721713485305.

Riff, D., Lacy, S., & Fico, F. (2014). Analyzing media messages: Using quantitative content analysis in research. New York: Routledge.

Riley, W. T., Rivera, D. E., Atienza, A. A., Nilsen, W., Allison, S. M., & Mermelstein, R. (2011). Health behavior models in the age of mobile interventions: are our theories up to the task? *Translational Behavioral Medicine, 1*(1), 53-71. doi: 10.1007/s13142-011-0021-7.

Rosenstock, I. M. (1974). Historical origins of the health belief model. *Health Education Monographs, 2*(4), 328-335.

Rosal, M. C., Olendzki, B., Reed, G. W., Gumieniak, O., Scavron, J., & Ockene, I. (2005). Diabetes self-management among low-income Spanish-speaking patients: a pilot study. *Annals of Behavioral Medicine*, 29(3), 225-235.

Rosenstock, I. M. (2005). Why people use health services. *The Milbank Quarterly,* 44,94–124. doi:10.2307/3348967.

Rosenstock, I. M., Strecher, V. J., & Becker, M. H. (1988). Social learning theory and the health belief model. *Health Education Quarterly, 15*(2), 175-183.

Ryan, R., Santesso, N., Lowe, D., Hill, S., Grimshaw, J., Prictor, M., . . . Taylor, M. (2014). Interventions to improve safe and effective medicines use by consumers: an overview of systematic reviews. *Cochrane Database Systematic Review*, 29(4):CD007768. doi: 10.1002/14651858.CD007768.pub3.

Sallis, J. F., Owen, N., & Fisher, E. (2015). Ecological models of health behavior. *Health behavior: Theory, Research, and Practice, 5*, 43-64.

Samdal, G. B., Eide, G. E., Barth, T., Williams, G., & Meland, E. (2017). Effective behaviour change techniques for physical activity and healthy eating in overweight and obese adults; systematic review and meta-regression analyses. *International Journal of Behavioral Nutrition and Physical Activity, 14*(1), 42. doi: 10.1186/s12966-017-0494-y.

Sandelowski, M. (2000). Focus on research methods-whatever happened to qualitative description? *Research in Nursing and Health, 23*(4), 334-340.

Sandelowski, M. (2010). What's in a name? Qualitative description revisited. *Research in Nursing & Health, 33*(1), 77-84. doi: 10.1002/nur.20362.

Sarkar, U., Ali, S., & Whooley, M. A. (2007). Self-efficacy and health status in patients with coronary heart disease: Findings from the heart and soul study. *Psychosomatic Medicine, 69*(4), 306-312. doi: 10.1097/PSY.0b013e3180514d57.

Saw, A., Paterniti, D., Fung, L.C., Tsoh, J. Y., Chen, M. S., & Tong, E. K. (2016). Social environmental influences on smoking and cessation: qualitative perspectives among Chinese-speaking smokers and nonsmokers in California. *Journal of Immigrant and Minority Health*, 19(6),1404-1411. doi: 10.1007/s10903-016-0358-6.

Scain, S. F., Friedman, R., & Gross, J. L. (2009). A structured educational program improves metabolic control in patients with type 2 diabetes. *The Diabetes Educator, 35*(4), 603-611. doi: 10.1177/0145721709336299.

Schulman-Green, D., Jaser, S., Martin, F., Alonzo, A., Grey, M., McCorkle, R., . . . Whittemore, R. (2012). Processes of self-management in chronic illness. *Journal of Nursing Scholarship, 44*(2), 136-144. doi: 10.1111/j.1547-5069.2012.01444.x.

Schwarz, P. E., Greaves, C. J., Lindström, J., Yates, T., & Davies, M. J. (2012). Nonpharmacological interventions for the prevention of type 2 diabetes mellitus. *Nature Reviews Endocrinology, 8*(6), 363-373. doi: 10.1038/nrendo.2011.232.

Schwarzer, R., Lippke, S., & Luszczynska, A. (2011). Mechanisms of health behavior change in persons with chronic illness or disability: the Health Action Process Approach (HAPA). *Rehabilitation Psychology, 56*(3), 161-70. doi: 10.1037/a0024509.

Schweikert, B., Hahmann, H., & Leidl, R. (2006). Validation of the EuroQol questionnaire in cardiac rehabilitation. *Heart, 92*(1), 62-67.

Seitz, P., Rosemann, T., Gensichen, J., & Huber, C. (2011). Interventions in primary care to improve cardiovascular risk factors and glycated haemoglobin (HbA1c) levels in patients with diabetes: a systematic review. *Diabetes, Obesity and Metabolism, 13*(6), 479-489. doi: 10.1111/j.1463-1326.2010.01347.x.

Sells, D., Sledge, W. H., Wieland, M., Walden, D., Flanagan, E., Miller, R., & Davidson, L. (2009). Cascading crises, resilience and social support within the onset and development of multiple chronic conditions. Chronic Illness, 5(2), 92-102. doi: 10.1177/1742395309104166.

Shafipour, V., Mohammad, E., & Ahmadi, F. (2014). Barriers to nurse-patient communication in cardiac surgery wards: a qualitative study. *Global Journal of Health Science, 6*(6), 234-244. doi: 10.5539/gjhs.v6n6p234.

Shah, B. R., Adams, M., Peterson, E. D., Powers, B., Oddone, E. Z., Royal, K., . . . Bosworth, H. B. (2011). Secondary Prevention Risk Interventions Via Telemedicine and Tailored Patient Education (SPRITE). *Circulation: Cardiovascular Quality and Outcomes, 4*(2), 235-242. doi: 10.1161/CIRCOUTCOMES.110.951160.

Sharoni, A., Khuzaimah, S., Minhat, H. S., Zulkefli, M., Afiah, N., & Baharom, A. (2016). Health education programmes to improve foot self-care practices and foot problems among older people with diabetes: a systematic review. *International Journal of Older People Nursing*, 11(3), 214-239. doi: 10.1111/opn.12112.

Shenton, A. K. (2004). Strategies for ensuring trustworthiness in qualitative research projects. *Education for Information, 22*(2), 63-75.

Sherifali, D., Viscardi, V., Bai, J., W., & Ali, R. (2016). Evaluating the Effect of a Diabetes Health Coach in Individuals with Type 2 Diabetes. *Canada Journal of Diabetes*. 2016, 40(1), 84-94. doi: 10.1016/j.jcjd.2015.10.006.

Shi, H., Zhang, F., Zhu, C., Wang, S., Li, S., & Chen, S. (2007). Incidence of changes and predictive factors for sexual function after coronary stenting. *Andrologia, 39*(1), 16-21.

Shi, M., Xu, M.-Y., Liu, Z.-L., Duan, X.-Y., Zhu, Y.-B., Shi, H.-M., . . . Yu, X.-H. (2016). Effectiveness of family involvement in newly diagnosed type 2 diabetes patients: a follow-up study. *Patient Education and Counseling, 99*(5), 776-782. doi: 10.1016/j.pec.2015.12.018.

Smith, C., McNaughton, D. A., & Meyer, S. (2016). Client perceptions of group education in the management of type 2 diabetes mellitus in South Australia. *Australian Journal of Primary Health, 22*(4), 360-367. doi: 10.1071/PY15008.

Sohal, T., Sohal, P., King-Shier, K. M., & Khan, N. A. (2015). Barriers and facilitators for type-2 diabetes management in South Asians: a systematic review. *PloS One*, 10(9), e0136202.

Soja, A. M. B., Zwisler, A.-D. O., Frederiksen, M., Melchior, T., Hommel, E., Torp-Pedersen, C., & Madsen, M. (2007). Use of intensified comprehensive cardiac rehabilitation to improve risk factor control in patients with type 2 diabetes mellitus or impaired glucose tolerance—the randomized DANish StUdy of impaired glucose metabolism in the settings of cardiac rehabilitation (DANSUK) study. *American Heart Journal, 153*(4), 621-628.

Sol, B. G. M., van der Graaf, Y., van Petersen, R., & Visseren, F. L. J. (2011). The effect of self-efficacy on cardiovascular lifestyle. *European Journal of Cardiovascular Nursing, 10*(3), 180-186. doi: 10.1016/j.ejcnurse.2010.06.005.

Steg, P. G., James, S. K., Atar, D., Badano, L. P., Lundqvist, C. B., Borger, M. A., . . . Fernandez-Aviles, F. (2012). ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation. *European Heart Journal*, 33(20), 2569-2619. doi: 10.1093/eurheartj/ehs215.

Steinsbekk, A., Rygg, L., Lisulo, M., Rise, M. B., & Fretheim, A. (2012). Group based diabetes self-management education compared to routine treatment for people with type 2 diabetes mellitus. A systematic review with meta-analysis. *BMC Health Services Research, 12*(1), 213. doi: 10.1186/1472-6963-12-213.

Strobl, C., Malley, J., & Tutz, G. (2009). An introduction to recursive partitioning: rationale, application, and characteristics of classification and regression trees, bagging, and random forests. *Psychological Methods, 14*(4), 323-48. doi: 10.1037/a0016973.

Sun, Li, S.-d., Liu, Y., Zhang, Y., Mei, R., & Yang, M.-h. (2013). Differences in the origin of philosophy between Chinese medicine and western medicine: exploration of the holistic advantages of Chinese medicine. Chinese Journal of Integrative Medicine, 19(9), 706-711. doi: 10.1007/s11655-013-1435-5.

Sun, Tsoh, J. Y., Saw, A., Chan, J. L., & Cheng, J. W. (2012). Effectiveness of a culturally tailored diabetes self-management program for Chinese Americans. *The Diabetes Educator, 38*(5), 685-694. doi: 10.1177/0145721712450922.

Svavarsdóttir, M. H., Sigurdardottir, A. K., & Steinsbekk, A. (2016). What is a good educator? A qualitative study on the perspective of individuals with coronary heart disease. *European Journal of Cardiovascular Nursing, 15*(7), 513-521.

Svavarsdóttir, M. H., Sigurðardóttir, Á. K., & Steinsbekk, A. (2016). Knowledge and skills needed for patient education for individuals with coronary heart disease: The perspective of health professionals. *European Journal of Cardiovascular Nursing, 15*(1), 55-63. doi: 10.1177/1474515114551123.

Swenne, C. L., & Skytt, B. (2014). The ward round–patient experiences and barriers to participation. *Scandinavian Journal of Caring Sciences, 28*(2), 297-304. doi: 10.1111/scs.12059.

Syx, R. L. (2008). The practice of patient education: The theoretical perspective. *Orthopaedic Nursing, 27*(1), 50-54. doi: 10.1097/01.NOR.0000310614.31168.6b.

Tai, M. C. T. (2012). An oriental understanding of health. *Tzu Chi Medical Journal, 24*(2), 92-95.

Tanash, M. a. I., Fitzsimons, D., Coates, V., & Deaton, C. (2017). An evaluation of the effectiveness of self‐management interventions for people with type 2 diabetes after an acute coronary syndrome: a systematic review. *Journal of Clinical Nursing, 26*(11-12), 1458-1472. doi: 10.1111/jocn.13487.

Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education*, 2, 53-55. doi: 10.5116/ijme.4dfb.8dfd.

Ter Hoeve, N., van Geffen, M.E., Post, M.W., Stam, H.J., Sunamura, M., van Domburg, R.T., van den Berg-Emons, R.J. (2015). Participation in society in patients with coronary artery disease before and after cardiac rehabilitation. *Archives of Physical Medicine and Rehabilitation*, 96 (6), 1110-1116. doi: 10.1016/j.apmr.2015.01.019.

Terry, P. E., & Healey, M. L. (2000). The physician's role in educating patients. *Journal of Family Practice, 49*(4), 314-314.

Thomas, E., & Magilvy, J. K. (2011). Qualitative rigor or research validity in qualitative research. *Journal for Specialists in Pediatric Nursing, 16*(2), 151-155. doi: 10.1111/j.1744-6155.2011.00283.x.

Torrance, G. W., Feeny, D., & Furlong, W. (2001). Visual analog scales: do they have a role in the measurement of preferences for health states? In: Sage Publications Sage CA: Thousand Oaks, CA.

Tracy, S. J. (2010). Qualitative quality: Eight “big-tent” criteria for excellent qualitative research. *Qualitative Inquiry, 16*(10), 837-851.

Twinn, S. F., & Lee, D. T. (1997). The practice of health education in acute care setting in Hong Kong: an exploratory study of the contribution of registered nurses. *Journal of Advanced Nursing, 25*(1), 178-185.

Vaismoradi, M., Turunen, H., & Bondas, T. (2013). Content analysis and thematic analysis: Implications for conducting a qualitative descriptive study. *Nursing & Health Sciences, 15*(3), 398-405. doi: 10.1111/nhs.12048.

Valderas, J. M., Starfield, B., Sibbald, B., Salisbury, C., & Roland, M. (2009). Defining Comorbidity: Implications for Understanding Health and Health Services. *Annals of Family Medicine, 7*(4), 357-363. doi: 10.1370/afm.983.

van de Glind, I., van Dulmen, S., & Goossensen, A. (2008). Physician–patient communication in single-bedded versus four-bedded hospital rooms. *Patient Education and Counseling, 73*(2), 215-219. doi: 10.1016/j.pec.2008.07.004.

Vanstone, M., Giacomini, M., Smith, A., Brundisini, F., DeJean, D., & Winsor, S. (2013). How diet modification challenges are magnified in vulnerable or marginalized people with diabetes and heart disease: a systematic review and qualitative meta-synthesis. *Ontario Health Technology Assessment Series*, 13(14):1-40. eCollection.

van Vugt, M., de Wit, M., Cleijne, W. H., & Snoek, F. J. (2013). Use of behavioral change techniques in web-based self-management programs for type 2 diabetes patients: systematic review. *Journal of Medical Internet Research, 15*(12), e279. doi: 10.2196/jmir.2800.

Vassilev, I., Rogers, A., Kennedy, A., & Koetsenruijter, J. (2014). The influence of social networks on self-management support: a metasynthesis. *BMC Public Health, 14*(1), 719. doi: 10.1186/1471-2458-14-719.

Vavalle, J. P., Lopes, R. D., Chen, A. Y., Newby, L. K., Wang, T. Y., Shah, B. R., . . . Roe, M. T. (2012). Hospital length of stay in patients with non-ST-segment elevation myocardial infarction. *The American Journal of Medicine, 125*(11), 1085-1094. doi: 10.1016/j.amjmed.2012.04.038.

Vibulchai, N., Thanasilp, S., & Preechawong, S. (2016). Randomized controlled trial of a self-efficacy enhancement program for the cardiac rehabilitation of Thai patients with myocardial infarction. *Nursing & Health Sciences, 18*(2), 188-195. doi: 10.1111/nhs.12243.

Voit, K. (2012). Nursing and midwifery workforce challenges for the Northern Territory : a qualitative study investigating opportunities for the introduction of clinician-led workforce research. Master Thesis, Charles Darwin University.

Wang, L., Gao, P., Zhang, M., Huang, Z., Zhang, D., Deng, Q., . . . Jin, D. (2017). Prevalence and ethnic pattern of diabetes and prediabetes in China in 2013. *JAMA, 317*(24), 2515-2523. doi: 10.1001/jama.2017.7596.

Wang, X., Zhang, C., Yang, R., Zhu, H., Zhao, H., & Li, X. (2014). Clinical study of the hypothesis of "endogenous collateral wind" on acute coronary syndrome-A Review. *African Journal of Traditional, Complementary and Alternative Medicines, 11*(1), 121-126.

Welch, A. (2011a). Qualitative Research Design. In S. Jirojwong, M. Johnson, & A. Welch (Eds.), *Research methods in nursing and midwifery: Pathways to evidence-based practice* (pp. 99-119). Oxford: Oxford University Press.

Welch, A. (2011b). Sampling in qualitative research. In S. Jirojwong, M. Johnson, & A. Welch (Eds.), *Research methods in nursing and midwifery: Pathways to evidence-based practice* (pp. 87-97). Oxford: Oxford University Press.

Welch, A., & Jirojwong, S. (2011). Data collection: qualitative research. In S. Jirojwong, M. Johnson, & A. Welch (Eds.), *Research methods in nursing and midwifery: Pathways to evidence-based practice* (pp. 121-139). Oxford: Oxford University Press.

Wen, M., Fan, J., Jin, L., Wang, G. (2010). Neighborhood effects on health among migrants and natives in Shanghai, China. *Health & Place,* 16 (3), 452-460. doi: 10.1016/j.healthplace.2009.12.001.

Whitehead, L. (2011). Qualitative Data Analysis. In S. Jirojwong, M. Johnson, & A. Welch (Eds.), *Research methods in nursing and midwifery: Pathways to evidence-based practice* (pp. 141-161). Oxford: Oxford University Press.

World Health Organization. (2012). Health education: theoretical concepts, effective strategies and core competencies: a foundation document to guide capacity development of health educators. Retrieved from http://applications.emro.who.int/dsaf/EMRPUB_2012_EN_1362.pdf.

World Health Organization. (2013). Health education. Retrieved from http://www.who.int/topics/health_education/en/

Williamson, G. R. (2005). Illustrating triangulation in mixed-methods nursing research. *Nurse Researcher, 12*(4), 7-18.

Wilson, A., & Gyi, A. A. (2010). The status and perspective of diabetes health education in China: inspiration from Australia. *International Journal of Nursing Practice, 16*(2), 92-98. doi: 10.1111/j.1440-172X.2010.01817.x.

Wolf, A., Fors, A., Ulin, K., Thorn, J., Swedberg, K., & Ekman, I. (2016). An eHealth Diary and Symptom-Tracking Tool Combined With Person-Centered Care for Improving Self-Efficacy After a Diagnosis of Acute Coronary Syndrome: A Substudy of a Randomized

Controlled Trial. *Journal of Medical Internet Research, 18*(2), e40. doi: 10.2196/jmir.4890.

Wood, D., Kotseva, K., Connolly, S., Jennings, C., Mead, A., Jones, J., . . . De Backer, G. (2008). Nurse-coordinated multidisciplinary, family-based cardiovascular disease prevention programme (EUROACTION) for patients with coronary heart disease and asymptomatic individuals at high risk of cardiovascular disease: a paired, cluster-randomised controlled trial. *The Lancet, 371*(9629), 1999-2012. doi: 10.1016/S0140-6736(08)60868-5.

Wouda, J. C., Zandbelt, L. C., Smets, E. M., & van de Wiel, H. B. (2011). Assessment of physician competency in patient education: Reliability and validity of a model-based instrument. *Patient education and counseling, 85*(1), 92-98. doi: 10.1016/j.pec.2010.09.007.

Wu, C. J., Chang, A. M., Courtney, M., & Kostner, K. (2012). Peer supporters for cardiac patients with diabetes: a randomized controlled trial. *International Nursing Review*, 59(3), 345-352. doi: 10.1111/j.1466-7657.2012.00998.x.

Wu, C. J. & Chang, A. M. (2014). Application of a theoretical framework to foster a cardiac-diabetes self-management programme. *International Nursing Review, 61*(3), 336-343. doi: 10.1111/inr.12104.

Wu, C. J., Chang, A. M., Courtney, M., & Ramis, M. A. (2012). Using user-friendly telecommunications to improve cardiac and diabetes self-management programme: a pilot study. *Journal of Evaluation in Clinical Practice, 18*(3), 695-697. doi: 10.1111/j.1365-2753.2010.01621.x.

Wu, C. J., Chang, A. M., & McDowell, J. (2009). Innovative self-management programme for diabetics following coronary care unit admission. *International Nursing Review, 56*(3), 396-399. doi: 10.1111/j.1466-7657.2009.00725.x.

Wu, C. J., Sung, H. C., Chang, A. M., Atherton, J., Kostner, K., & McPhail, S. M. (2017). Cardiac-diabetes self-management program for Australians and Taiwanese: A randomized blocked design study. *Nursing & Health Sciences, 19*(3), 307-315. doi: 10.1111/nhs.12346.

Wu, C.J., Sung, H.-C., Chang, A. M., Atherton, J., Kostner, K., Courtney, M., & McPhail, S. M. (2013). Protocol for a randomised blocked design study using telephone and text-messaging to support cardiac patients with diabetes: a cross cultural international collaborative project. *BMC Health Services Research, 13*(1), 402.

Wu, C. J., & Chang, A. M. (2008). Audit of patients with type 2 diabetes following a critical cardiac event. *International Nursing Review, 55*(3), 327-332. doi: 10.1111/j.1466-7657.2008.00636.x.

Wu, S.F. V., Courtney, M., Edwards, H., McDowell, J., Shortridge-Baggett, L. M., & Chang, P. J. (2008). Development and validation of the Chinese version of the Diabetes

Management Self-efficacy Scale. *International Journal of Nursing Studies, 45*(4), 534-542.

Xiao, H.T., Zhong, L., Tsang, S.W., Lin, Z.-S., & Bian, Z.X. (2015). Traditional Chinese medicine formulas for irritable bowel syndrome: from ancient wisdoms to scientific understandings. *The American journal of Chinese medicine, 43*(01), 1-23.

Yang W, Lu J, Weng J, Jia W, Ji L, Xiao J, et al. Prevalence of diabetes among men and women in china. *New England Journal of Medicine* 2010; 362: 1090–1101.

Yang, Q., & Fang, P. (2016). Impact of the conversation map tools in patients with type 2 diabetes mellitus: A PRISMA-compliant meta-analysis of randomized controlled trials. *Medicine (Baltimore), 95*(40), e4664. doi: 10.1097/md.0000000000004664.

Yang, Q., Wang, Y., Liu, J., Liu, J., Hao, Y., Smith, S. C., . . . Ge, J. (2017). Invasive Management Strategies and Antithrombotic Treatments in Patients With Non–ST-Segment–Elevation Acute Coronary Syndrome in China. *Circulation: Cardiovascular Interventions, 10*(6), e004750. doi: 10.1161/CIRCINTERVENTIONS.116.004750.

You, H., Zhang, T., Feng, W., & Gai, Y. (2017). Association of TCM body constitution with insulin resistance and risk of diabetes in impaired glucose regulation patients. *BMC Complementary and Alternative Medicine, 17*(1), 459. doi: 10.1186/s12906-017-1964-0.

Zhang, W., & Creswell, J. (2013). The use of "mixing" procedure of mixed methods in health services research. *Medical Care, 51*(8), e51-e57. doi: 10.1097/MLR.0b013e31824642fd.

Zhang, L., Li, X., & Shah, I. H. (2007). Where do Chinese adolescents obtain knowledge of sex? Implications for sex education in China. *Health Education, 107*(4), 351-363.

Zhao, F. F., Suhonen, R., Koskinen, S., & Leino-Kilpi, H. (2017). Theory-based self-management educational interventions on patients with type 2 diabetes: a systematic review and meta-analysis of randomized controlled trials. *Journal of Advanced Nursing, 73*(4), 812-833. doi: 10.1111/jan.13163.

Zhou, L. (2014). Music is not our enemy, but noise should be regulated: Thoughts on shooting/conflicts related to dama square dance in China. *Research Quarterly for Exercise and Sport, 85*(3), 279-281.

Zhou, W., Dong, Y., Lin, X., Lu, W., Tian, X., Yang, L., & Zhang, X. (2013). Community health service capacity in China: a survey in three municipalities. *Journal of Evaluation in Clinical Practice, 19*(1), 167-172. doi: 10.1111/j.1365-2753.2011.01788.x.

Appendices

Appendix A: List of Publication or Submitted Papers by the Candidate

A.1 Publication Papers by the Candidate

Liu, X. L., Shi, Y., Willis, K., Wu, C-J (Jo)., & Johnson, M. (2017). Health education for patients with acute coronary syndrome and type 2 diabetes mellitus: an umbrella review of systematic reviews and meta-analyses. BMJ Open, 7(10), e016857.

Open Access Research

BMJ Open

Health education for patients with acute coronary syndrome and type 2 diabetes mellitus: an umbrella review of systematic reviews and meta-analyses

Xian-liang Liu,[1,2,3] Yan Shi,[1] Karen Willis,[4] Chiung-Jung (Jo) Wu,[5,6,7,8] Maree Johnson[9,10]

To cite: Liu X, Shi Y, Willis K, *et al*. Health education for patients with acute coronary syndrome and type 2 diabetes mellitus: an umbrella review of systematic reviews and meta-analyses. *BMJ Open* 2017;**7**:e016857. doi:10.1136/bmjopen-2017-016857

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ABSTRACT

Objectives This umbrella review aimed to identify the current evidence on health education-related interventions for patients with acute coronary syndrome (ACS) or type two diabetes mellitus (T2DM); identify the educational content, delivery methods, intensity, duration and setting required. The purpose was to provide recommendations for educational interventions for high-risk patients with both ACS and T2DM.

Design Umbrella review of systematic reviews and meta-analyses.

Setting Inpatient and postdischarge settings.

Participants Patients with ACS and T2DM.

Data sources CINAHL, Cochrane Library, Joanna Briggs Institute, Journals@Ovid, EMBase, Medline, PubMed and Web of Science databases from January 2000 through May 2016.

Outcomes measures Clinical outcomes (such as glycated haemoglobin), behavioural outcomes (such as smoking), psychosocial outcomes (such as anxiety) and medical service use.

Results Fifty-one eligible reviews (15 for ACS and 36 for T2DM) consisting of 1324 relevant studies involving 288 057 patients (15 papers did not provide the total sample); 30 (58.8%) reviews were rated as high quality. Nurses only and multidisciplinary teams were the most frequent professionals to provide education, and most educational interventions were delivered postdischarge. Face-to-face sessions were the most common delivery formats, and many education sessions were also delivered by telephone or via web contact. The frequency of educational sessions was weekly or monthly, and an average of 3.7 topics was covered per education session. Psychoeducational interventions were generally effective at reducing smoking and admissions for patients with ACS. Culturally appropriate health education, self-management educational interventions, group medical visits and psychoeducational interventions were generally effective for patients with T2DM.

Conclusions Results indicate that there is a body of current evidence about the efficacy of health education, its content and delivery methods for patients with ACS or T2DM. These results provide recommendations about the content for, and approach to, health education intervention for these high-risk patients.

Strengths and limitations of this study

- This umbrella review is the first synthesis of systematic reviews or meta-analyses to consider health education-related interventions for patients with acute coronary syndrome (ACS) or type two diabetes mellitus (T2DM).
- These results provide recommendations about the content of a health education intervention for patients with ACS and T2DM.
- The diversity of the educational interventions seen in the reviews included in this umbrella review may reflect the uncertainty about the optimal strategy for providing health education to patients.
- This umbrella review found no reviews focused on patients with ACS and T2DM—the intended target group; instead, all of the systematic reviews and meta-analyses focused on only one of these two diseases.

INTRODUCTION

Acute coronary syndrome (ACS) is the leading cause of death worldwide. The risk of high mortality rates relating to ACS is markedly increased after an initial cardiac ischaemic event.[1] Globally, 7.2 million (13%) deaths are caused by coronary artery disease (CAD),[2] and it is estimated that >780 000 persons will experience ACS each year in the USA.[3] Moreover, about 20%–25% of patients with ACS reportedly also have diabetes mellitus (DM); predominantly type two diabetes mellitus (T2DM)).[4 5] Patients with ACS and DM have an increased risk of adverse outcomes such as death, recurrent myocardial infarction (MI), readmission or heart failure during follow-up.[6] Longer median delay times from symptom onset to hospital presentation, have been reported among patients with ACS and DM than patients with ACS alone.[7]

DM is now considered to confer a risk equivalent to that of CAD for patients for future MI and cardiovascular mortality.[8] Mortality

Title: Health education for patients with acute coronary syndrome and type 2 diabetes mellitus: an umbrella review of systematic reviews and meta-analyses.

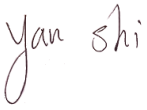
Status: Published in BMJ Open.

Statement of contribution of authors:

I acknowledge that my contribution to the above paper is 60%.

Xian-Liang Liu

I acknowledge that my contribution to the above paper is 8%.



Professor Yan Shi

I acknowledge that my contribution to the above paper is 7%.

Professor Karen Willis

I acknowledge that my contribution to the above paper is 5%.

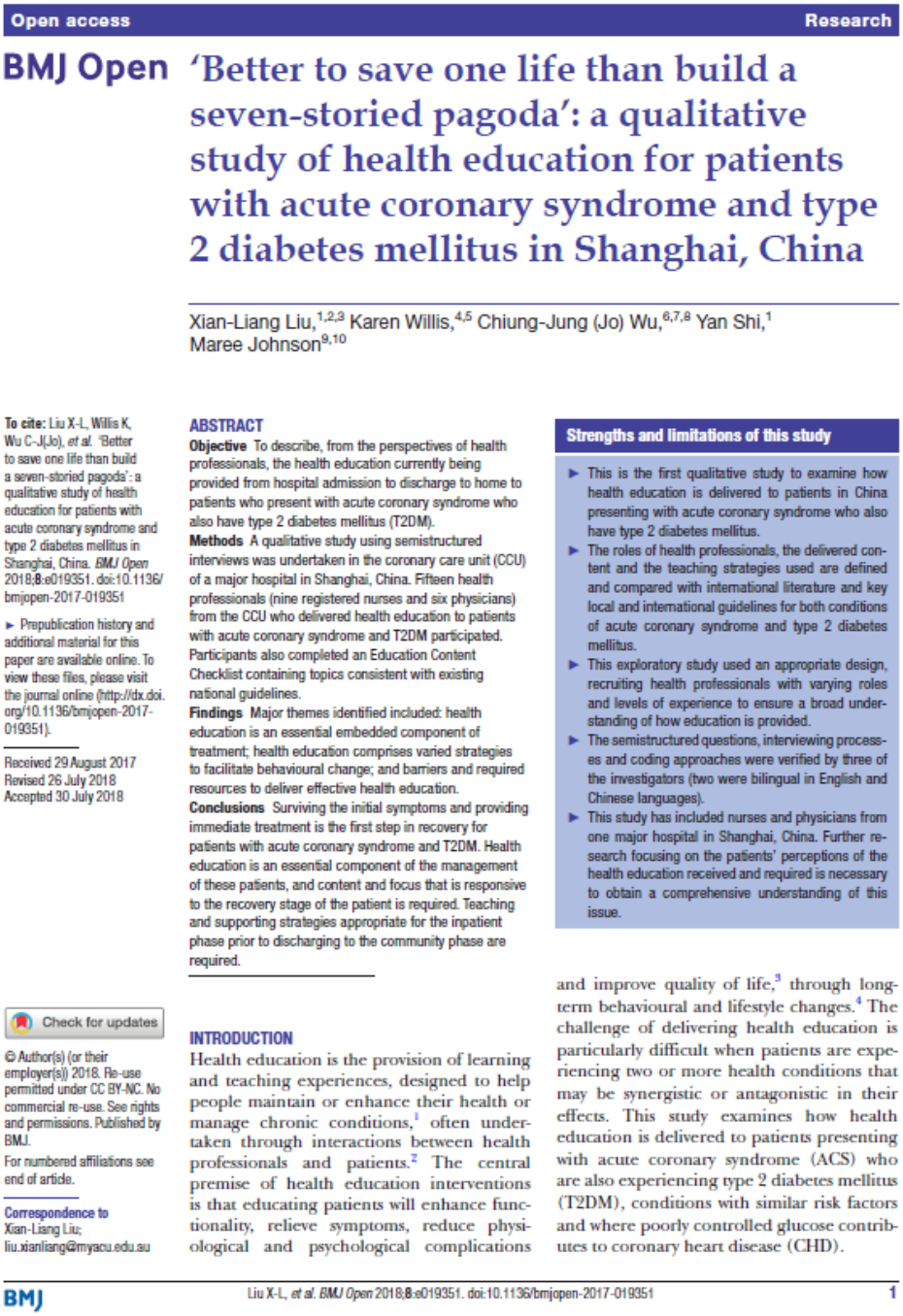
Associate Professor Chiung-Jung (Jo) Wu

I acknowledge that my contribution to the above paper is 20%.

Professor Maree Johnson

A.2 Publication Papers by the Candidate

Liu, X. L., Willis, K., Wu, C. J. J., Shi, Y., & Johnson, M. (2018a). 'Better to save one life than build a seven-storied pagoda': a qualitative study of health education for patients with acute coronary syndrome and type 2 diabetes mellitus in Shanghai, China. BMJ Open, 8(8), e019351.



Open access Research

BMJ Open

'Better to save one life than build a seven-storied pagoda': a qualitative study of health education for patients with acute coronary syndrome and type 2 diabetes mellitus in Shanghai, China

Xian-Liang Liu,[1,2,3] Karen Willis,[4,5] Chiung-Jung (Jo) Wu,[6,7,8] Yan Shi,[1] Maree Johnson[9,10]

To cite: Liu X-L, Willis K, Wu C-J(Jo), *et al*. 'Better to save one life than build a seven-storied pagoda': a qualitative study of health education for patients with acute coronary syndrome and type 2 diabetes mellitus in Shanghai, China. *BMJ Open* 2018;**8**:e019351. doi:10.1136/bmjopen-2017-019351

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ABSTRACT

Objective To describe, from the perspectives of health professionals, the health education currently being provided from hospital admission to discharge to home to patients who present with acute coronary syndrome who also have type 2 diabetes mellitus (T2DM).

Methods A qualitative study using semistructured interviews was undertaken in the coronary care unit (CCU) of a major hospital in Shanghai, China. Fifteen health professionals (nine registered nurses and six physicians) from the CCU who delivered health education to patients with acute coronary syndrome and T2DM participated. Participants also completed an Education Content Checklist containing topics consistent with existing national guidelines.

Findings Major themes identified included: health education is an essential embedded component of treatment; health education comprises varied strategies to facilitate behavioural change; and barriers and required resources to deliver effective health education.

Conclusions Surviving the initial symptoms and providing immediate treatment is the first step in recovery for patients with acute coronary syndrome and T2DM. Health education is an essential component of the management of these patients, and content and focus that is responsive to the recovery stage of the patient is required. Teaching and supporting strategies appropriate for the inpatient phase prior to discharging to the community phase are required.

Strengths and limitations of this study

- This is the first qualitative study to examine how health education is delivered to patients in China presenting with acute coronary syndrome who also have type 2 diabetes mellitus.
- The roles of health professionals, the delivered content and the teaching strategies used are defined and compared with international literature and key local and international guidelines for both conditions of acute coronary syndrome and type 2 diabetes mellitus.
- This exploratory study used an appropriate design, recruiting health professionals with varying roles and levels of experience to ensure a broad understanding of how education is provided.
- The semistructured questions, interviewing processes and coding approaches were verified by three of the investigators (two were bilingual in English and Chinese languages).
- This study has included nurses and physicians from one major hospital in Shanghai, China. Further research focusing on the patients' perceptions of the health education received and required is necessary to obtain a comprehensive understanding of this issue.

INTRODUCTION

Health education is the provision of learning and teaching experiences, designed to help people maintain or enhance their health or manage chronic conditions,[1] often undertaken through interactions between health professionals and patients.[2] The central premise of health education interventions is that educating patients will enhance functionality, relieve symptoms, reduce physiological and psychological complications and improve quality of life,[3] through long-term behavioural and lifestyle changes.[4] The challenge of delivering health education is particularly difficult when patients are experiencing two or more health conditions that may be synergistic or antagonistic in their effects. This study examines how health education is delivered to patients presenting with acute coronary syndrome (ACS) who are also experiencing type 2 diabetes mellitus (T2DM), conditions with similar risk factors and where poorly controlled glucose contributes to coronary heart disease (CHD).

Title: 'Better to save one life than build a seven-storied pagoda': a qualitative study of health education for patients with acute coronary syndrome and type 2 diabetes mellitus in Shanghai, China.

Status: Published in BMJ Open.

Statement of contribution of authors:

I acknowledge that my contribution to the above paper is 60%.

Xian-Liang Liu

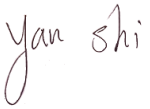
I acknowledge that my contribution to the above paper is 10%.

Professor Karen Willis

I acknowledge that my contribution to the above paper is 7%.

Associate Professor Chiung-Jung (Jo) Wu

I acknowledge that my contribution to the above paper is 3%.



Professor Yan Shi

I acknowledge that my contribution to the above paper is 20%.

Professor Maree Johnson

A.3 Publication Papers by the Candidate

Liu, X. L., Wu, C. J., Willis, K., Shi, Y., & Johnson, M. (2018b). The impact of inpatient education on self-management for patients with acute coronary syndrome and type 2 diabetes mellitus: a cross-sectional study in China. Health Education Research, 33(5), 389-401.

HEALTH EDUCATION RESEARCH

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The impact of inpatient education on self-management for patients with acute coronary syndrome and type 2 diabetes mellitus: a cross-sectional study in China

Xian-Liang Liu[1,2,3]*, Chiung-Jung (Jo) Wu[4,5], Karen Willis[6,7], Yan Shi[1] and Maree Johnson[2,8]

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Received on September 13, 2017; editorial decision June 27, 2018; accepted on June 29, 2018

Abstract

This study examined the impact of inpatient education on diabetes knowledge, acute coronary syndrome (ACS) symptom management and diabetes self-management on discharge for patients with ACS and type 2 diabetes mellitus (T2DM). A cross-sectional survey and patient health record review of 160 patients was conducted in a major hospital in Shanghai. Patient education received was measured using a visual analogue scale. The survey included valid and reliable measures of diabetes knowledge, self-efficacy, attitudes to ACS and clinical outcomes. Inpatient education contributed to improvements in fasting blood glucose on discharge ($P < 0.05$). ACS symptom management [Chinese language version of the ACS response index (C-ACSRI) scores] and self-management of T2DM [Chinese version of diabetes management self-efficacy scale (C-DMSES) scores] on discharge differed for the limited education group and sufficient education group ($P < 0.001$). Based on the multiple regression analyses, increasing scores for the C-ASCRI and C-DMSES could be explained by higher scores for perceived health education. Education relating to ACS and T2DM delivered during an acute admission was associated with improved scores in ACS symptom management and T2DM self-management, preparing some patients to manage both conditions on discharge.

Introduction

The prevalence of acute coronary syndrome (ACS) remains high, despite the reported decline of mortality rates for coronary heart disease (CHD) [1]. Diabetes is a strong independent risk factor for ACS [2, 3], with a 2–4-fold increased prevalence of ACS among patients with diabetes compared to those people without diabetes [4]. Approximately one-third of ACS patients also had diabetes or impaired glycaemic status [5, 6].

In China, patients admitted with type 2 diabetes mellitus (T2DM) have also been frequently reported as having ACS (19.7%) [7]. The occurrence of ACS increased with age and with being male [7]. ACS patients with diabetes are reported as having higher rates of congestive heart failure and stroke, with

doi:10.1093/her/cyy023

Title: The impact of inpatient education on self-management for patients with acute coronary syndrome and type 2 diabetes mellitus: a cross-sectional study in China.

Status: Published in Health Education Research.

Statement of contribution of authors:

I acknowledge that my contribution to the above paper is 65%.

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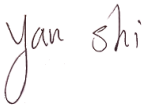


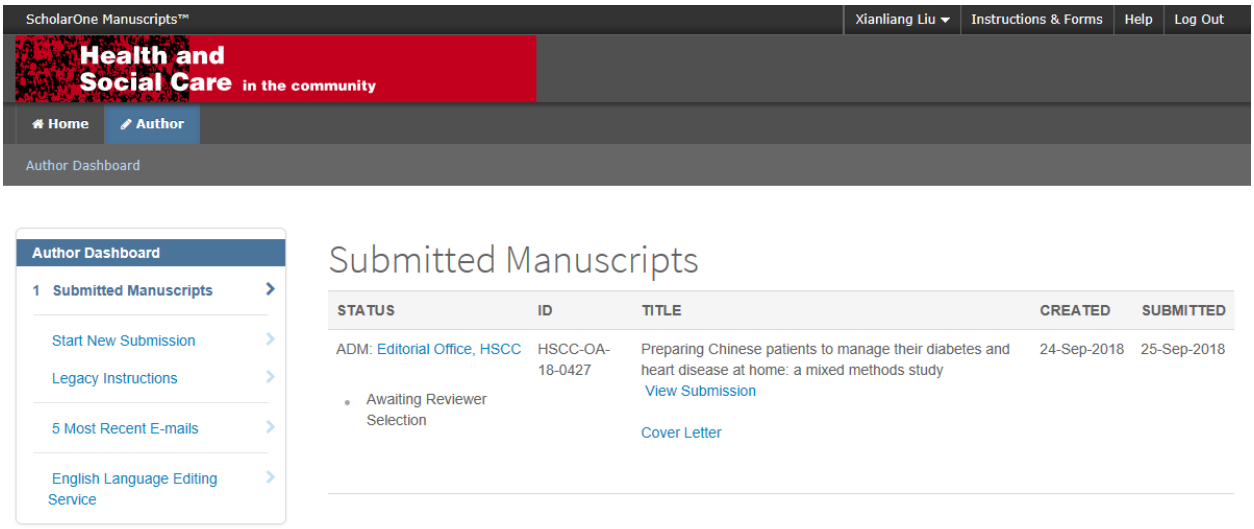
Professor Yan Shi

I acknowledge that my contribution to the above paper is 20%.

Professor Maree Johnson

A.4 Submitted Papers by the Candidate

Liu, X. L., Willis, K., Wu, C-J (Jo)., Fulbrook, P., Shi, Y., & Johnson, M. (2018c). Preparing Chinese patients to manage their diabetes and heart disease at home: a mixed methods study. Manuscript submitted for publication in Health & Social Care in the Community.



Title: Preparing Chinese patients to manage their diabetes and heart disease at home: a mixed methods study.

Status: Submitted for publication in the Health & Social Care in the Community.

Statement of contribution of authors:

I acknowledge that my contribution to the above paper is 60%.

Xian-Liang Liu

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Professor Karen Willis

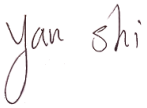
I acknowledge that my contribution to the above paper is 5%.

Associate Professor Chiung-Jung (Jo) Wu

I acknowledge that my contribution to the above paper is 4%.

Professor Paul Fulbrook

I acknowledge that my contribution to the above paper is 3%.



Professor Yan Shi

I acknowledge that my contribution to the above paper is 20%.

Professor Maree Johnson

Appendix B: Ethics Approval

B.1 Australian Catholic University Human Research Ethics Committee

AUSTRALIAN CATHOLIC UNIVERSITY

Human Research Ethics Committee
Registration of External Ethics Approval

Principal Investigator/Supervisor: Prof Maree Johnson, Dr Jo Wu, Prof Karen Willis

Student Researcher: Liu Xian-Liang (HDR Student)

Ethics approval has been noted for the following project: A mixed methods study of the experiences and outcomes of health education delivered to ACS and T2DM in China

for the period: 31/12/2018

Human Research Ethics Committee (HREC) Register Number: 2016-148R

Ratification of External Ethics Approval

The Australian Catholic University Human Research Ethics Committee has considered your application for registration of an externally approved ethics protocol and notes that this application has received ethics approval from Tenth People's Hospital of Tongji University, China [Reference: SHSY-IEC-3.0/16-20/01].

The ACU HREC accepts the ethics approval with no additional requirements, save that ACU HREC is informed of any modifications of the research proposal and that copies of all progress reports and any other documents be forwarded to it. Any complaints involving ACU staff must also be notified to ACU HREC (National Statement 5.3.3)

K. Pashley.

Signed: .... Date: .... 4/07/2016...
(Research Ethics Officer, McAuley Campus)

B.2 The Major Hospital Human Research Ethics Committee

The Human Research Ethics Committee of the Tenth People's Hospital of Tongji University

Ethics Review Document of Human Research Ethics Committee, Tenth People's Hospital of Tongji University

Ethics Reference Number: SHSY-IEC-3.0/16-20/01

Basic Information	Project Title: A mixed methods study of the experiences and outcomes of health education delivered to Acute Coronary Syndrome and Type 2 Diabetes Mellitus patients in China		
	Drug/Medical apparatus name: **NA**	CFDA Number: **NA**	
	Registration classification: **NA**	Application Category: **Research-based Clinical Trial**	
	Applicant hospital/CRO: **Tenth People's Hospital of Tongji University**		
	Chair unit: **NA**	Main Researchers: Xian-Liang Liu; Maree Johnson; Jo Wu; Karen Willis; Yan Shi.	
	Major: **Nursing**	Administrator of Major: **Yan Shi**	Principal Investigator: **Xian-liang Liu**
Application Documents	Refer to "The List of Ethics Review Documents for the Human Research Ethics Committee, Tenth People's Hospital of Tongji University"		
Review information	■ Quick Review ☐Meeting Review ☐ Urgent Meeting Review		Chairmen: Xuejin Yu; Lili Gao
	Review date: May 18th 2016 Note: No		
Review Results	Conclusion: ■ Agree ☐Agree after revised ☐Review again after revised ☐ Disagree ☐Suspend/terminate approved trial		
	Does it need ongoing review? ■ Yes ☐ No	Review frequency (from the approved date) ☐ 6 months ■ 12 months	
Comments of Human Research Ethics Committee	Agree. Chair, Human Research Ethics Committee Signature: The Human Research Ethics Committee, Tenth People's Hospital of Tongji University (stamp) Date: June 6th 2016		
Notes	1. In the course of study, any modification of the research design and the materials of the informed consent, please submit the modification application form and required materials, and must get the approval from HERC before the implementation. 2. To suspend or terminate the study, please inform the HERC in a timely manner. 3. Any serious adverse events or unexpected events must be reported to the Human Research Ethics Committee immediately, and the Human Research Ethics Committee will review and make a new decision on registered study. 4. Any violation of ethics must be reported Human Research Ethics Committee immediately. 5. An annual progress report must be submitted to the Human Research Ethics Committee at one month before the due date. 6. The research must be undertaken within one year of the approval date. Otherwise this approval is automatically cancelled. 7. A final report must be submitted to the Human Research Ethics Committee when the project is completed.		

The Human Research Ethics Committee, Tenth People's Hospital of Tongji University; Email: shsyiec@126.com; Contact Phone Number: 021-66301604. The composition and work of the Human Research Ethics Committee is strictly in accordance with China GCP and related regulations.

Appendix C: Participant Information Letter for Healthcare Professionals

C.1 English Version

Project Title: A mixed methods study of the experiences and outcomes of health education delivered to Acute Coronary Syndrome and Type 2 Diabetes Mellitus patients in China

Principal Investigator: Professor Maree Johnson, Doctor Jo Wu, Professor Karen Willis and Professor Yan Shi

Student Researcher: Xian-Liang Liu

Student's Degree: Ph.D. Degree

Dear Participant,
You are invited to participate in the research project described below.

What is the project about?
The research project investigates health education provided to patients with heart and blood sugar problems admitted in a Shanghai hospital, China. This will use a mixed methods approach to explore the topics/information received by patients, the behavioural changes intended or perceived to have happened, and the health outcomes for patients with heart and blood sugar problems.

Who is undertaking the project?
This project is being conducted by Xian-liang Liu and will form the basis for the degree of PhD at Australian Catholic University and Tongji University under the supervision of Professor Maree Johnson, Doctor Jo Wu, Professor Karen Willis and Professor Yan Shi. This study is funded by the ACU Faculty of Health Sciences Tongji University Cotutelle PhD Scholarship.

Are there any risks associated with participating in this project?
As there is no intervention this would be considered a low-risk study. There may be some burden to the participant if they become unwell during the interview and the interview will cease if any distress is identified and appropriate health staff will be contacted within the hospital setting.

What will I be asked to do?
You will then be invited to participate in an interview with the researcher. This will occur at a time and place convenient to you. The interview will involve a number of questions about your experience or perceptions of providing health education and will be audiotaped. You will receive an education content checklist before the interview to consider all possible content and to assist the interviews. This research will be conducted at this major hospital.

How much time will the project take?
The interview will take approximately 30 to 45 minutes. The education content checklist will take approximately 5 to 10 minutes

What are the benefits of the research project?
This research is not proposing any intervention, and that the patients will not directly receive any benefit. However, the knowledge obtained from the research is likely to inform future education programs.

Can I withdraw from the study?

It is not expected that this should cause you any discomfort. If you are uncomfortable during the interview, you can withdraw at any time without any consequences.

Will anyone else know the results of the project?

In this project all data is confidential and anonymous. No names are attached to completed questionnaires and consent forms bearing the signature of participants will be held in a secure facility separate from other documents. Only aggregated data will be published.

Will I be able to find out the results of the project?

The findings of this research project will be published in journals and the researchers of this project will send the papers/summary of the findings to the participants by Email once the research findings are published, therefore the research outcomes are accessible to the participants. Moreover, the patients could contact Xian-liang Liu (Tel: +86 15900705339; Email: liu.xianliang@myacu.edu.au) for the results of the research.

Who do I contact if I have questions about the project?

If you have any questions/concerns, during or after the study, or wish to contact a person to whom any questions may be directed or further information may be sought from, please contact:

Australia: School of Nursing, Midwifery and Paramedicine; Faculty of Health Sciences; Australian Catholic University; 1100 Nudgee Road, Banyo, QLD 4014 Australia; PO Box 456 Virginia, QLD 4014 Australia Telephone: +61 497440830 Email: liu.xianliang@myacu.edu.au	China: Department of Nursing 301, YanChang Road, Shanghai, China Tel: +86 15900705339 Email: 505362738@qq.com

What if I have a complaint or any concerns?

The study has been reviewed by the Human Research Ethics Committee at Australian Catholic University (review number 2016 0000019827). If you have any complaints or concerns about the conduct of the project, you may write to the Manager of the Human Research Ethics Committee care of the Office of the Deputy Vice Chancellor (Research) of ACU and this major hospital.

Manager, Ethics c/o Office of the Deputy Vice Chancellor (Research) Australian Catholic University; North Sydney Campus PO Box 968 NORTH SYDNEY, NSW 2059 Ph.: 02 9739 2519; Fax: 02 9739 2870 Email: resethics.manager@acu.edu.au	Manager, Ethics Office of Human Research Ethics Committee in this major hospital. Ph.: 021 66301604; Email: shsyiec@126.com

I want to participate! How do I sign up?

If you agree to participate please contact Xian-liang Liu (Tel: +86 15900705339; Email: liu.xianliang@myacu.edu.au) to sign a consent form.

Yours sincerely,

Xian-liang Liu

C.1 Chinese Version

研究题目: 混合研究方法研究急性冠脉综合征和 2 型糖尿病患者健康教育的经验和效果

主要调查者：Maree Johnson 教授; Jo Wu 博士; Karen Willis 教授; 施雁教授

研究生： 刘贤亮

学生学位：博士学位

亲爱的参与者，

您被邀请参加的一项研究描述如下：

这是关于什么的一项研究？

这项研究的研究目的是探索在上海一家医院提供给有心脏和血糖问题患者的健康教育。

这项研究是采用混合研究方法挖掘健康工作人员提供给具有心脏和血糖问题的患者健康教育的内容和经验以及效果。

谁做这项研究？

您被邀请参加由刘贤亮进行的一项研究，他是来之澳大利亚天主教大学（ACU）和同级大学的博士生。刘先生正在进行这项研究作为他的博士论文。Maree Johnson 教授; Jo Wu 博士; Karen Willis 教授 和施雁教授是作为他的导师指导个项目。这项研究是由澳大利亚天主教大学健康科学部和同济大学双博士奖学金资助。

参与这项研究有什么相关的风险吗？

这是一项没有任何干预的低风险研究。如果您在调查或访谈的过程中感觉到有负担，一旦确定您有一定压力我们通知相关的医务人员在医院内提供相关服务。

我会被要求做什么？

如果您同意参加这项研究，你将被要求签署的参与者知情同意书。然后，您将被邀请参加与一个研究人员的访谈。访谈时间和地点将依据您最方便的情况安排。您会要求完成一个健康教育内容清单。访谈会涉及一些您的提供健康教育的内容和经验，访谈将会被录音。

我会花多少时间？

参与者不需要花费任何费用。您参与这项研究包括与一个研究人员的访谈。访谈时间也约 30 至 45 分钟。健康教育内容清单将会花费 5-10 分钟。

我能在这项研究中有什么获益？

这项研究对研究的参与者没有直接的获益，但本项研究的结果会给未来提供健康教育项目提供一定的参考。

我能退出这项研究吗？

这项研究的参与者是完全自愿的，您不是必须参加。如果您参加，您也可以在任何时间，没有任何理由的情况下推出。

其他人会知道这些研究的结果吗？

所有的数据资料都是保密和匿名的，完成的问卷和录音资料上不会标记名字，签字的知情同意书会被单独存放在安全的地方。只有集合的数据会被发表。

我可以找到这项研究的结果吗？

这项研究的研究结果会发表在相关的学术杂志上，相关的结果也会通过邮件发给参与者，因此这项研究的结果是可以获得的。

如果我有相关的问题，我能联系谁？

如果您有任何问题/担心，研究过程中或研究后，或希望联系的其他人员，任何可能的问题或寻求进一步的相关信息，请联系：

澳大利亚: 护理，助产和辅助医学学院 健康科学部; 澳大利亚天主教大学 1100 纳吉路，班约，昆士兰 4014 澳大利亚 电话: +61 497440830 邮箱: liu.xianliang@myacu.edu.au	中国：本医院护理部 延长路 301 号，上海 电话: +86 15900705339 邮箱: liu.xianliang@myacu.edu.au

如果我有投诉或担心？

这个研究被澳大利亚天主教大学人类研究伦理委员会审核。如果您对这项研究有任何的投诉或担心，你可以联系 ACU 和本医院人类研究伦理委员会的主任即副校长办公室。

主任，伦理 副校长办公室副校长（研究） 澳大利亚天主教大学;北悉尼校区; 邮政信箱 968, 北悉尼，新南威尔士州 2059 电话：9739 2519 02 传真：9739 2870 02 电子邮件：resethics.manager@acu.edu.au	主任， 本医院人类研究伦理委员会办公室 电话： 021 66301604 电子邮件： shsyiec@126.com

如果我想参与！怎么签字？

如果您愿意参与本研究， 请联系刘贤亮（ 电话: +86 15900705339；邮箱: liu.xianliang@myacu.edu.au ）来签署知情同意书。

谨启！

刘贤亮

Appendix D: Participant Information Letter for Patients

D.1 English Version

Project Title: A mixed methods study of the experiences and outcomes of health education delivered to Acute Coronary Syndrome and Type 2 Diabetes Mellitus patients in China

Principal Investigator: Professor Maree Johnson, Doctor Jo Wu, Professor Karen Willis and Professor Yan Shi

Student Researcher: Xian-Liang Liu

Student's Degree: Ph.D. Degree

Dear Participant,
You are invited to participate in the research project described below.

What is the project about?
The research project investigates health education provided to patients with heart and blood sugar problems admitted in a Shanghai hospital, China. We will explore the topics/information received by patients, the changes in their health behaviours, and the health outcomes.

Who is undertaking the project?
This project is being conducted by Xian-liang Liu and will form the basis for the degree of PhD at Australian Catholic University and Tongji University under the supervision of Professor Maree Johnson, Doctor Jo Wu, Professor Karen Willis and Professor Yan Shi. This study is funded by the ACU Faculty of Health Sciences Tongji University Cotutelle PhD Scholarship.

Are there any risks associated with participating in this project?
As there is no intervention this would be considered a low-risk study and minimal potential burden to participants. If you become unwell during the survey and interview, the survey and interview will cease and appropriate health staff will be contacted within the hospital setting. Your participation in this project is voluntary and whether you participate or not will not affect the care and services you receive from this major hospital in Shanghai.

What will I be asked to do?
Participation in this study involves completing a survey and review your health care records and possibly an interview with the researcher. If you agree to participate in this study, you will be asked to sign the Participant Consent Form. You will then be invited to participate in a survey (your health care records will also be reviewed by the researcher) and an interview with the researcher. The interview is based on semi-structured questions and will be audio recorded. This will occur at a time and place convenient to you at this major hospital. We would also like to phone you in a couple of weeks after you are discharged to ask you a few questions about how you are managing at home.

How much time will the project take?
The survey will take approximately 20 to 30 minutes. The interview will involve a number of questions about your experience or perceptions of education and take approximately 20 to 30 minutes. The telephone follow up will take about 30 mins.

What are the benefits of the research project?

This research is not proposing any intervention, and the patients will not directly receive any benefit. However, the knowledge obtained from the research is likely to inform future education programs.

Can I withdraw from the study?

It is not expected that this should cause you any discomfort. If you are uncomfortable during the survey or interview, you can withdraw at any time without any consequences by contacting the researcher listed below.

Will anyone else know the results of the project?

In this project all data is confidential and anonymous. No names are attached to scales and completed questionnaires and consent forms bearing the signature of participants will be held in a secure facility separate from other documents. Only aggregated data will be published.

Will I be able to find out the results of the project?

The findings of this research project will be published in journals and the project researchers will send the papers to the participants by Email once the research findings are published. Therefore the research outcomes are accessible to the participants.

Who do I contact if I have questions about the project?

If you have any questions/concerns, during or after the study, or wish to contact a person to whom any questions may be directed or further information may be sought from, please contact:

Australia: School of Nursing, Midwifery and Paramedicine; Faculty of Health Sciences; Australian Catholic University; 1100 Nudgee Road, Banyo, QLD 4014 Australia; PO Box 456 Virginia, QLD 4014 Australia Telephone: +61 497440830 Email: liu.xianliang@myacu.edu.au	China: Department of Nursing 301, YanChang Road, Shanghai, China Tel: +86 15900705339 Email: liu.xianliang@myacu.edu.au

What if I have a complaint or any concerns?

The study has been reviewed by the Human Research Ethics Committee at Australian Catholic University (review number 2016 0000019827). If you have any complaints or concerns about the conduct of the project, you may write to the Manager of the Human Research Ethics Committee care of the Office of the Deputy Vice Chancellor (Research) of ACU and this major hospital.

Manager, Ethics c/o Office of the Deputy Vice Chancellor (Research); Australian Catholic University; North Sydney Campus; PO Box 968 NORTH SYDNEY, NSW 2059 Ph.: 02 9739 2519; Fax: 02 9739 2870 Email: resethics.manager@acu.edu.au	Manager, Ethics Office of Human Research Ethics Committee in this major hospital. Ph.: 021 66301604; Email: shsyiec@126.com

I want to participate! How do I sign up?

If you agree to participate please contact Xian-liang Liu (Tel: +86 15900705339; Email:liu.xianliang@myacu.edu.au) to sign a consent form.

Yours sincerely,

Xian-liang Liu

D.2 Chinese Version

研究题目: 混合研究方法研究急性冠脉综合征和 2 型糖尿病患者健康教育的经验和效果

主要调查者：Maree Johnson 教授; Jo Wu 博士; Karen Willis 教授; 施雁教授

研究生： 刘贤亮

学生学位：博士学位

亲爱的参与者，

您被邀请参加的一项研究描述如下：

这是关于什么的一项研究？

这项研究的研究目的是探索在上海一家医院提供给具有心脏和血糖问题患者的健康教育。

这项研究是采用混合研究方法挖掘健康工作人员提供心脏和血糖问题患者健康教育的内容和经验以及效果。

谁做这项研究？

您被邀请参加由刘贤亮进行的一项研究，他是来之澳大利亚天主教大学（ACU）和同济大学的博士生。刘先生正在进行这项研究作为他的博士论文。Maree Johnson 教授; Jo Wu 博士; Karen Willis 教授; 施雁教授作为他的导师指导个项目。

这项研究是由澳大利亚天主教大学健康科学部和同济大学双博士奖学金资助。

参与这项研究有什么相关的风险吗？

这是一项没有任何干预的低风险研究。如果您在调查或访谈的过程中感觉到有负担，一旦确定您有一定压力我们通知相关的医务人员在医院内提供相关服务。您参加这项研究是完全自愿的，且您参与与否不会影响您在第十人民医院接受的治疗和护理。

我会被要求做什么？

如果您同意参加这项研究，你将被要求签署的参与者知情同意书。然后，您将被邀请参加一个调查以及与一个研究人员的访谈。调查和访谈时间和地点将依据您最方便的情况安排。访谈会涉及一些您的提供健康教育的内容和经验，访谈将会被录音。我们也会在接下的几周打电话给您，问您几个关于您在家管理您健康问题的问题。

我会花多少时间？

参与者不需要花费任何费用。您参与这项研究包括参加一个调查以及与一个研究人员的访谈。调查会花费约 20 至 30 分钟，访谈时间也约 20 至 30 分钟。电话随访将会花费您大约 30 分钟。

我能在这项研究中有什么获益？

这项研究对研究的参与者没有直接的获益，但本项研究的结果会给未来提供健康教育项目提供一定的参考。

我能退出这项研究吗？

这项研究的参与者是完全自愿的，您不是必须参加。如果您参加，您也可以在任何时间，没有任何理由的情况下通过联系以下的研究者来退出。

其他人会知道这些研究的结果吗？

所有的数据资料都是保密的，录音资料上不会标记名字，签字的知情同意书会被单独存放。这项研究的数据是不可确认性的，只要集合的数据会被发表。

我可以找到这项研究的结果吗？

这项研究的研究结果会发表在相关的学术杂志上，相关的结果也会通过邮件发给本研究的参与者，因此这项研究的结果是可以获得的。

如果我有相关的问题，我能联系谁？

如果您有任何问题/担心，研究过程中或研究后，或希望联系的其他人员，任何可能的问题或寻求进一步的相关信息，请联系：

澳大利亚: 护理，助产和辅助医学学院 健康科学部; 澳大利亚天主教大学 1100 纳吉路，班约，昆士兰 4014 澳大利亚 电话: +61 497440830 邮箱: liu.xianliang@myacu.edu.au	中国：本医院护理部 延长路 301 号，上海 电话: +86 15900705339 邮箱: liu.xianliang@myacu.edu.au

如果我有投诉或担心？

这个研究被澳大利亚天主教大学人类研究伦理委员会审核。如果您对这项研究有任何的投诉或担心，你可以联系 ACU 和本医院人类研究伦理委员会的主任即副校长办公室。

主任，伦理 副校长办公室副校长（研究） 澳大利亚天主教大学;北悉尼校区; 邮政信箱 968, 北悉尼，新南威尔士州 2059 电话：9739 2519 02 传真：9739 2870 02 电子邮件：resethics.manager@acu.edu.au	主任， 本医院人类研究伦理委员会办公室 电话： 021 66301604 电子邮件： shsyiec@126.com

如果我想参与！怎么签字？

如果您愿意参与本研究， 请联系刘贤亮（ 电话: +86 15900705339；邮箱: liu.xianliang@myacu.edu.au ）来签署知情同意书。

谨启！

刘贤亮

Appendix E: Consent Form (Healthcare professionals)

E.1 English Version

HEALTH PROFESSIONALS CONSENT FORM

Copy for Researcher to Keep

TITLE OF PROJECT: A mixed methods study of the experiences and outcomes of health education delivered to Acute Coronary Syndrome and Type 2 Diabetes Mellitus patients in China

(NAME OF) PRINCIPAL INVESTIGATOR (or SUPERVISOR): Professor Maree Johnson, Doctor Jo Wu, Professor Karen Willis and Professor Yan Shi

(NAME OF) STUDENT RESEARCHER (if applicable): Xian-liang LIU

I ..... (the participant) have read (*or, where appropriate*, have had read to me) and understood the information provided in the Letter to the Participants. Any questions I have asked have been answered to my satisfaction. I agree, nominated below, to participate in this activity (interview, the length of time required, 30 to 45 mins and the interview will be digitally recorded), realising that I can withdraw my consent at any time without adverse consequences. I agree that research data collected for the study may be published or may be provided to other researchers in a form in any way.

NAME OF HEALTH PROFESSIONAL: .....

SIGNATURE ..... DATE: .....

SIGNATURE OF STUDENT RESEARCHER: .....

DATE: .....

SIGNATURE OF WITNESS (if applicable): .....

DATE: ....

Do you need the researcher send the papers from the study to you by Email? ☐ Yes ☐ No

If yes, please provide your Email:_____

E.2 Chinese Version

健康工作人员知情同意书

研究者保留

研究题目: 混合研究方法研究急性冠脉综合征和 2 型糖尿病患者健康教育的经验和效果

主要调查组或研究者姓名 : Maree Johnson 教授; Jo Wu 博士; Karen Willis 教授; 施雁教授
研究者（学生）姓名: 刘贤亮

我.....（参与者）已阅读（或在适当的情况下，已向我阅读），并理解在信中所提供的信息的参与者。我所问的任何问题都得到了满意的回答。我同意，参加本次活动（访谈，所需时间 30 至 45 分钟，访谈将被录音），我意识到可以随时撤回我的同意（无不良后果）。我同意为这项研究收集的研究数据可能会采用任何形式公布或提供给其他研究人员。

参与者姓名:

签名： ..... 日期:.....

研究者（学生）签名: .....

日期:.....

见证者（如适用）签名: .....

日期: .....

您需要研究者把本研究的相关文章通过邮箱发送给您吗? ☐是 ☐不是
如果是的，请您提供邮箱:_____

Appendix F: Consent Form (Patients)

F.1 English Version

PATIENTS CONSENT FORM
Copy for Researcher to Keep

TITLE OF PROJECT: A mixed methods study of the experiences and outcomes of health education delivered to Acute Coronary Syndrome and Type 2 Diabetes Mellitus patients in China

(NAME OF) PRINCIPAL INVESTIGATOR (or SUPERVISOR): Professor Maree Johnson, Doctor Jo Wu, Professor Karen Willis and Professor Yan Shi

(NAME OF) STUDENT RESEARCHER (if applicable): Xian-liang LIU

I ..... (the participant) have read (*or, where appropriate*, have had read to me) and understood the information provided in the Letter to the Participants. Any questions I have asked have been answered to my satisfaction. I agree, nominated below, to participate in this activity (A: survey, the length of time required, 20 to 30 mins and review my health care records and/or B: interview, the length of time required, 20 to 30 mins, the interview will be digitally recorded and we will to do a follow up interview with you about 30 mins), realising that I can withdraw my consent at any time (without adverse consequences). I agree that research data collected for the study may be published or may be provided to other researchers in a form in any way.

NAME OF PATIENT: .....

SIGNATURE ..... DATE: .....

SIGNATURE OF STUDENT RESEARCHER: .....

DATE: .....

SIGNATURE OF WITNESS (if applicable): .....

DATE: ....

Do you need the researcher send the summary findings of the study to you by Email? ☐ Yes ☐ No

If yes, please provide your Email:_____

F.2 Chinese Version

患者知情同意书

研究者保留

研究题目: 混合研究方法研究急性冠脉综合征和 2 型糖尿病患者健康教育的经验和效果

主要调查组或研究者姓名 : Maree Johnson 教授; Jo Wu 博士; Karen Willis 教授; 施雁教授

研究者（学生）姓名: 刘贤亮

我.....（参与者）已阅读（或在适当的情况下，已向我阅读），并理解在信中所提供的信息的参与者。我所问的任何问题都得到了满意的回答。我同意，参加本次活动（A: 调查，所需时间 20 至 30 分钟和/或 B：访谈，所需时间 20 至 30 分钟，访谈将被录音以及一个 30 分钟的电话随访访谈），我意识到可以随时撤回我的同意（无不良后果）。我同意为这项研究收集的研究数据可能会采用任何形式公布或提供给其他研究人员。

参与者姓名:

签名： ..... 日期:.....

研究者（学生）签名: .....

日期:.....

见证者（如适用）签名: .....

日期: .....

您需要研究者把本研究的结果通过邮箱发送给您吗? 是 ☐ 不是 ☐

如果是的，请您提供邮箱:_____

Appendix G: Interview Schedule (Healthcare professionals)

E.1 English Version

Preamble:

Thank you very much for your time today. My name is Liu Xian-Liang and I am completing a PhD *from the Australian Catholic University in Australia and Tongji University here in China. I would like to talk with you about how you deliver health education to patients with Acute Coronary Syndrome (ACS) and Type 2 diabetes mellitus. We are interested in finding out more about who delivers health education when these patients are admitted to hospital, what is delivered to them, and how it is delivered.*

The interview will take about half an hour and if at any point you would like to take a break, just let me know. Everything we talk about today will be anonymous. This means that your interview responses will only be shared with research team members and we will ensure that any information we include in our report is not linked to your name.

Are you willing to participate in this interview? (Reconfirm and Sign consent form)

Although I will take some notes, I would like to record the information so I don't miss anything. Do you give consent for me to record the interview?

I have a brief demographic survey to complete. Can we complete this now? We have a content checklist about health education that we will complete during the interview.

Section 1 – Introduction:

1. Can we start by finding out some information about you?

(a) What position do you hold here at the hospital?

(b) What are your main responsibilities?

Section 2 – Health education

I would now like to find out about the delivery of health education to patients.

2. What does the term health education mean to you?
3. Can you tell me what kind of health information is provided for patients with ACS and T2DM?
   (a) And what do you provide? (prompt: can you give me an example?) What related T2DM？
   (b) Introduce the Content Checklist here, and ask the participant to complete – either talking through with you marking off the content; or they complete.
4. Can you tell me what strategies you use to deliver health education to patients?
   a. What kind of material and which format do you use to provide the material to patients?
5. When and where is health information provided for ACS-T2DM patients?
6. What the perceived impact of the current health education?
7. Can you recall when you last delivered an education session to a patient?
   a. Can you describe the process you used in detail?
8. Do you think that health education is effective and necessary for ACS-T2DM patients?
   a. Can you tell me why you think this is the case?
   b. Are there any specific problems when you give health education for patients with ACS and T2DM?
9. Is there anything else you would like to tell me about delivering health education to ACS-T2DM patients

Thank you very much for your time today.

G.2 Chinese Version

访谈提纲 (健康工作人员)

序言:

非常感谢你今天抽时间参与我们的访谈。我叫刘贤亮，我是澳大利亚天主教大学和同济大学的博士研究生。我想和你谈谈关于你如何对急性冠状动脉综合征（ACS）和 2 型糖尿病（T2DM）患者提供健康教育。我们感兴趣的是，当这些病人被送往医院时，为他们提供健康教育的时候，提供了什么信息给他们，以及如何提供这些健康教育信息。

访谈会花大约半个小时的时间，请让我知道，如果你想休息一下。今天我们谈论的一切内容都将是匿名的。这意味着你的访谈回答将只与研究小组成员分享，我们将确保在我们的报告中包含的任何信息都不与你的名字相关。

你愿意参加这次访谈吗？（签署同意书）

虽然我会做一些笔记，我想记录的相关信息，使得我不错过任何东西。你同意我来记录访谈吗？

我有一个简短的基本信息表需要您完成。我们能完成这个吗？

我们有一个健康教育的内容清单，我们将在访谈过程中完成。

第一部分– 简介

1. 我们能从关于你的一些基本情况开始吗？

（a）您在科室是什么职位? (什么科室)

（b）您的主要职责是什么?

第二部分 – 健康教育:

我现在想了解一下给病人提供健康教育的相关问题。

2. 对您来说，健康教育的意思是什么？

3. 您能告诉我您给急性冠脉综合症和 2 型糖尿病患者提供什么类型的健康信息？

（a）以及您提供了什么信息？（提示：可以给我一个例子吗？）哪些是和 T2DM 相关的？

（b）介绍健康教育内容清单并请参与者完成；可以和参与者介绍相关内容并完成它，也可以参与者自己完成。

4. 您进行健康教育使用什么策略？

（a）您能描述一下提供这些健康信息给急性冠脉综合症和 2 型糖尿病患者的材料以及什么形式？

5. 什么时间和地点向患者提供这些健康信息？

6. 您认为当前的健康教育对 ACS 和 T2DM 患者的影响是什么？

7. 您能回想一下您最近一次提供健康教育是什么时候？

（a）您能描述一下这次健康教育过程的具体情况吗？

8. 您认为健康教育对 ACS 和 T2DM 患者是有效？您认为健康教育对 ACS 和 T2DM 患者是必要的吗？

（a）您能告诉我为什么您认为是这样的？

（b）您对 ACS 和 T2DM 患者进行健康教育时，有没有遇到具体的问题？

9. 您对提供健康教育给 ACS 和 T2DM 患者的相关内容还有什么需要补充的吗？

谢谢您抽空参加今天的访谈！

Appendix H: Cardiac and Diabetes Education Content Checklist

H.1 English Version

Each section of this checklist contains some health education topics relating cardiac and diabetes education. Read each topic and ticking the appropriate box. Your answers and results are completely confidential.

Topic of Education	**I provide this education** (Tick the relevant box)	**Another health professional provides this education** (Tick the relevant box)	**Source of Content**				
			Chinese Society of Cardiology of Chinese Medical Association, 2013	Diabetes Association of Chinese Medical Association, 2014	Queenslan d Health, 2004	Australia Diabetes, 2016	Haas, 2013
Heart disease: how the heart works; atherosclerosis; angina; conduction disorders; Vascular disease; diseases of the heart muscle; heart attack and the healing process;	☐ Yes ☐ No	☐ doctor ☐ nurse ☐ dietitian ☐ others, describe_____	√		√		
Diabetes disease process: knowledge and understanding of diabetes disease process.	☐ Yes ☐ No	☐ doctor ☐ nurse ☐ dietitian ☐ others, describe_____		√		√	√
Risk factors: smoking, psychosocial factors, stress, high BP, high cholesterol, physical inactivity, unhealthy diet, overweight; age; gender; family history and other risk factors.	☐ Yes ☐ No	☐ doctor ☐ nurse ☐ dietitian ☐ others, describe_____	√	√	√	√	√
Symptoms and their management: symptoms management strategies.	☐ Yes ☐ No	☐ doctor ☐ nurse ☐ dietitian ☐ others, describe_____	√	√		√	
Medications: knowledge and understanding of medications; cost; method of administration; strategies for compliance with medications.	☐ Yes ☐ No	☐ doctor ☐ nurse ☐ dietitian ☐ others, describe_____	√	√	√	√	√
Blood pressure: management strategies.	☐ Yes ☐ No	☐ doctor ☐ nurse ☐ dietitian ☐ others, describe_____	√	√	√	√	
Blood sugar monitoring: resources available; management strategies.	☐ Yes ☐ No	☐ doctor ☐ nurse ☐ dietitian ☐ others, describe_____	√	√		√	√

Nutrition: weight management; dietary fats; salt, fibre other nutrients in foods; Cholesterol; food selection/shopping; eating habits/meal patterns; food preparation/cooking; eating out/takeaway; food labelling; recipe modification.	☐ Yes ☐ No	☐ doctor ☐ nurse ☐ dietitian ☐ others, describe_____	√	√	√	√	√
Smoking cessation: benefits of quitting; nicotine dependence; methods of quitting; resources available.	☐ Yes ☐ No	☐ doctor ☐ nurse ☐ dietitian ☐ others, describe_____	√	√	√	√	
Physical activity/exercise: definition of physical activity and exercise; type, duration, frequency, intensity; how to monitor the level of exertion; benefits; how to manage symptoms while doing activity	☐ Yes ☐ No	☐ doctor ☐ nurse ☐ dietitian ☐ others, describe_____	√	√	√	√	√
Return to work: resources available; management strategies.	☐ Yes ☐ No	☐ doctor ☐ nurse ☐ dietitian ☐ others, describe_____		√	√	√	
Psychosocial issues: mood and emotions (anxiety, denial, depression, grief and loss); address areas of concern: job security, Sexual activity; psychosocial risk factors; return to normal activities.	☐ Yes ☐ No	☐ doctor ☐ nurse ☐ dietitian ☐ others, describe_____	√	√	√	√	√
Stress management: resources available; stress management strategies.	☐ Yes ☐ No	☐ doctor ☐ nurse ☐ dietitian ☐ others, describe_____	√	√	√	√	
Acute and chronic complications: definition of acute and chronic complications; types of acute and chronic complications; acute and chronic complications management strategies.	☐ Yes ☐ No	☐ doctor ☐ nurse ☐ dietitian ☐ others, describe_____		√		√	√

Now some questions about you and your experience

Name Abbreviation		Age at last birthday	
Gender (please circle)	1 Male 2 Female		
Classifications of staff (please circle)	1 doctor 2 nurse 3 dietitian 4 others_____		
Department (please circle)	1 Diabetes unit 3 Department of cardiology 5 Rehabilitation department	2 Cardiac surgery department 4 Nutritional department 6 others_____.	

Length of time delivering education to patients with heart disease and/or diabetes patients	

Source: *Chinese Society of Cardiology of Chinese Medical Association. (2013). Chinese experts consensus on cardiac rehabilitation/secondary prevention for coronary artery disease. Zhonghua Xin Xue Guan Bing Za Zhi., 41(4), 267-275.

*Diabetes Association of Chinese Medical Association. Guideline of prevention and treatment for type 2 diabetes in China (2013 edition). Chinese Journal of Diabetes Mellitus., 30(10): 893-942.

Queensland Health. (2004). Best practice guidelines for health professionals: outpatient cardiac rehabilitation (pp. 1-37). Brisbane Queensland Government.

Australia Diabetes. (2016). Best practice guidelines. Retrieved from https://www.diabetesaustralia.com.au/best-practice-guidelines

Haas, L., Maryniuk, M., Beck, J., Cox, C. E., Duker, P., Edwards, L., . . . Force, S. R. T. (2013). National Standards for Diabetes Self-Management Education and Support. Diabetes Care, 36, S100-S108. doi: 10.2337/dc13-S100

H.1 Chinese Version

健康教育内容清单

这个清单是为了协助收集所有提供给急性冠脉综合症和 2 型糖尿病患者的健康教育内容而建立的。本清单的每一个主题都是关于心脏和糖尿病相关的健康教育内容。请阅读相关条目，采用在相应的小框里打勾来回答相应的问题。您所有提供的答案都是完全保密的。

健康教育项目	**我提供了此项健康教育** (在相应的小框里打勾)	**其他工作人员也提供了此项健康教育** (在相应的小框里打勾)	**Source of Content**				
			Chinese Society of Cardiology of Chinese Medical Association, 2013	Diabetes Association of Chinese Medical Association, 2014	Queensland Health, 2004	Australia Diabetes, 2016	Haas, 2013
心脏疾病: 心脏如何工作；动脉粥样硬化；心绞痛；传导障碍；血管疾病；心脏肌肉疾病；心脏病发作和愈合过程.	☐ 是 ☐ 否	☐ 医生 ☐ 护士 ☐ 营养师 ☐ 其他:_____	√		√		
糖尿病疾病过程: 糖尿病病程知识与认识。	☐ 是 ☐ 否	☐ 医生 ☐ 护士 ☐ 营养师 ☐ 其他:_____		√		√	√
危险因素: 吸烟，心理社会因素，压力，高血压，高胆固醇，不运动，不健康饮食，超重；年龄；性别；家庭史及其他危险因素。	☐ 是 ☐ 否	☐ 医生 ☐ 护士 ☐ 营养师 ☐ 其他:_____	√	√	√	√	√
症状及管理： 症状和管理策略。	☐ 是 ☐ 否	☐ 医生 ☐ 护士 ☐ 营养师 ☐ 其他:_____	√	√		√	
药物： 对药品的认识和理解；成本；管理方法；药物治疗依从性的策略。	☐ 是 ☐ 否	☐ 医生 ☐ 护士 ☐ 营养师 ☐ 其他:_____	√	√	√	√	√
血压： 管理策略。	☐ 是 ☐ 否	☐ 医生 ☐ 护士 ☐ 营养师 ☐ 其他:_____	√	√	√	√	

血糖监测： 可利用的资源及管理策略。	☐ 是 ☐ 否	☐ 医生 ☐ 护士 ☐ 营养师 ☐ 其他:_____	√	√		√	√
营养： 重量管理；膳食脂肪；盐；食物中纤维的其它营养；胆固醇；食物选择/购物；饮食习惯/饮食模式；食物准备/烹饪；饮食/外卖；食品标签；处方修饰。	☐ 是 ☐ 否	☐ 医生 ☐ 护士 ☐ 营养师 ☐ 其他:_____	√	√	√	√	√
戒烟： 戒烟的好处；尼古丁依赖；戒烟方法；资源利用。	☐ 是 ☐ 否	☐ 医生 ☐ 护士 ☐ 营养师 ☐ 其他:_____	√	√	√	√	
身体运动/训练： 身体活动和运动的定义，类型，持续时间，频率，强度，如何监测，如何发挥作用；如何管理症状，同时做活动	☐ 是 ☐ 否	☐ 医生 ☐ 护士 ☐ 营养师 ☐ 其他:_____	√	√	√	√	√
回归工作： 可利用的资源及策略。	☐ 是 ☐ 否	☐ 医生 ☐ 护士 ☐ 营养师 ☐ 其他:_____		√	√	√	
心理问题： 情绪和情绪（焦虑、否认、抑郁、悲伤和失落）；关注领域：工作安全性、性活动；心理社会危险因素；回归正常活动。	☐ 是 ☐ 否	☐ 医生 ☐ 护士 ☐ 营养师 ☐ 其他:_____	√	√	√	√	√
压力管理： 可利用的资源及管理策略。	☐ 是 ☐ 否	☐ 医生 ☐ 护士 ☐ 营养师 ☐ 其他:_____	√	√	√	√	
急/慢性并发症： 急性和慢性并发症的定义，急性和慢性并发症的类型，急性和慢性并发症的管理策略。	☐ 是 ☐ 否	☐ 医生 ☐ 护士 ☐ 营养师 ☐ 其他:_____		√		√	√

现在问您一些您个人经历的相关问题

名字缩写		年龄（最近一次过生日的年龄）	
性别（画圈）	1 男	2 女	

职业（画圈）	1 医生　　2 护士　　3 营养师　　4 其他_____;
部门（画圈）	1 糖尿病单元　　2 心脏外科 3 心脏内科　　4 营养科 5 康复科　　6 其他_____.
对急性冠脉综合症和糖尿病患者提供健康教育的时间长度:	

Source: *Chinese Society of Cardiology of Chinese Medical Association. (2013). Chinese experts consensus on cardiac rehabilitation/secondary prevention for coronary artery disease. Zhonghua Xin Xue Guan Bing Za Zhi., 41(4), 267-275.

*Diabetes Association of Chinese Medical Association. Guideline of prevention and treatment for type 2 diabetes in China (2013 edition). Chinese Journal of Diabetes Mellitus., 30(10): 893-942.

Queensland Health. (2004). Best practice guidelines for health professionals: outpatient cardiac rehabilitation (pp. 1-37). Brisbane Queensland Government.

Australia Diabetes. (2016). Best practice guidelines. Retrieved from https://www.diabetesaustralia.com.au/best-practice-guidelines

Haas, L., Maryniuk, M., Beck, J., Cox, C. E., Duker, P., Edwards, L., . . . Force, S. R. T. (2013). National Standards for Diabetes Self-Management Education and Support. Diabetes Care, 36, S100-S108. doi: 10.2337/dc13-S100

Appendix I: Re-calculated the sample size (N=150)

Outcome	Divided group by	N	Mean ± SD	*P* value	Effect Size	α err prob	Power	Tails	Sample size	Add 10% invalid response
C-DKS Total Score	VAS score of Blood Sugar	H: 74 L: 76	H: 6.20 ± 1.21 L: 5.31 ± 1.65	< 0.00	0.62	0.05	0.90	Two	112	***125***
C-DMSES Total Score	VAS score of Blood Sugar	H: 74 L: 74	H: 132.81 ± 27.25 L: 114.80 ± 23.28	< 0.00	0.71	0.01	0.90	Two	122	***135***
C-ACSRI Total Score	VAS score of Heart Disease	H: 47 L: 107	H: 13.89 ± 2.56 L: 11.08 ± 2.34	< 0.00	1.15	0.01	0.95	Two	58	***60***
Duration of Admission	VAS score of Heart Disease	H: 46 L: 104	H: 8.11 ± 5.85 L: 9.03 ± 6.58	0.503	0.15	0.05	0.90	Two	1102	***1200***
BMI	VAS score of Heart Disease	L: 103 H: 41	L: 24.45 ± 3.07 H: 25.45 ± 3.30	0.087	0.31	0.10	0.80	Two	260	***285***
Total Cholesterol	VAS score of Heart Disease	L: 101 H: 44	L: 4.27 ± 1.14 H: 3.68 ± 1.21	0.005	0.76	0.01	0.95	Two	128	***140***
HDL Cholesterol	VAS score of Heart Disease	L: 103 H: 46	L: 1.03 ± 0.31 H: 0.90 ± 0.18	0.005	0.52	0.05	0.85	Two	136	***150***
LDL Cholesterol	VAS score of Heart Disease	L: 99 H: 44	L: 2.50 ± 0.99 H: 2.07 ± 1.04	0.019	0.43	0.10	0.80	Two	136	***150***
SBP (discharged)	VAS score of Blood Sugar	L: 79 H: 71	L: 126.92 ± 20.51 H: 128.01 ± 17.30	0.727	0.06	0.10	0.80	Two	6872	***7500***
DBP (discharged)	VAS score of Blood Sugar	L: 79 H: 71	L: 70.25 ± 11.44 H: 74.85 ± 10.39	0.011	0.42	0.10	0.80	Two	142	***155***
BSL (admission)	VAS score of Blood Sugar	L: 79 H: 70	L: 10.08 ± 4.34 H: 9.30 ± 3.35	0.224	0.20	0.10	0.80	Two	620	***700***
BSL (discharged)	VAS score of Blood Sugar	L: 78 H: 70	L: 8.51 ± 1.99 H: 7.75 ± 1.84	0.016	0.39	0.10	0.80	Two	164	***180***
HbAc1	VAS score of Blood Sugar	L: 75 H: 70	L: 8.32 ± 1.87 H: 7.41 ± 1.45	0.001	0.55	0.05	0.85	Two	122	***135***

Note: C-DKS= Chinese version of Diabetes Knowledge Scale; C-DMSES = Chinese version of Diabetes Management Self efficacy Scale; C-ACSRI = Chinese version of Acute Coronary Syndrome Response Index; SBP= Systolic Blood Pressure; DBP= Diastolic Blood Pressure; BSL= Blood sugar level; H=VAS score > 50% group; L= VAS score ≤ 50% group; N= Number of Patients.

Appendix J: Invitation to Participate in Medical Research Project (Patients)

J.1 English Version

Dear,

We are pleased to inform you about a new study in the School of Nursing, Midwifery and Paramedicine at School of Nursing, Midwifery and Paramedicine, Australian Catholic University (ACU) and this major hospital. We are currently looking for patients with heart and blood sugar problems to take part in a study. The Project Title is: A mixed methods study of the experiences and outcomes of health education delivered to patients with heart and blood sugar problems in China.

This is a research study conducted by Xian-liang Liu, who is a doctoral student from the School of Nursing, Midwifery and Paramedicine at Australian Catholic University (ACU) and Tongji University. Mr. Liu is conducting this study for his doctoral dissertation. Prof. Maree Johnson, Dr. Jo Wu, Prof. Karen Willis and Prof. Yan Shi are his faculty sponsors for this project. This study is funded by the ACU Faculty of Health Sciences Tongji University Cotutelle PhD Scholarship.

We are interesting in finding out how health education is delivered and received by patients with both heart and problems with their blood sugar. You will be invited to participate in a survey or an interview with the researcher. This will occur at a time and place convenient to you. The survey will take approximately 20 to 30 minutes.

If you completed the survey and are willing attend an interview talking about your experiences or perceptions of health education, you will be invite to take part in an interview. The interview will involve a number of questions about your experience or perceptions of education and take approximately 20 to 30 minutes and will be audiotaped. We would also like to phone you in a couple of weeks to ask you a few questions about how you are managing at home.

If you would like to participate, and require any further information about the study, please call

China: Department of Nursing,

301, YanChang Road, Shanghai, China

Tel: +86 15900705339

Email: liu.xianliang@myacu.edu.au

J.2 Chinese Version

参与者邀请信 (患者)

亲爱的：

我们很高兴地告知您关于澳大利亚天主教大学（ACU）护理，助产和辅助医学学院和本医院的一项新的研究。我们正在寻找具有心脏和血糖问题的患者参加本项研究。

您被邀请参加由刘贤亮进行的一项研究，他是来之澳大利亚天主教大学（ACU）和同济大学的一个博士生。刘先生正在进行这项研究作为他的博士论文。Maree Johnson 教授; Jo Wu 博士; Karen Willis 教授; 施雁教授作为他的导师指导个项目。这项研究是由澳大利亚天主教大学健康科学部和同济大学双博士奖学金资助。研究题目: 混合方法研究急性冠脉综合征和 2 型糖尿病患者健康教育的经验和效果。

这篇论文的研究目的是挖掘在中国提供给心脏和血糖问题患者的健康教育。

这项研究是采用混合研究方法 (质性和量性相结合)挖掘提供急性冠脉综合症和 2 型糖尿病患者健康教育的内容，经验以及它的效果。

您将会被邀请完成一项调查或一个访谈。这项内容将会安排在您最方便的时间和地点。

调查将会花费 20-30 分钟。

如果您完成了调查又愿意参与我们的关于健康教育经验和理解的访谈的话 ，您将被邀请参加一次访谈。访谈将会问及关于您对接受健康教育经验和理解的问题，并将花费 20-30 分钟，以及会被录音。我们也会在接下的几周打电话给您，问您几个关于您在家管理您健康问题的问题。

如果您想参加，并要求有关该研究的进一步信息，请联系：

中国：本医院护理部

延长路 301 号，上海

电话: +86 15900705339

邮箱: liu.xianliang@myacu.edu.au

我们期待您的参与。

Appendix K: Acute Coronary Syndrome Response Index (ACSRI) - Attitudes Subscale.

The C-ACSRI Attitudes Subscale is some questions about some statements of attitude. Please circle "1" for not at all, "2" for a little sure, "3" for pretty sure, and "4" for very sure.

C-ACSRI 态度亚量表包含了一些关于态度的问题。"1"表示完全不肯定；"2"表示几乎不肯定； "3"表示相对肯定； "4"表示非常肯定。

Items 条目	**Responses 回答**			
1.你对在别人身上能辨认出心脏病发作的症状有多少把握？	1.完全不肯定	2.几乎不肯定	3.相对肯定	4.非常肯定
1. How sure are you that you could recognize the signs and symptoms of a heart attack in someone else?	1.Not at all	2. Little sure	3.Pretty sure	4. Very sure
2. 你对在自己身上能辨认出心脏病发作的症状有多少把握？	1.完全不肯定	2.几乎不肯定	3.相对肯定	4.非常肯定
2. How sure are you that you could recognize the signs and symptoms of a heart attack in yourself?	1.Not at all	2. Little sure	3.Pretty sure	4. Very sure
3.你对能区别出心脏病急性发作和其他健康问题之间的不同有多少把握？	1.完全不肯定	2.几乎不肯定	3.相对肯定	4.非常肯定
3. How sure are you that you could tell the difference between the signs or symptoms of a heart attack and other medical problems?	1.Not at all	2. Little sure	3.Pretty sure	4. Very sure
4.如果你认为有人有心脏病发作病症，你有多大把握使那人得到帮助？	1.完全不肯定	2.几乎不肯定	3.相对肯定	4.非常肯定
4. How sure are you that you could get help for someone if you thought they were having a heart attack?	1.Not at all	2. Little sure	3.Pretty sure	4. Very sure
5. 如果你认为你自己心脏病发作了，你有多大把握得到帮助？	1.完全不肯定	2.几乎不肯定	3.相对肯定	4.非常肯定
5. How sure are you that you could get help for yourself if you thought you were having a heart attack?	1.Not at all	2. Little sure	3.Pretty sure	4. Very sure

Source: Cao, X., Cao, Y., Salamonson, Y., DiGiacomo, M., Chen, Y., Chang, S., ... & Davidson, P. M. (2012). Translation and validation of the Chinese version of the Acute Coronary Syndrome Response Index (C-ACSRI). International Journal of Nursing Studies, 49(10), 1277-1290.

Riegel, B., McKinley, S., Moser, D. K., Meischke, H., Doering, L., & Dracup, K. (2007). Psychometric evaluation of the acute coronary syndrome (ACS) response index. Research in Nursing & Health, 30(6), 584-594.

Appendix L: Diabetes Management Self-efficacy Scale (DMSES)

	完全无法做到					也许可以也许不可以				完全可以做到
	Cannot do at all									Certainly can do
	0	1	2	3	4	5	6	7	8	9	10
1. 当有需要时，我有能力自行检测血糖 I am able to check my blood sugar if necessary	0	1	2	3	4	5	6	7	8	9	10
2. 当我的血糖太高时，我有能力调整我的血糖值（例如：食用不同种类的食物） I am able to correct my blood sugar when the sugar level is too high (e.g. eat different foods)	0	1	2	3	4	5	6	7	8	9	10
3. 当我的血糖太低时，我有能力调整我的血糖（例如：食用不同种类的食物） I am able to correct my blood sugar when the sugar level is too low (e.g. eat different foods)	0	1	2	3	4	5	6	7	8	9	10
4. 我有能力选择最有利于我健康的食物 I am able to choose the foods that are best for my health	0	1	2	3	4	5	6	7	8	9	10
5. 我有能力选择不同种类的食物来维持健康的饮食计划 I am able to choose different foods and maintain a healthy eating plan	0	1	2	3	4	5	6	7	8	9	10
6. 我有能力将我的体重控制在理想范围内 I am able to control my body weight and maintain it within the ideal weight range	0	1	2	3	4	5	6	7	8	9	10
7. 我有能力自行检查我的脚(例如：伤口或起水泡） I am able to examine both of my feet (e.g. for cuts or blisters)	0	1	2	3	4	5	6	7	8	9	10
8. 我有能力做足够的身体活动（例如：溜狗、瑜珈、园艺、或伸展运动等） I am able to do enough physical activity (e.g. walking the dog, yoga, gardening, stretching exercises)	0	1	2	3	4	5	6	7	8	9	10
9. 当我生病时，我仍然能维持我的饮食计划 I am able to maintain my eating plan when I am ill	0	1	2	3	4	5	6	7	8	9	10
10. 大部份的时间内，我都能确实遵守我的健康饮食计划 I am able to follow a healthy eating plan most of the time	0	1	2	3	4	5	6	7	8	9	10
11. 当医师建议我多做一些身体活动，我有能力确实做到 I am able to do more physical activity if the doctor advises me to do	0	1	2	3	4	5	6	7	8	9	10
12. 当我身体活动量增加时，我有能力自行调整我的饮食计划	0	1	2	3	4	5	6	7	8	9	10

When doing more physical activity, I am able to adjust my eating plan											
13. 当我外出时，我仍然能遵行健康的饮食计划 I am able to follow a healthy eating plan when I am away from home	0	1	2	3	4	5	6	7	8	9	10
14. 当我外出时，我有能力选择不同的食物种类，来维持我的饮食计划 I am able to choose different foods and maintain my eating plan when I am away from home	0	1	2	3	4	5	6	7	8	9	10
15. 在特殊节日时，我仍然能遵守健康饮食计划 I am able to follow a healthy eating plan during festive periods	0	1	2	3	4	5	6	7	8	9	10
16. 当我在外用餐或参加聚会时，我有能力选择不同种类的食物来维持我的健康饮食计划 I am able to choose different foods and maintain a healthy eating plan when I am eating out or at a party	0	1	2	3	4	5	6	7	8	9	10
17. 当我面对压力或焦虑时，我仍然能维持我的饮食计划 I am able to maintain my eating plan when I am feeling stressed or anxious	0	1	2	3	4	5	6	7	8	9	10
18. 我能每年至少去看医生四次，以监测我的糖尿病状况 I am able to visit my doctor four times a year to monitor my diabetes	0	1	2	3	4	5	6	7	8	9	10
19. 我能够依医师处方按时服药 I am able to take my medication as prescribed	0	1	2	3	4	5	6	7	8	9	10
20. 当我生病时，我仍然能维持我的糖尿病药物治疗 I am able to maintain my medication when I am ill	0	1	2	3	4	5	6	7	8	9	10

Source: Wu, S. F., Courtney, M., Edwards, H., McDowell, J., Shortridge-Baggett, L. M., & Chang, P.-J. (2008). Development and validation of the Chinese version of the Diabetes Management Self-efficacy Scale. International Journal of Nursing Studies, 45(4), 534-542.

McDowell, J., Courtney, M., Edwards, H., & Shortridge-Baggett, L. (2005). Validation of the Australian/English version of the Diabetes Management Self-Efficacy Scale. International Journal of Nursing Practice, 11(4), 177-184.

Appendix M: Diabetes Knowledge Scale (DKS)

Items 条目	**Responses 回答**	
1. 正常的血糖值是多少? What is a normal blood sugar?	(A)70-126 毫克/分升(3.9-7 毫摩尔/升) (B) 126-200 毫克/分升(7-11 毫摩尔/升) (C)大於 200 毫克/分升(11 毫摩尔/升) (D)不知道	(A)70-126 mg/dl (3.9-7 mmol/l) (B) 126-200 mg/dl (7-11 mmol/l) (C) Greater Than 200 mg/dl (11 mmol/l) (D) Don't know
2.血糖可以血液或尿液來检测，这两者的比较： Blood sugar can be checked with a blood sample or a urine sample. How do these two tests compare:	(A)血液检查较好 (B)尿液检查较好 (C)两者相同 (D)不知道	(A) Blood test is better (B) Urine test is better, (C) They are about the same, (D) Don't know
3.如果糖尿病患者感到口渴、疲累且虛弱，通常是指他的血糖 If someone with diabetes feels thirsty, tired, and weak, it usually means their blood sugar is:	(A)高 (B)低 (C)不知道	(A) High (B) Low (C) Don't know
4. 当糖尿病患者运动时，血糖会 When someone with diabetes exercises, their blood sugar:	(A)上升 (B)下降 (C)维持不变 (D)不知道	(A) Goes up (B) Goes down (C) Stays the same (D) Don't know
5. 糖尿病是否会造成心脏病发作? Can diabetes cause heart attacks?	(A)会 (B)不会 (C)不知道	(A) Yes (B) No (C) Don't know
6. 糖尿病是否会造成癌症? Can diabetes cause cancer?	(A) 会 (B)不会 (C)不知道	(A) Yes (B) No (C) Don't know
7. 糖尿病是否会造成瞎眼? Can diabetes cause blindness?	(A) 会 (B)不会 (C)不知道	(A) Yes (B) No (C) Don't know
8. 糖尿病是否会造成肾脏衰竭? Can diabetes cause kidney failure?	(A) 会 (B)不会 (C)不知道	(A) Yes (B) No (C) Don't know

Source: Wu C-J Jo, Sung H-C, Chang AM, Atherton J, Kostner K, Courtney M, McPhail SM. (2013). Protocol for a randomised blocked design study using telephone and text-messaging to support cardiac patients with diabetes: A cross cultural international collaborative project, BMC Health Services Research, 13, 204,doi:10.1186/1472-6963-13-402

Persell, S. D., Keating, N. L., Landrum, M. B., Landon, B. E., Ayanian, J. Z., Borbas, C., & Guadagnoli, E. (2004). Relationship of diabetes-specific knowledge to self-management activities, ambulatory preventive care, and metabolic outcomes. Preventive Medicine, 39(4), 746-752.

Appendix N: Patient Health Care Record Review Tool

N.1 English Version

A MIXED METHODS STUDY OF THE EXPERIENCES AND OUTCOMES OF HEALTH EDUCATION DELIVERED TO ACUTE CORONARY SYNDROME AND TYPE 2 DIABETES MELLITUS PATIENTS IN CHINA

1	Reviewers name				
2	Date	____ /____ /_____			
3	Study ID Number				
4	Name Abbreviation for interview				
5	Gender	1. Male		2. Female	
6	Marital Status	1. Single (Single, widow, divorce, separated)		2. Coupled (married, de facto)	
7	Date of birth	____ /____ /_____			
8	Age at last birthday	_____ years			
9	Date of admission	____ /____ /_____		Date of Discharge ____ /____ /_____	
10	Principal diagnosis at admission	1.STEMI	2.Non-STEMI	3.Unstable angina	4.Unspecified ACS
		5. CCF	6.Arrhythmia	7.Cancer	Other:_____
11	Secondary diagnoses (list up to three)	_____; _____; _____.			
12	Duration of diagnosis of Type 2 Diabetes Mellitus (Time since first diagnosed with T2DM)	_____ (weeks, months, or years)			
13	Cardiac related admission	1.ACS	2. Arrhythmia	3. Shortness of breathing	
14	Height (last recorded entry)	Cm			
15	Weight	Kg			
16	BMI				
17	Blood pressures: (last blood pressure < 140/90 mmHG	_____/_____mmHg (Admission)		_____/_____ mmHg (Discharge)	
18	Lipid levels (when at admission and discharge):, level and date of recording	Total cholesterol :_____; _____		HDL cholesterol:_____;_____;	
		LDL cholesterol:_____; _____;		(<130mg/dL (3.36 mmol/L)	
19	Blood glucose levels	_____ (Admission)		_____ (Discharge)	

20	HbA1C (<= 9.5%)	_____ (Admission)		_____ (Discharge	
21	Smoking status	1. Never	2. Current	3. Former	4.Unknown
22	Education	*(Provide exact text of any education noted in the medical record. This could include information related to diagnosis, treatment options, or other issues). Note the health professional who has signed the entry (Doctor, nurse, diabetes educator, dietitican etc).*			
23	Checks for complications conducted during this admission	Urine microalbumin	Retinal exam	Foot exam	
24	Where is the patient discharged to	1. Home	2. Ward/unit	3. Other hospital	
		4. Death	5. Nursing home	6. Other	
25	Treatment Plan on Discharge	ACS: Diet	ACS: Medication (type and name)		
		ACS: Referrals list	ACS: Other _____		
26	T2DM	Diet			
		Exercise			
		Medication(hypoglycaemic agents, insulin)			
		Self-management of blood glucose monitoring			
		Referrals to other services (list them)			
27	Clinical outcomes from 0 to discharge date for this admission	Death			
		Non-fatal MI			
		Non-fatal stroke			
		Revascularization			
		Other			
28	Principal and secondary diagnoses on discharge List				

Source:

National Prescribing Service. (2012). DMACS (discharge management of acute coronary syndromes) e-DUE (drug use evaluation) audit tools. Retrieved from http://www.nps.org.au/health-professionals/cpd/activities/due-for-hospitals/discharge-management-of-acute-coronary-syndromes/dmacs-due/dmacs-e-due-audit-tool

Australia Diabetes. (2009). National Evidence Based Guideline for Patient Education in Type 2 Diabetes. Sydney: Diabetes Australia Guideline Development Consortium (DAGD).

Queensland Health. (2004). Best practice guidelines for health professionals: outpatient cardiac rehabilitation (pp. 1-37). Brisbane Queensland Government.

Montalescot, G., Sechtem, U., Achenbach, S., Andreotti, F., Arden, C., Budaj, A., . . . Di Mario, C. (2013). 2013 ESC guidelines on the management of stable coronary artery disease. European Heart Journal, 34(38), 2949-3003.

Roffi, M., Patrono, C., Collet, J. P., Mueller, C., Valgimigli, M., Andreotti, F., ... & Gencer, B. (2015). 2015 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation. European Heart Journal, ehv320.

Wu, C-J & Chang, A.M. (2008). Audit of patients with type 2 diabetes following a critical cardiac event, International Nursing Review, 55, 327-332.

Fanaroff, A. C., Rymer, J. A., Goldstein, S. A., Simel, D. L., & Newby, L. K. (2015). Does This Patient With Chest Pain Have Acute Coronary Syndrome?: The Rational Clinical Examination Systematic Review. JAMA, 314(18), 1955-1965.

Woodruffe, S., Neubeck, L., Clark, R. A., Gray, K., Ferry, C., Finan, J., ... & Briffa, T. G. (2015). Australian Cardiovascular Health and Rehabilitation Association (ACRA) core components of cardiovascular disease secondary prevention and cardiac rehabilitation 2014. Heart, Lung and Circulation, 24(5), 430-441.

Ho, P. M., Lambert-Kerzner, A., Carey, E. P., Fahdi, I. E., Bryson, C. L., Melnyk, S. D., ... & Weaver, J. (2014). Multifaceted intervention to improve medication adherence and secondary prevention measures after acute coronary syndrome hospital discharge: a randomized clinical trial. JAMA Internal Medicine, 174(2), 186-193.

Kuhl, J., Jörneskog, G., Wemminger, M., Bengtsson, M., Lundman, P., & Kalani, M. (2015). Long-term clinical outcome in patients with acute coronary syndrome and dysglycaemia. Cardiovascular Diabetology, 14(1), 120.

N.2 Chinese Version

混合研究方法研究急性冠脉综合征和2型糖尿病患者健康教育的经验和效果
病例资料收集表

1	收集者名字				
2	时间	____/____/_____			
3	研究编号				
4	患者名字缩写				
5	性别	1. 男		2.女	
6	婚姻情况	1. 单身(单身, 寡妇, 离婚, 分居)		2. 已婚(结婚, 事实上婚姻关系)	
7	出生日期	____/____/_____			
8	年龄	_____年			
9	入院日期	____/____/_____		出院日期 ____/____/_____	
10	入院时的主要诊断	1. ST 段抬高急性心肌梗死	2.非 ST 段抬高急性心肌梗死	3.非稳定型心绞痛	4.非特异性 ACS
		5. 充血性心力衰竭	6. 心律失常	7.癌症	其他:_____
11	次要诊断(最多列三个)	_____; _____; _____。			
12	诊断为 2 型糖尿病的时间 (从第一次诊断为 2 型糖尿病算起)	_____ (周, 月, 或者年)			
13	心血管相关的诊断	1.急性冠脉综合症	2. 心律失常	3. 呼吸短促	
14	身高	Cm			
15	体重	Kg			
16	BMI				
17	血压: (last blood pressure < 140/90 mmHG	_____/_____mmHg (入院)		_____/_____ mmHg (出院)	
18	血脂水平 (入院和出院)	总胆固醇:_____; _____		高密度脂蛋白胆固醇：_____;_____;	
		低密度脂蛋白胆固醇：_____; _____;		(<130mg/dL (3.36 mmol/L)	
19	血糖水平	_____ (入院)		_____ (出院)	
20	HbA1C (<= 9.5%)	_____ (入院)		_____ (出院)	
21	吸烟状态	1. 从未吸烟	2.现有吸烟	3. 之前有吸烟	4.不知道

22	健康教育	*(记录病例中所有关于健康教育的内容. 可以是关于诊断，治疗和其他问题相关的健康教育).*		
23	此次住院检查了的并发症	尿微量蛋白检查	视网膜检查	足部检查
24	患者出院后去了哪里	1. 家	2. 病房/病区	3. 其他医院
		4. 死亡	5. 护理家园	6. 其他
25	ACS 出院后的治疗计划	ACS: 饮食	ACS: 药物(类型和时间)	
		ACS: 推荐名单	ACS: 其他 _____	
26	T2DM 出院后的治疗计划	饮食		
		训练		
		药物 (降糖药和胰岛素)		
		血糖自我管理监测		
		推荐的其他医疗服务 (列出)		
27	本次入院后的临床结果（从 0 开始）	全因死亡		
		非致命的心肌梗死		
		非致命的卒中		
		血运重建		
		其他		
28	出院时的主要和次要诊断			

Source: National Prescribing Service. (2012). DMACS (discharge management of acute coronary syndromes) e-DUE (drug use evaluation) audit tools. Retrieved from http://www.nps.org.au/health-professionals/cpd/activities/due-for-hospitals/discharge-management-of-acute-coronary-syndromes/dmacs-due/dmacs-e-due-audit-tool

Australia Diabetes. (2009). National Evidence Based Guideline for Patient Education in Type 2 Diabetes. Sydney: Diabetes Australia Guideline Development Consortium (DAGD).

Queensland Health. (2004). Best practice guidelines for health professionals: outpatient cardiac rehabilitation (pp. 1-37). Brisbane Queensland Government.

Montalescot, G., Sechtem, U., Achenbach, S., Andreotti, F., Arden, C., Budaj, A., . . . Di Mario, C. (2013). 2013 ESC guidelines on the management of stable coronary artery disease. European Heart Journal, 34(38), 2949-3003.

Roffi, M., Patrono, C., Collet, J. P., Mueller, C., Valgimigli, M., Andreotti, F., ... & Gencer, B. (2015). 2015 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation. European Heart Journal, ehv320.

Wu, C-J & Chang, A.M. (2008). Audit of patients with type 2 diabetes following a critical cardiac event, International Nursing Review, 55, 327-332.

Fanaroff, A. C., Rymer, J. A., Goldstein, S. A., Simel, D. L., & Newby, L. K. (2015). Does This Patient With Chest Pain Have Acute Coronary Syndrome?: The Rational Clinical Examination Systematic Review. JAMA, 314(18), 1955-1965.

Woodruffe, S., Neubeck, L., Clark, R. A., Gray, K., Ferry, C., Finan, J., ... & Briffa, T. G. (2015). Australian Cardiovascular Health and Rehabilitation Association (ACRA) core components of cardiovascular disease secondary prevention and cardiac rehabilitation 2014. Heart, Lung and Circulation, 24(5), 430-441.

Ho, P. M., Lambert-Kerzner, A., Carey, E. P., Fahdi, I. E., Bryson, C. L., Melnyk, S. D., ... & Weaver, J. (2014). Multifaceted intervention to improve medication adherence and secondary prevention measures after acute coronary syndrome hospital discharge: a randomized clinical trial. JAMA Internal Medicine, 174(2), 186-193.

Kuhl, J., Jörneskog, G., Wemminger, M., Bengtsson, M., Lundman, P., & Kalani, M. (2015). Long-term clinical outcome in patients with acute coronary syndrome and dysglycaemia. Cardiovascular Diabetology, 14(1), 120.

Appendix O: Visual Analogue Scale (VAS)

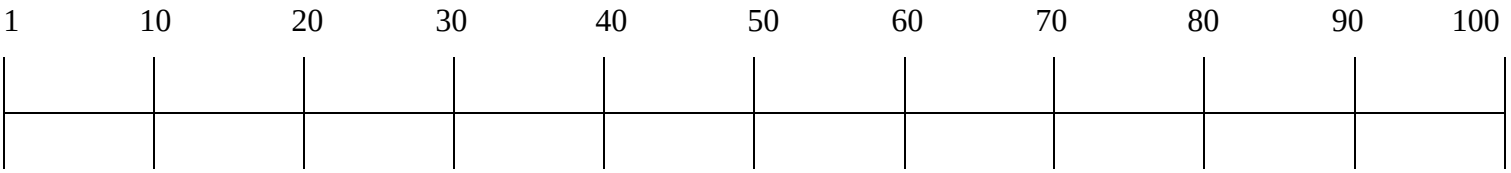
The VAS for education consists of a 100mm line with two end-points representing ‘little or no education’ and ‘comprehensive information’. Patients with ACS and T2DM are asked to rate their health education by placing a mark on the line corresponding to their current level of education.

1 = I have received little or no education relating to blood sugar problems (我只接受的很少或没有接受关于血糖的健康教育).

100 = I have received comprehensive information of how to manage my blood sugar problems (我接受了全面、综合的关于血糖的健康教育).

我只接受的很少或没有
接受关于血糖的健康教育

我接受了全面、综合的
关于血糖的健康教育

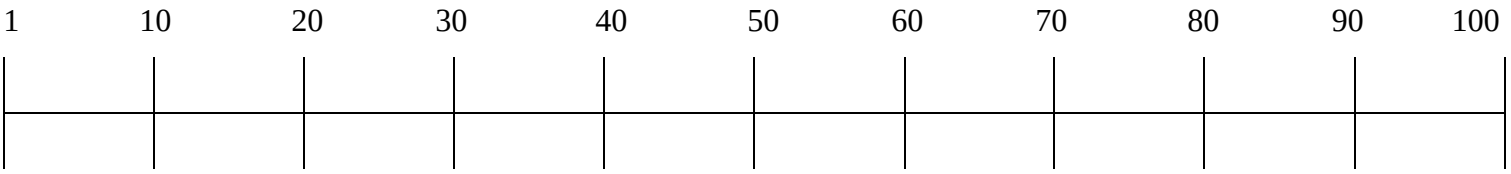


1 = I have received little or no education relating to my heart problems (我只接受的很少或没有接受关于心脏问题的健康教育).

100 = I have received comprehensive information on how to manage my heart problems (我接受了全面、综合的关于心脏问题的健康教育).

我只接受的很少或没有
接受关于心脏问题的健康教育

我接受了全面、综合的
关于心脏问题的健康教育



Source: Visual Analogue Scale - Physiopedia, universal access to physiotherapy knowledge. (2016). Retrieved from http://www.physio-pedia.com/Visual_Analogue_Scale

Appendix P: Interview Schedule (Patients)

P.1 English Version

Preamble:

Thank you for consenting to participant in this research. My name is Liu Xian-Liang and I am completing a PhD *from the Australian Catholic University in Australia and Tongji University here in China. I would like to talk with you about the health education you have received since you have been admitted to hospital. We are interested in finding out about who delivers health education to you, what is provided, and whether you feel confident about taking care of yourself when you leave the hospital.*

The interview will take about half an hour and if at any point you would like to take a break, just let me know. Everything we talk about today will be anonymous. This means that your interview responses will only be shared with research team members and we will ensure that any information we include in our report is not linked to your name.

Are you willing to participate in this interview? (Reconfirm and Sign consent form)

Although I will take some notes, I would like to record the information so I don't miss anything. Do you give consent for me to record the interview?

Section 1 – Introduction:

1. Can you tell me a bit about your main health problems?
2. How long have you been diagnosed with your primary disease?
3. What prompted you to seek help at the hospital on this occasion?
4. How much do you feel you already know about taking good care of yourself when you return home?

Section 2 – Current education for patients:

5. Have you received any health education about your condition since you came to hospital?
    a. Who provided it to you?
    b. What did they teach you about?
6. Have you received health information or health education about your condition before coming to hospital?
    a. Can you tell me about when you received this information, who provided it, and where was it provided?
7. What material and in which format, is health related material provided to you?
    a. Prompts: paper forms, brochures or pamphlets, telephone, email, other
8. Do you think that the health education you have received will help you to take good care of yourself when you are at home?
    a. Did you already have this information?
    b. Has the education you received here been helpful to you?

Section 3 – Experiences about health education

9. What are the reasons that you want to receive health information?
10. Are you satisfied with the health information from this hospital? (Prompts: Why or why not?)
11. Do you think it is necessary for all patients to receive healthcare information? (Prompts: Why or why not?)
12. What do you intend to change after receiving health education while here in hospital?
    a. What problems do you think you will face when you change your behaviour?
    b. What do you think will make it easier to change your behaviours?

Finally, is there anything else you would like to tell me about your experiences of receiving health education to help you manage your condition?

Thank you very much for your time. I would also like to phone you in a couple of weeks to ask you a few questions about how you are managing at home. Are you happy for me to call you?

(Make arrangements for day and time to call).

P.2 Chinese Version

访谈提纲 (患者)

序言:

非常感谢你同意参与这项研究。我叫刘贤亮，我是澳大利亚天主教大学和同济大学的博士研究生。我想和你谈谈您在入院以来已经接受的来之医院的健康教育。我们感兴趣的是谁提供的健康教育，提供了什么健康教育，以及当您离开医院的时候是否您有信心照顾自己。

访谈会花大约半个小时的时间，请让我知道，如果你想休息一下。今天我们谈论的一切内容都将是匿名的。这意味着你的面试回应将只与研究小组成员分享，我们将确保在我们的报告中包含的任何信息都不与你的名字相关。

你愿意参加这次面试吗？（签署同意书）

虽然我会做一些笔记，我想记录的相关信息，使得我不错过任何东西。你同意我来记录访谈吗？

我有一个简短的基本信息表需要您完成。我们能完成这个吗？

第一部分 – 介绍:

1. 您能稍微告诉我您最主要的健康问题是什么?
2. 您得主要疾病多久了?
3. 是什么促使你这一次在医院寻求帮助？
4. 当你回家的时候，您感觉您知道多少关于照顾好自己的相关信息？

第二部分 – 健康教育现状:

5. 您能告诉我，自从您入院以来获得的健康信息有哪些？

（a）谁提供它给您的？

（b）他们教了您什么？

6.您在入院前有接受关于您健康问题相关的健康教育或健康信息吗？

（a）您能告诉我当您接受这些信息的时候，是谁提供的以及在哪里提供给您的？

7. 医院提供什么健康信息材料以及以什么形式给您的？

提示：比如纸质形式，小册子，小书，电话，邮件或其他？

8. 您觉得健康信息对您在家里照顾好自己有用吗？

（a）您以及掌握了这些信息吗？

（b）您接受的这些教育对您有帮助吗？

Section 3 – **接受健康教育的经验：**

9.您接受健康教育的原因是什么？

10.您对第十人民医院提供的健康信息满意吗？（提示：为什么？为什么不？）

11. 您觉得所有患者接受健康教育是必要的吗？（提示：为什么必要或为什么不必要？）

12. 您在医院这里接受健康教育之后，什么行为习惯是您想改变的？

（a）您认为您改变相关习惯的时候会越到什么问题？

（b）您对改变您的行为习惯变的更容易是怎么想的？

最后，您还有什么关于您接受的关于帮助您管理您疾病的健康教育的经验想告诉我的吗？

非常感谢您抽空参加今天的访谈。我还想在几周内给您打电话问您关于如何在家里管理您健康问题的几个问题。您介意我打电话给你吗？

（安排打电话的日期和时间）。

Appendix Q: Follow up Interview Schedule (Patients)

Q.1 English Version

Preamble

Hello, it is Liu Xian-Liang here. We spoke at the Hospital on (insert date), and you agreed to participate in a follow up interview. Is this a convenient time for us to talk?

(If no – can we reschedule. Please let me know when it would be convenient for me to call you back.)

(If yes – thank you. I want to ask you about your progress since you left hospital

The interview will take about half an hour and if at any point you would like to take a break, just let me know. If you feel unwell and unable to finish the interview, also let me know.

Are you willing to participate in this interview?

Questions

(This is a general guide only – specific questions will depend on the responses at the first interview).

Question 1: How have you been since you were discharged from hospital?

Question 2: What advice from the hospital have you been following? Prompts: Avoiding risk factors like smoking, high blood pressure, stress?)

Making lifestyle changes like increasing exercise

Changing diet

Monitoring symptoms

Managing your stress levels

Taking medication as prescribed

Question 3: Which actions have been easy for you to take on?

Prompts: Can you tell me why this is the case?

Question 4: What are the health actions you have not been able to implement?

Prompts: Can you tell me why this is the case?

Question 5: Do you feel confident that you can improve your health being better informed about your condition?

Question 6: Do you feel confident you can improve your health by taking the actions that were recommended for you while you were in hospital?

Question 7: Is there anything else you would like to tell me about how you are managing your condition since you got home from hospital?

Thank you very much for your time today. The information that you have provided will help us to deliver good quality health education for people with conditions like yours.

Q.2 Chinese Version

电话随访提纲 **(**患者**)**

<u>序言</u>:

您好，这里是刘贤亮。我们在医院（<u>插入日期</u>），您同意参加一个后续的访谈。请问您现在方便吗？

（如果不方便---我们可以重新安排。请让我知道什么时候方便我打电话给您。）

（如果方便的话---谢谢。我想问你，自从你离开医院以后您的进展）

面试会花大约半个小时，请让我知道，如果你想休息一下。 如果您在访谈中感觉不是很好以及无法完成访谈，请特让我知道。

您愿意参加这次随访吗？

问题

（这是一个一般的指南，具体的问题将取决于第一次访谈时的回答）。

问题 1： 自从您出院后，您感觉怎么样？

问题 2：您遵从了哪些来之医院里的建议？

提示：避免危险因素，如吸烟，高血压，压力？

使生活方式改变，如增加锻炼

改变饮食习惯

症状监测

管理您的压力水平

按医嘱服药

问题 3：哪些行动是您很容易采取的？

提示：您能告诉我为什么这样的情况吗？

问题 4：什么是您无法实施的健康行为？

提示：您能告诉我为什么这样的情况吗？

问题 5：您是否觉得有信心您可以在更了解您健康问题的情况下提高您的健康状况？

问题 6：您是否觉得有信心您可以提高你的健康状况采取医院推荐您的相关措施？

问题 7：还有什么您想告诉我关于您自从从医院回家后是如何管理您的健康情况？

非常感谢您今天抽空接受我的随访。您所提供的信息将有助于我们为您以及和您有相似健康问题的人提供优质的健康教育。

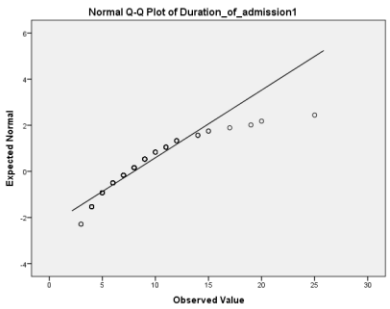
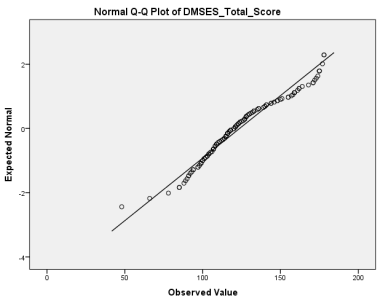
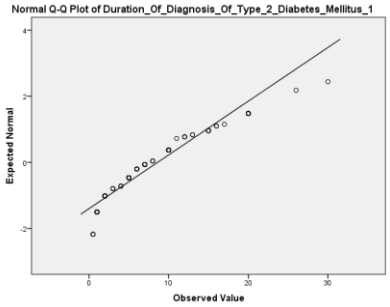
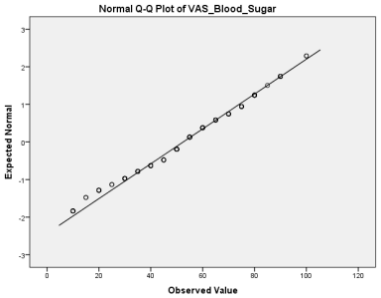
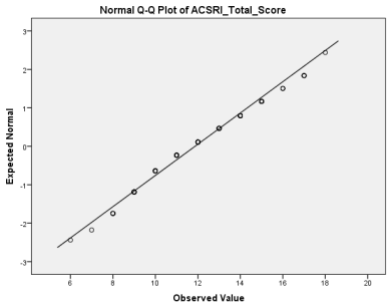
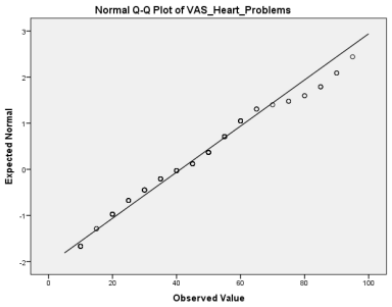
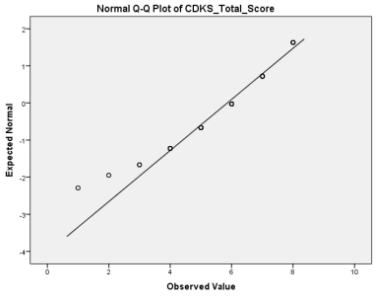
Appendix R: Normality Test for Main Valuables

R1 Skewness and kurtosis values

Variables	Skewness		Kurtosis	
	Statistic	Standard Error	Statistic	Standard Error
Gender	-0.817	0.192	-1.350	0.381
Age	0.028	0.192	-0.511	0.391
BMI	0.551	0.195	1.694	0.389
DA	1.695	0.192	5.099	0.381
DD	0.828	0.192	0.293	0.381
FBS_A	2.157	0.192	7.674	0.383
FBS_D	1.268	0.913	2.639	0.384
HbA1C_A	1.138	0.195	1.316	0.387
C-ACSRI	0.410	0.192	-0.118	0.381
C-DKS	-0.782	0.192	0.502	0.386
C-DMSES	0.150	0.195	-0.157	0.389
DE	-0.037	0.192	-0.529	0.381
HE	0.374	0.192	-0.310	0.381
DBP_A	-0.129	0.192	0.134	0.381
DBP_D	-0.028	0.192	0.323	0.381
SBP_A	0.457	0.192	0.629	0.381
SBP_ D	-0.053	0.192	-0.020	0.381
Total cholesterol	0.766	0.195	0.291	0.387
Triglycerides	1.494	0.195	2.292	0.387
HDL cholesterol	1.423	0.192	2.370	0.383
LDL cholesterol	0.786	0.196	0.609	0.390

Note: DA= Duration of admission; DD = Duration of Diagnosis of Type 2 Diabetes Mellitus; BMI=Body Mass Index; FBS_A= Fasting Blood Sugar (Admission); FBS_D= Fasting Blood Sugar (Discharge); HbA1C_A: Glycosylated Haemoglobin (Admission); C-ACSRI = Chinese version of Acute Coronary Syndrome Response Index total score; C-DKS= Chinese version of Diabetes Knowledge Scale total score; DMSES = Chinese version of C-Diabetes Management Self efficacy Scale total score; DE= Diabetes education; HE= Heart education; SBP_A=Systolic Blood Pressure (Admission); DBP_A=Diastolic Blood Pressure (Admission); SBP_D=Systolic Blood Pressure (Discharge); DBP_D=Diastolic Blood Pressure (Discharge).

R2 Normality plots

Variables	Normality Plots	Variables	Normality Plots
DA		C-DMSES	
DD		DE	
C-ACSRI		HE	
C-DKS			

Note: DA= Duration of admission; DD = Duration of Diagnosis of Type 2 Diabetes Mellitus; C-ACSRI = Chinese version of Acute Coronary Syndrome Response Index total score; C-DKS= Chinese version of Diabetes Knowledge Scale total score; C-DMSES = Chinese version of C-Diabetes Management Self efficacy Scale total score; DE= Diabetes education; HE= Heart education.

Appendix S: Correlation Matrix for Perceived Education and Main Valuables

	Gender	Age	DA	DD	FBS1	C-ACSRI	C-DKS	C-DMSES	DE	HE
Gender	1.00									
Age	-.308**	1.00								
DA	-.132	.266**	1.00							
DD	-.297**	.391**	.161*	1.00						
FBS_D	-.091	-.048	.132	-.025	1.00					
C-ACSRI	.219**	-.191*	-.066	-.035	.060	1.00				
C-DKS	.024	-.207**	-.039	.130	-.068	.437**	1.00			
C-DMSES	.171*	-.017	-.008	.040	-.153	.501**	.440**	1.00		
DE	.056	-.024	-.010	.184*	-.178*	.316**	.335**	.387**	1.00	
HE	.141	-.109	.004	-.001	.018	.575**	.287**	.415**	.534**	1.00

Note: DA= Duration of admission; DD = Duration of Diagnosis of Type 2 Diabetes Mellitus; FBS_D= Fasting Blood Sugar (Discharge); C-ACSRI = Chinese version of Acute Coronary Syndrome Response Index total score; C-DKS= Chinese version of Diabetes Knowledge Scale total score; C-DMSES = Chinese version of C-Diabetes Management Self efficacy Scale total score; DE= Diabetes education; HE= Heart education;

**: Correlation is significant at the 0.01 level (2-tailed);

*: Correlation is significant at the 0.05 level (2-tailed).

Appendix T: Internal Consistency of Instruments

T1 Characteristics of Items in Acute Coronary Syndrome Response Index (ACSRI) - Attitudes Subscale (n=160)

Items	Mean	SD	ICT
1. How sure are you that you could recognize the signs and symptoms of a heart attack in someone else?	2.11	0.74	0.69
2. How sure are you that you could recognize the signs and symptoms of a heart attack in yourself?	2.79	0.67	0.62
3. How sure are you that you could tell the difference between the signs or symptoms of a heart attack and other medical problems?	2.51	0.64	0.62
4. How sure are you that you could get help for someone if you thought they were having a heart attack?	1.87	0.81	0.65
5. How sure are you that you could get help for yourself if you thought you were having a heart attack?	2.66	0.58	0.55

Note: ICT = Item-total correction; C-ACSRI has an overall cumulative variance contribution rate of 59.31% with a Cronbach's alpha of 0.826.

T2 Characteristics of Items in Diabetes Management Self-efficacy Scale (DMSES) (n=154)

Items	Mean	SD	ICT
1. I am able to check my blood sugar if necessary	6.55	2.37	0.53
2. I am able to correct my blood sugar when the sugar level is too high (e.g. eat different foods)	5.90	2.13	0.56
3. I am able to correct my blood sugar when the sugar level is too low (e.g. eat different foods)	6.87	1.96	0.60
4. I am able to choose the foods that are best for my health	5.94	2.15	0.73
5. I am able to choose different foods and maintain a healthy eating plan	5.77	2.03	0.69
6. I am able to control my body weight and maintain it within the ideal weight range	5.88	2.16	0.48
7. I am able to examine both of my feet (e.g. for cuts or blisters)	6.94	2.02	0.64
8. I am able to do enough physical activity (e.g. walking the dog, yoga, gardening, stretching exercises)	5.87	2.61	0.61
9. I am able to maintain my eating plan when I am ill	5.63	1.81	0.77
10. I am able to follow a healthy eating plan most of the time	5.51	1.63	0.78
11. I am able to do more physical activity if the doctor advises me to do	6.25	2.10	0.62
12. When doing more physical activity, I am able to adjust my eating plan	6.03	1.68	0.80
13. I am able to follow a healthy eating plan when I am away from home	5.49	1.51	0.68
14. I am able to choose different foods and maintain my eating plan when I am away from home	5.45	1.62	0.71
15. I am able to follow a healthy eating plan during festive periods	5.60	2.06	0.60
16. I am able to choose different foods and maintain a healthy eating plan when I am eating out or at a party	5.54	1.86	0.61
17. I am able to maintain my eating plan when I am feeling stressed or anxious	5.90	1.71	0.71
18. I am able to visit my doctor four times a year to monitor my diabetes	7.17	2.25	0.45
19. I am able to take my medication as prescribed	8.03	1.81	0.52
20. I am able to maintain my medication when I am ill	7.84	1.86	0.52

Note: ICT = Item-total correction; C-DMSES has an overall cumulative variance contribution rate of 60.11% with a Cronbach's alpha of 0.932.

T3 Characteristics of Items Diabetes Knowledge Scale (DKS) (n=156)

Items	Correct proportion	ICT
1. What is a normal blood sugar?	137/156	0.18
2. Blood sugar can be checked with a blood sample or a urine sample. How do these two tests compare:	117/156	0.22
3. If someone with diabetes feels thirsty, tired, and weak, it usually means their blood sugar is:	102/156	0.20
4. When someone with diabetes exercises, their blood sugar:	111/156	0.15
5. Can diabetes cause heart attacks?	114/156	0.16
6. Can diabetes cause cancer?	107/156	0.03
7. Can diabetes cause blindness?	149/156	0.26
8. Can diabetes cause kidney failure?	120/156	0.36

Note: ICT = Item-total correction; C-DKS has an overall cumulative variance contribution rate of 50.29% with a Kuder-Richardson 20 (KR20) coefficient of 0.422 (using the Kuder Richardson Reliability Analysis).

Appendix U: Proposed Health Education for Patients Experiencing ACS and T2DM

U1 Components of the educational intervention as aligned with SCT, HBM and Eastern philosophies

Conceptual Framework	Concepts	Study Variables	Educational Components
SCT	Personal factors	Disease characteristics and learning needs	Comprehensive learning needs assessment
	Efficacy expectations	Self-efficacy	(1) Mastery experiences by reinforce techniques: such as self-monitoring of blood glucose levels, and skills related to exercise and diet regulation (2) Social modeling by watching the success or failure of other people performing a task. Such as share successful experiences of other patients managing their conditions at home; (3) Social persuasion by providing reasons for self- monitoring activities, such as encouragement to exercise, diet regulation and take medications, as well as answer patients' questions. (4) Physical and emotional states by help patients develops a positive emotional state, such as emotional support.
	Outcome expectations	Physical, social and self-evaluative nature	Positive outcome expectations related physical, social and self-evaluative nature: such as providing knowledge about healthy eating, physical activity, and their benefits; telephone-based contact reinforce outcome expectations
	Behaviour	Support behavioural factors	(1) Behavioural skills: Self-monitoring, goal setting, feedback about the quality of performance and how to improve; self-reward and self-instruction. (2) Intention: helping patients develop a good readiness to perform healthy behaviours; (3) Reinforcement and punishment: Giving reword for perform self-management activities or sustain health behaviours.
	Environment	Physical and social environment	(1) Observational learning, such as observing a positive reinforcement for exercise and eating healthy food; (2) Normative beliefs: such as correct the overestimation of smoking norms and to express social disapproval of smoking; (3) Social support: such as expressing positive affect, validating beliefs and actions; providing advice and information; and providing educational materials; let family involve educational process; (4) Barriers and opportunities: help patients find the opportunities to engage in health behaviours.

HBM	Perceived severity	Physical consequences and social consequences	Specify consequences of risks and conditions: Perceived severity of ACS (acute life-threatening nature of ACS) should have been understood when the individual was first diagnosed with T2DM and provide a realistic experience of having an ACS event to improve their control of risk factors associated with both ACS and diabetes.
	Perceived threat	Likelihood of getting a condition	(1) Define individuals at risk: unmask the real threat to health of diabetes and related poor lifestyle factors, such as provide key aspects of threat of diabetes and smoking: no symptoms experienced until the damaged has occurred. (2) Personalize risk based on person's individual characteristics or behaviours. (3) Make an individual's perceptions more consistent with his or her actual risk.
Eastern philosophies	Balance or harmony	Maintaining harmony in the body and mind, as well as a holistic view	The TCM understanding of balance and harmony focuses on holism and this could be used for health education for patients with ACS and T2DM, such as maintain blood glucose balance by combination exercise, diet and medications in balance

Note: SCT=Social Cognitive Theory; HBM =Health Belief Model; TCM = Traditional Chinese Medicine.

U2 Proposed health education program for patients experiencing ACS and T2DM in China

		Recommendations
Theoretical approach		HBM; SCT and Eastern philosophies, such as balance or harmony, see Appendix U1 (Liu et al., 2017).
Behavioural strategies		Goal setting (Liu et al., 2017).
Comprehensive learning needs assessment		Using Cardiac Patients Leaning Needs Inventory (CPLNI) (Galdeano et al., 2014) and information needs in diabetes (IND) questionnaire (Chernyak et al., 2016) once patients were stabilised and able to communicate.
Key Educational content		Specific clinical factors for ACS and T2DM (blood pressure, glycemic level, and medication), modifiable risk factors (unhealthy diet, inactivity, and smoking), and other psychological factors (anxiety and depression) (Fu et al., 2003; Liu et al., 2017).
		Timing: Initial 1 to 2 days of admission: pre and post-operative care and anticoagulant therapy only; Day 3 post-procedure: could being with education that increases exercise and introducing issues of medications, diet, blood glucose monitoring and other topics based on patients' learning needs; After day 3: the long term care and more comprehensive management (including ACS, T2DM and hypertension).
Healthcare professionals to deliver		Nurse or multidisciplinary team (Liu et al., 2017).
		Health education training programs: (1) Individual level: Certified Health Education Specialist (CHES),and Certified in Public Health (CPH) (Allegrante et al., 2012; Cottrell et al., 2009); (2) Institutional level: National Task Forces on Accreditation in Health Education.
Teaching approaches	Strategies	Face-to-face, phone or WeChat contact, online or web-based, written materials or video (Liu et al., 2017).
	Format	Individual (One by one) (Fan & Sidani, 2009; Liu et al., 2017).
Delivery		10 hours or 10 contact sessions (Liu et al., 2017): at least 1.5 hours

timing	Contact hours	with 3 face-to-face educational sessions during the inpatient duration (or develop new clinics within the acute hospital sector) (Tanash et al., 2017; Wu, Chang, Courtney, & Ramis, 2012) and 8.5 hours from outpatient education services (such as health educational platform or WeChat) (Fu et al., 2003).
	Duration	At least 6 months (Liu et al., 2017).
Duration of follow up		At least 12 months (Liu et al., 2017).
Settings		Inpatient and post-discharge settings, such as outpatient department or community (Liu et al., 2017).
Built-in quality assurance and regular audit of outcomes		National quality assurance tool.

Note: ACS = acute coronary syndrome; T2DM = type 2 diabetes mellitus; SCT=Social Cognitive Theory; HBM =Health Belief Model; TCM = Traditional Chinese Medicine.