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SELF-MANAGEMENT BEHAVIOURS, DEPRESSION, AND ANXIETY IN HEART

FAILURE: A SYSTEMATIC REVIEW

Jennifer Leung

BScN, Lakehead University, Canada, 2007

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Abstract

Among individuals with heart failure (HF), concurrent depression and anxiety may impact the performance of self-management. Little is known about this relationship. The aim of this systematic review of the literature was to describe self-management, depression and anxiety in individuals with HF, and to explore the relationship among these variables. Studies included in the review were written in English, and measured HF self-management, and either or both depression and anxiety. Fourteen studies were included in the review. Overall, the findings on self-management performance were mixed. The levels of depression among individuals with HF were low overall, which was unexpected for this population, whereas findings on the levels of anxiety were mixed, with some authors reporting high levels of anxiety and some reporting low levels. Mixed findings were also noted in terms of the relationship between self-management, and both depression and anxiety.

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CHAPTER 1

Introduction and Background

Heart failure (HF) is a chronic condition involving a poorly functioning heart resulting from diseases and trauma related to the heart (Alsafwah et al., 2007). HF is often associated with a reduced quality of life, frequent readmissions to hospital, and poor prognosis (Hobbs, 2009; Mejhert et al., 2004). Internationally, it is a significant health problem affecting approximately 23 million individuals (McMurray et al., 1998). In Canada, an estimated 500,000 people are living with HF and 50,000 new diagnoses are made each year (Heart and Stroke Foundation, 2010). Among those aged 65 years or older, the prevalence of HF is one out of every 10 individuals (Lane, Chong & Lip, 2009). This rate continues to rise and can be attributed to an aging population. In addition, improved diagnostic and treatment options for cardiovascular diseases are allowing people to live longer despite having poorly functioning hearts (Annema et al., 2009; Grady et al., 2000; MacMahon & Lip, 2002; Pelle et al., 2008).

Heart failure is among the most costly chronic medical conditions, which can be attributed to increased hospital readmissions and length of stay (Grady et al., 2000; Hobbs, 2009). Internationally, 60% to 70% of the total expenditure for HF is spent on hospitalizations (Annema et al., 2009; Lee et al., 2004). In addition, research has demonstrated that readmission to hospital is associated with decreased survival, increased mortality and worsening quality of life (Annema et al., 2009). Literature has also reported the rate of readmission for HF to be 25% to 50% within six months after the first hospitalization, and nearly half these admissions are preventable (Hoyt & Bowling, 2001; Shearer et al., 2007). These financial and personal costs to the healthcare system and to the individuals living with HF may be preventable by understanding and addressing the challenges that hinder an individual's ability to manage their illness.

Overview of Heart Failure

Heart failure occurs as a consequence of heart diseases (Lane et al., 2009) and is itself a progressive disease (Mann & Bristow, 2005). It arises when the heart experiences trauma, which may involve an acute event, such as a myocardial infarction, gradual trauma, or a hereditary cause, as with genetic abnormalities (Mann & Bristow, 2005). This trauma results in damage to the cardiac muscle cells affecting the heart's ability to pump blood throughout the body either immediately or over time (Case et al., 2010; Schweitzer et al., 2007). The heart's decreased ability to pump blood forward diminishes perfusion to all organs, and causes both fluid backup in the lungs and the peripheral system (Case et al., 2010; Grady et al., 2000). As a result, HF is manifested by weight gain, peripheral edema, shortness of breath and fatigue (Carlson, Riegel & Moser, 2001). While shortness of breath and fatigue are the most commonly reported symptoms, there have been as many as 23 reported symptoms of HF (Soo, Burney, & Basten, 2009).

Heart failure occurs on a continuum and is viewed as a progressive illness, with symptoms worsening with time as compensatory mechanisms begin to fail and secondary damage from these compensatory mechanisms occurs (Mann & Bristow, 2005). One commonly used method for describing HF involves a classification system based on the individual's experience of symptoms. Individuals who present with the signs and symptoms of HF are often diagnosed according to the New York Heart Association (NYHA) classification system for HF, ranging from classes I to IV (Arnold et al., 2006). The four classes of HF describe functional status and presence of symptoms, ranging from no limitation of activity as well as no symptoms (class I) to severe limitation of activity and presence of symptoms at rest (class IV) (Hoyt & Bowling, 2001)

Heart Failure Self-Management

Beyond the physiological and symptom related descriptions of HF, this illness is a burden and challenging life experience for the individual. Living with HF impacts all aspects of an individual's life, from their financial status, to their social life, to their ability to function day to day (Jeon et al., 2010). There is no cure for HF, and one year mortality can be as high as 50% (Jeon et al., 2010). As the severity of HF progresses, symptoms of shortness of breath, fatigue, fluid retention, edema, dizziness, and acute exacerbations requiring admission to hospital worsen (Jeon et al., 2010). While HF has been traditionally managed with pharmaceuticals and with physicians primarily directing care, the high rate of readmission among individuals with HF has identified a need to make changes in the management of HF (Butler & Kalogeropoulos, 2008), with individuals taking more responsibility for their illness and its management.

Individuals living with HF are required to engage in constant decision-making and performance of behaviours that are needed to maintain their physiological well-being, and to appropriately respond to symptoms (Riegel et al., 2009). Throughout this thesis, the term self-management will describe the participation of an individual with HF in the performance of health promoting and health protecting behaviours related to the management of their illness (Jones et al., 2011; Richard & Shea, 2011). Specifically, the behaviours, or tasks required of individuals with HF include taking medications, monitoring symptoms, following dietary guidelines, daily weighing and fluid intake monitoring, exercising, alcohol cessation, smoking cessation, as well as preventive behaviours such as receiving annual influenza vaccinations (Riegel et al., 2009) and seeking out medical assistance when illness-related problems arise, known as consulting behaviour (Jaarsma, Stromberg, Martensson, & Dracup, 2003). These behaviours require active participation by the individual, are health protecting and health promoting, occur long-term, and

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are specific to their illness. These nine behaviours will define self-management throughout this thesis. Other terms such as self-care, self-care management, self-care maintenance, self-regulation, or self-monitoring (Curtin & Mapes, 2001; Dunbar, Jacobson, & Deaton, 1998; Jones et al., 2011; Lainscak et al., 2011; Lorig & Holman, 2003) have been used in the HF literature to describe the performance of behaviours related to managing one's illness as well. While these terms share some similarities, they are conceptually distinct (Jones et al., 2011; Richard & Shea, 2011). Only recently have researchers begun to recognize a need to differentiate these terms (Jones et al., 2011; Richard & Shea, 2011). Self-management will be used in this thesis as it is the term that most comprehensively conceptualizes the performance of these illness-related behaviours. A more detailed description of the development of these terms follows in the next chapter.

The positive outcomes associated with HF self-management may include: improved decision-making and feelings of control over one's HF, a decrease in the negative physical and psychological impacts of HF, and prevention or minimization of complications from HF (Jones et al., 2011). These outcomes are more likely to be attained when individuals with HF have engaged in self-management, meaning they have performed some or all of the behaviours of HF self-management. How well an individual is living with their HF can be a result of how they are self-managing. However, there are many barriers that exist to make it difficult for an individual to self-manage, that is, perform the necessary actions to care for their illness.

Self-Management, and Depression and Anxiety

Successfully self-managing becomes difficult when living with a chronic illness such as HF. In the presence of shortness of breath, fatigue, pain, and edema the seemingly simple behaviours of HF self-management may be overwhelming and seem impossible. Furthermore, HF

profoundly impacts an individual's quality of life by limiting social interactions and activities of daily living (McMurray & Stewart, 2002). The diminished quality of life, as well as facing a poor prognosis may leave individuals feeling both depressed and anxious (Cully et al., 2009; Sykes & Simpson, 2011). This has been increasingly described in the literature, with elevated rates of depression and anxiety reported among individuals living with HF (Riegel et al., 2009).

Within the elevated prevalence rates of depression and anxiety among individuals living with HF reported in the literature, there remains much variation. Several factors may contribute to this variation. Firstly, symptoms of depression closely mimic those of HF, such as fatigue and pain, which make it difficult for health care providers to detect depression and anxiety (Lea, 2009). As a result, depression and anxiety may be under-diagnosed in this population. Secondly, there is currently no standardized way to assess depression and anxiety in individuals living with HF, and when assessments are made, they are performed inconsistently, assessed with a large variety of diagnostic tools, and often by health professionals inadequately informed on depression and anxiety in the HF population (Cully et al., 2009). Together, these factors contribute to the wide variation of reported rates within the literature.

Depression and anxiety occur along a continuum of severity from depressive and anxious symptomatology to more severe depression and anxiety disorders (Pelle et al., 2008). Lane, Chong, and Lip (2009) found that the prevalence of depressive symptomatology in the HF population ranged from 24% to 85%, while the prevalence of major depression ranged from 14% to 26% (Lane, Chong, & Lip, 2009). In another study, depressive symptoms were reported in 51% to 69% of individuals with HF, whereas more severe depressive disorders were reported in up to 11% of individuals with HF (Pelle et al., 2008). Another study reported prevalence rates non-specific to type of depression, ranging from 15% to 77.5% (Jurgens et al., 2007). Thus, the

prevalence of depression among individuals living with HF has been reported in recent studies and covers a wide range of prevalence rates. This may be explained by several reasons including the use of different tools to measure depression, or the inclusion of study participants with varied characteristics impacting depression (Lea, 2009). This wide variation has made it difficult to gain an overall sense of the levels and prevalence of depression in this population.

Although anxiety has been reported to occur frequently with depression, little is known about its role in HF (MacMahon & Lip, 2002) and much less literature exists reporting on anxiety in HF (Konstam et al., 2005) than depression. The prevalence of anxiety within the HF population has been broadly estimated to occur in 9% to 63% of individuals with HF (Evangelista et al., 2009). Compared to their healthy counterparts, individuals with HF have 60% higher levels of anxiety, and 40% of individuals with HF may have major anxiety (Konstam et al., 2005). Overall, the rates of depression and anxiety have been inconsistently reported in this population yet there is reason to suggest they may impact individuals living with HF because of the impact of these negative emotions on the individuals' abilities to cope with the symptoms of HF, and to perform the required behaviours to manage their illness (Cully et al., 2009).

The cause of elevated rates of depression and anxiety among the HF population is unclear. Living with a poor prognosis and the daily challenges of HF may be possible contributing factors to the elevated rates of depression and anxiety (Sykes & Simpson, 2011). In addition to the negative outlook of living with a chronic illness, individuals with HF tend to live alone, abuse alcohol, experience financial trouble, and have worse baseline health as compared with their healthy counterparts, which may contribute to increased depression and/or anxiety (Lea, 2009). This is problematic as depression and anxiety are associated with poor outcomes for individuals living with HF including worsened prognosis, poor quality of life, decreased physical

functioning, and an increased mortality rate (Corvera-Tindel et al., 2009; Friedmann et al., 2006; Junger et al., 2005; MacMahon & Lip, 2002; Smith, 2010).

There are varied findings within the HF literature to explain the relationship between depression, anxiety and self-management. Physiologically, depression and anxiety increase the stress response, heart rate, and myocardial oxygen demand (Jurgens et al., 2007; MacMahon & Lip, 2002), which further weakens the heart. Beyond the physiological effects, depression and anxiety can influence an individual's daily life and have an impact on how they think, feel and behave (MacMahon & Lip, 2002), including their "memory, energy…and interpersonal interactions" (Katon & Ciechanowski, 2002, p. 861). For instance, depression results in "insomnia, low energy, feeling of worthlessness, diminished concentration, indecisiveness, nervousness" (Jurgens et al., 2007, p.171), which may negatively impact one's ability to self-manage since the behaviours of HF self-management require sufficient energy to follow exercise regimens, or concentration and decisiveness to learn and make decisions about medication based on one's symptoms.

Other literature has also presented findings suggesting that depression and anxiety impact the physical and psychological resources required to perform self-management (Dowson, Kuijer, & Mulder, 2004; Falk, Patel, Swedberg, & Ekman, 2009). Despite this preliminary evidence, the role of depression and anxiety on self-management, particularly on the behaviours of self-management, remains unclear. For instance, it is not known which self-management behaviours are most adversely affected by depression or anxiety, or how the severity of depression and anxiety impact specific self-management behaviours. Preliminary research suggests that depression and anxiety have an overall negative impact on HF self-management. However, more

information is needed to guide the creation of interventions or institute practice changes related to assisting individuals living with HF to self-manage (Lane et al., 2009).

Self-management, and Depression and Anxiety in Other Chronic Illnesses

The similarities between HF and other chronic illnesses suggest it may be helpful to briefly explore the findings from other illnesses regarding depression, anxiety and self-management. Depression and anxiety exist at elevated rates compared to the general population in individuals with other chronic illnesses as well. In coronary artery disease (CAD), individuals are three times more likely to develop depression (Lichtman et al., 2008), and in diabetes, depression and anxiety occur at double the rate of the general population (Collins, Corcoran, & Perry, 2009; Lin et al., 2004). Similarly, elevated rates of depression and anxiety have been found in the chronic obstructive pulmonary disease (COPD) population (Maurer et al., 2008).

As in HF, individuals living with CAD, diabetes or COPD are required to perform behaviours of self-management as an important component of the management of their illness (Byrne, Walsh, & Murphy, 2005; Dowson et al., 2004; Gonzales et al., 2008). In these and other chronic conditions, similar to HF, it is difficult for individuals to perform self-management. Bayliss, Ellis, & Steiner (2007) recognized that identifying barriers is the first step to improving self-management among individuals with multiple chronic conditions. These barriers identified by Bayliss and colleagues (2007) included a troubled emotional state, such as feeling anxious or depressed.

Evidence from the COPD population suggests that feeling anxious about one's illness and a desire to avoid readmission to hospital may act as motivational factors to enhance learning self-management knowledge and performing required behaviours (Dowson et al., 2004). However it is not known at what point anxiety becomes a hindrance to learning and behaviour performance.

Findings from research in other chronic illnesses raise a similar question as in HF regarding the relationship between depression and anxiety, and the performance of self-management behaviours.

In other chronic illnesses, the presence of depression and anxiety negatively influences an individual's engagement in self-management behaviours. In diabetes, depression is linked with an increase of complications, such as hyperglycemia (Anderson et al., 2001) and a decrease in following recommendations regarding physical activity, diet, and medications (Collins, Corcoran, & Perry, 2009). Similarly in COPD, Dowson and colleagues (2004) examined the relationship between depression and anxiety and self-management, and found that depressed and anxious individuals had more difficulty learning and applying self-management knowledge. Thus, the presence of co-morbid depression and anxiety in other chronic illnesses appears to have a negative impact on the performance of self-management behaviours.

A meta-analysis conducted by Gonzalez and colleagues (2008) examined the relationships between depression and various diabetes self-management behaviours. A significant relationship was found between depression and overall poor performance of self-management behaviours (Gonzalez et al., 2008). Another study explored the relationship further and found that among the diabetic population, the performance of particular self-management behaviours, specifically patient initiated behaviours such as exercise, taking medications and monitoring blood sugars worsened in the presence of co-morbid depression. However, the aspects of self-management such as following up with physician ordered tests, did not worsen (Lin et al., 2004), suggesting the impact of depression and anxiety may vary depending on the behaviour.

Similar research has been performed in the HF population, however the findings have not been summarized in detail. For instance, one study found the rates of depression to be the highest

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among individuals who performed self-management poorly, however the results do not indicate which behaviours individuals performed poorly (Riegel et al., 2007). As such, the details of how anxiety and depression negatively impact self-management remain fairly unclear at this time. Knowledge on this topic in the HF population has not been extensive thus far (DiMatteo, Lepper, & Croghan, 2000). Therefore, performing a systematic review of the literature in HF in this area may enhance the understanding of which behaviours of HF self-management are most impacted by depression and anxiety, or how the severity of depression and anxiety impact HF self-management and its behaviours.

Problem Statement

As a result of increased survival following acute cardiac events, as well as improvements in the medical and surgical management of heart disease, more individuals are developing HF and living longer with this progressive condition (Annema et al., 2009; Grady et al., 2000; MacMahon & Lip, 2002; Pelle et al., 2008). Self-management has been identified as an important strategy in the management of chronic illnesses for improving patient outcomes (RNAO, 2010), and this is consistent within HF. A challenge in effectively managing HF, is the existence of depression and anxiety which may occur at elevated rates among populations with chronic illnesses, and threaten the performance of self-management. The relationships between self-management and depression, and self-management and anxiety are complex, and have been examined, but to a limited extent in the HF literature. Improvements in the performance of self-management behaviours among individuals with HF may be possible if these relationships are better understood. In this systematic review is an examination of the existing literature on HF self-management, and the potential impact of depression and anxiety on self-management among individuals living with HF.

Statement of Purpose

   The purpose of this systematic review was to examine the literature in relation to HF self-management and the potential role depression and anxiety may play in the performance of self-management in individuals living with HF. Specifically, this systematic review added to the current body of knowledge by comparing the findings from the HF literature addressing self-management and depression and self-management and anxiety, providing a descriptive overview of the current literature and existing findings, and determining if relationships exist among these concepts, and the nature of these relationships.

Significance of the Study

   The need to establish sustainable and effective interventions for long-term management of chronic illnesses, such as HF, becomes increasingly important as the number of individuals afflicted with such illnesses continues to increase (Newman, Steed, & Mulligan, 2004). To accomplish this, there was a need to examine the HF literature in a systematic way in order to understand the interrelationship between self-management and depression and anxiety in HF. The findings from this study could contribute to the knowledge of self-management and depression and anxiety among individuals living with HF. By understanding the impact of depression and anxiety on the day-to-day self-management of HF, this study may identify some challenges in the current research and practice surrounding this area and make some suggestions that may improve the research or practice in this area. Ultimately, the findings from this systematic review may contribute to helping individuals living with HF improve the management of their illness condition, and bring attention to their experience with depression and anxiety.

CHAPTER 2

Conceptual Framework

The variables of interest for this study are defined in this chapter. The discussion below includes conceptual and operational definitions of self-management, depression, and anxiety, and the proposed relationships among these variables.

Self-Management

Within chronic illness literature, there is inconsistent use of terms describing how individuals with chronic illnesses care for themselves. Terms such as self-care, self-management, self-care management, self-care maintenance, self-regulation, and self-monitoring are often encountered. These terms often appear in the literature without a definition, and are even used interchangeably within studies to represent the same concept. This is confusing for the consumer of research, and presents some difficulty to those studying this particular area. A review of the origins of these terms is helpful to understand how they are understood today.

Orem (1971) first described the term self-care, which she defined as "the practice of activities that individuals personally initiate and perform on their own behalf in maintaining life, health, and well-being" (Orem, 1971, p.13). This definition of self-care described a general and continuous process of maintaining a healthy life (Orem, 1971). Orem's definition of self-care encompassed both universal self-care, referring to meeting the basic human needs of living a healthy life, such as food, water, rest, and social interaction, and health-deficit self-care, referring to the care of oneself when faced with illness or some deviation from health (Orem, 1971). The term self-care continues to be used today by some researchers to describe both categories of self-care: leading a healthy life in general and illness-specific care (Kennedy et al., 2007; Riegel et al., 2009). The use of the term self-management to describe the latter category of self-care has

created some confusion in the literature, as this choice of terminology is not consistent among researchers.

The term self-management emerged around the mid-1960s and was first used to describe the rehabilitation of chronically ill children (Lorig & Holman, 2003). The researchers at the time felt the term self-management indicated that a patient was actively engaged in treatment, and since that time, the term has been widely used in work surrounding chronic illnesses (Lorig & Holman, 2003). This continues to be true today, with self-management defined as the daily management of an illness by the individual requiring active participation in the performance of health protecting and health promoting behaviours related to that illness (Jones et al., 2011; Lorig & Holman, 2003; Richard & Shea, 2011). Thus, self-management is a term that encompasses the health-deficit, illness-related spectrum of self-care, described by Orem. However, some researchers examining behaviours related to managing an illness have continued to use the broad term self-care instead of self-management. Therefore, both self-management and self-care are often used interchangeably in the chronic illness literature, which creates some confusion for the consumers of research when trying to understand these terms. To reduce confusion, it has been suggested that self-care remain a broad concept encompassing both general and illness-related health behaviours, as intended by Orem, while reserving self-management for describing the illness-related spectrum of self-care (Jones et al., 2011; Richard & Shea, 2011).

This clarification of terminology is supported by Richard and Shea (2011), who defined self-care as "the ability to care for oneself and the performance of activities necessary to achieve, maintain, or promote optimal health" (p.261) and defined self-management as "the ability of the individual…to manage symptoms, treatments, lifestyle changes, and psychosocial, cultural, and spiritual consequences of health conditions" (p.261). Thus, similar to Orem, they viewed self-

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management as a subset of self-care, specific to illness management. As this thesis is concerned with the manner in which an individual cares for themselves when living with a chronic illness, the term self-management is used. However, it is acknowledged that other terms, like self-care, have been and continue to be used in the literature to describe this concept.

Self-management, the illness related spectrum of self-care, requires that particular actions are performed by the individual living with an illness. This involves adjusting or revising the activities of daily living, learning new ways to care for oneself, coping with the effects of the illness and engaging in the medical care needed for the treatment of the illness (Orem, 1971). More specifically, these actions can be understood as particular behaviours that are adopted and performed by the individual to be able to live with their illness and limit or avoid any further deterioration in health (Riegel et al., 2009). When performed, self-management has the potential to result in improved prognosis, quality of life and functional status, and contribute towards fewer admissions to hospital (Lainscak et al., 2011).

Researchers have used several terms, such as compliance and adherence, in their understanding of how an individual manages their illness condition. Although not included in the conceptualization of self-management in this review, these terms deserve a brief discussion as they describe a different perspective of self-management. Compliance and adherence are defined as the extent to which an individual's behaviour coincides with expectations and recommendations of the health care professional (Dunbar-Jacob & Mortimer-Stephens, 2001; Evangelista & Dracup, 2000). The point at which an individual is considered compliant versus non-compliant, or adherent versus not adherent, varies. Variations on this cut-off point exist based on the tool used to measure this concept and may lead to some ambiguity when comparing several studies in which different tools have been used.

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It is important to note that several tools have established cut-off scores to provide categorization of individuals as either performing self-management well, or not. In other words, these tools provide an assessment of compliance or adherence. There are limitations with the use of such terms (van der Wal et al., 2005). Firstly, self-management is not simply present or absent, but rather occurs along a continuum. Secondly, characterizing an individual's performance in such a way devalues their efforts and may result in health-care providers viewing a "non-compliant" patient negatively (van der Wal et al., 2005). Thus, self-management defined in this review does not involve these terms exclusively, however compliance and adherence are acknowledged as a conceptualization of self-management.

Conceptual Definition. For this systematic review, HF is the chronic illness of interest, and self-management is viewed as a set of behaviours which individuals living with HF are required to perform in order to live with and manage their HF. The nine behaviours include taking medication as prescribed, following dietary guidelines, exercising, monitoring fluid intake and daily weight, monitoring symptoms of HF, demonstrating consulting behaviour, taking health precautions (annual flu vaccination), smoking cessation and alcohol cessation. The performance of one or more of these nine behaviours describes HF self-management in this review.

Operational Definition. The operationalization of a concept, such as self-management, allows it to be measured and compared (Burns & Grove, 2009). Measurement tools can include scales, questionnaires, observations, diaries, physiological measures, and interviews (Burns & Grove, 2009). Some examples of commonly used tools measuring self-management include the Heart Failure Compliance Questionnaire (HFCQ), and the European Heart Failure Self-Care Behaviour Scale (EHFSCB). Physiological measures include blood and urine samples, and other tools include pill counts and electronic observation of exercise, as with a pedometer. Some tools

require self-assessment and are completed by the individual. Other tools require no self-assessment by the individual, such as blood and urine tests. Please refer to Appendix A for a list and description of commonly used tools for measuring self-management.

Tools can measure one or more components of self-management. For instance, the EHFSCB is one example of a tool that measures an individual's self-reported proficiency with daily weighing, consulting behaviours, fluid restrictions, sodium restrictions, medication taking, exercise and health protective behaviours (Jaarsma et al., 2003). Whereas, measuring the serum level of a cardiac medication is a measure capturing only the medication aspect of one's self-management. Researchers use these tools, alone or in combination, depending on their study focus and methodology. By measuring an individual's self-management, the extent of his or her performance of required behaviours is being assessed. For instance, scoring higher on a self-report tool may indicate worse self-management, or having expected concentrations of a particular medication in their blood may serve as an indication of their self-management performance in relation to medication taking.

For the purposes of this systematic review, in order to remain inclusive of the literature, the operational definition of self-management included tools (self-report, interview, physiological, electronic) which measure one or more of the behaviours of self-management as defined for this systematic review, including those tools or measures assessing compliance or adherence.

Depression

Depression affects many individuals and is the most common cause of disability around the world (Oltmanns, Emery, & Taylor, 2002). Within the general population, it is estimated that four percent to 10% of people are affected by depressive disorders (Holzapfel et al., 2008). Depression is a disorder of mood affecting an individual's physical, emotional, and behavioural

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functioning (Kneisl, Wilson, & Trigoboff, 2004). Depression is described as "feeling utterly gloomy, dejected, or despondent" (Oltmanns et al., 2002, p.5). The line dividing normal feelings of sadness experienced by everyone and depression is not always clear. Depression occurs along a continuum, ranging from mild feelings of sadness to depressive symptoms to severe feelings of depression, manifested as a major depressive disorder (Oltmanns et al., 2002). Without treatment, depressive symptoms may worsen and develop into a major depressive disorder (Dekker, 2011).

Depression is accompanied by emotional, cognitive, somatic and behavioural symptoms. Emotional symptoms include a depressed mood and irritability. "In addition to the way people feel, mood disorders also change the way people think about themselves and their surroundings" (Oltmanns et al., 2002, p.7). This includes the cognitive symptoms of depression such as difficulty concentrating, thinking at a slower pace, being easily distracted, and engaging in self-destructive and impulsive thoughts and actions which accompany feelings of guilt and worthlessness (Oltmanns et al., 2002). Also, "poor memory and concentration, fatigue, apathy, indecisiveness, and loss of self-confidence" can plague depressed individuals (Kneisl et al., 2004, p.336). Somatic symptoms of depression include headache and bodily pains, loss of appetite, insomnia and fatigue (Oltmanns et al., 2002; Tsay & Chao, 2002). Finally, behavioural symptoms of depression include significantly decreased levels of activity and engagement with others (Oltmanns et al., 2002). Alcohol abuse, eating disorders, and anxiety disorders also seem to occur frequently with depression (Oltmanns et al., 2002). In fact, anxiety is frequently reported with depression, with two out of three individuals with depression reporting feelings of anxiety (Oltmanns et al., 2002).

Differentiation between normal experiences of sadness and depression is not always clear. However, several characteristics of the depressed mood are taken into consideration when making this distinction (Oltmanns et al., 2002). The intensity and pervasiveness of the mood affecting all aspects of the person's life, the absence of any obvious causes, the quality of the sadness, and the presence of other symptoms as described above are taken into consideration when deciphering between clinical depression and normal sadness (Oltmanns et al., 2002).

There are many causes of depression. Prospective studies have demonstrated that stressful life events involving a major loss of people or roles can trigger the onset of depression (Oltmanns et al., 2002). A diagnosis of HF, which is often accompanied by a feeling of losing one's life roles, may trigger the onset of depression. However, not everyone who experiences a stressful life event will experience depression (Oltmanns et al., 2002). While everyone feels sad from time to time, epidemiological studies have estimated that there is a five percent to 25% chance of developing major depression over the course of one's life (DiMatteo et al., 2000; Oltmanns et al., 2002). Women are two to three times more likely than men to experience depression, and while depression is often intuitively thought to impact older adults, epidemiological data suggest that it is younger to middle-aged adults who are more often afflicted with depression (Oltmanns et al., 2002). In addition to gender and age, social, interpersonal and biological factors also play a role in predicting the onset of depression (Oltmanns et al., 2002). Depression is reported at much higher rates in populations with chronic illnesses, as in HF, where depressive symptoms have been reported to occur in up to 70% of individuals with HF (Lea, 2009). There is variation in the reported rates of depression, likely resulting from the different methods of measuring and assessing depression as well as the varied sample sizes and characteristics of existing studies (Lane et al., 2009).

Depression is a serious problem and a common finding among individuals with chronic illness (Tsay & Chao, 2002), and is attributable to a severe debilitation of one's functional abilities (Cully et al., 2009). Among individuals living with HF, some predictors of depression have been suggested including worse NYHA classification of HF, younger age, and decreased quality of life (Holzapfel et al., 2008). Although the relationship between depression in HF and prognosis has been inconsistently reported (Tsuchihashi-Makaya et al., 2009), there is preliminary evidence suggesting that depression has an overall negative impact on the health of those living with HF, by increasing the risk of mortality and decreasing quality of life (Lea, 2009). It has been found that individuals with HF who experience depression have twice the risk of death or hospitalization compared to non-depressed individuals (Dekker, 2011). This may be partly related to the physiological mechanisms of experiencing depression, which place additional stress on the heart (Sherwood et al., 2007). Alternatively, there is the possibility that HF, by decreasing quality of life, may increase the likelihood of experiencing depression.

Depression is related to worsened health and well-being, worsened prognosis, and increased hospitalization and mortality rates among those with HF (Falk et al., 2009; Sherwood et al., 2007). While it has been proposed that depression and self-management may be related (Gonzalez et al., 2008; Katon et al., 2007), presently no conclusions on causality can be drawn on whether depression leads to poor self-management, or poor self-management leads to depression (DiMatteo et al., 2000). However, Oltmanns and colleagues (2002) suggest that the symptoms of depression may exert some negative influence over a person's ability to care for themselves.

The negative impact of depression on engaging in self-management can be understood by considering the emotional, cognitive and behavioural symptoms of depression. Depressed people

often feel hopeless, unworthy, and have a negative outlook that pervades all aspects of their life (Oltmanns et al., 2002). This negativity theoretically impacts their ability to perform the behaviours of self-management. In order for a person to actively engage in the behaviours suggested to them, they must have "positive expectations and beliefs in the benefits and efficacy of treatment" (DiMatteo et al., 2000, p.2105). Without this, people may feel less inclined to follow suggested treatment regimens, and therefore poorly self-manage.

Furthermore, depressed individuals may poorly self-manage as a result of poor social networks and support from others (DiMatteo et al., 2000). People who are depressed are more likely to isolate themselves and experience social withdrawal (DiMatteo, et al., 2000; Oltmanns et al., 2002). Finally, people who are depressed may often have significant cognitive deficits in terms of memory, concentration, decision making and the speed of processing thoughts (Oltmanns et al., 2002). The nature of living with and self-managing HF successfully involves learning a lot of new, complex information, and making a variety of decisions each day about one's health and medical treatment (DiMatteo et al., 2000). Depression may be associated with individuals feeling less inclined to manage their diet, exercise, and take medication properly, which may contribute to worsening of their HF (Lane et al., 2009). The symptoms of depression overlap with those of HF, which may be one reason why depression often goes unrecognized and is undertreated among individuals living with HF (Holzapfel et al., 2008; Tsay & Chao, 2002).

Conceptual definition. For the purposes of this systematic review, the definition of depression encompassed the depressed feelings, cognitions, and behaviours as described previously. Depression is understood as occurring along a continuum from mild to severe. As such, studies reporting depressive symptoms to major depression were included. Somatic symptoms of depression may mimic the somatic symptoms of HF, such as headache, fatigue, and

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bodily pain (Cully et al., 2009). However, it has been suggested in the literature that it is better to include overlapping symptoms in a diagnosis of depression in the presence of a chronic illness, rather than not including them (McLachlan, 2011). Therefore, the definition of depression for the purposes of this paper also included the somatic symptoms of depression, in order to be inclusive of the literature.

Operational definition. Depression was defined operationally as the score obtained on a tool designed to assess depression that indicates the degree to which or the frequency with which individuals experience depression. Tools were included if they were designed to capture depressive symptoms and feelings, or somatic symptoms of depression. Tools included scales, questionnaires, or structured interviews (Burns & Grove, 2009). Some examples of such tools are the Structured Clinical Interview from the Diagnostic and Statistical Manual (SCID), or the Beck Depression Inventory (BDI). Please refer to Appendix B for a list and description of common tools for measuring depression.

Anxiety

Anxiety is an elevated state of nervousness or agitation which occurs when an individual perceives a situation to be threatening and is unsure of what to expect (Bay & Algase, 1999). Anxiety is experienced by everyone at varying levels and at different points in time and the result may be positive or negative (Bay & Algase, 1999). When viewed in a positive manner, anxiety can be considered an adaptive response to changes in the environment (Konstam et al., 2005). Healthy levels of anxiety exist when changes and threatening situations elicit behaviour that assists individuals to cope with a threatening situation (Spielberger & Sarason, 2005). Broadly speaking however, anxiety is considered a negative emotion that results when an individual views a situation as too threatening, uncontrollable, and unpredictable, and responds to the

situation in a dysfunctional manner (Konstam et al., 2005). This negative aspect of anxiety exists when normal levels of anxiety become heightened, and impair an individual's ability to function (Kneisl, Wilson, & Trigoboff, 2004). Other negative reactions associated with anxiety include irrational fears, poor behaviour choices (Bay & Algase, 1999), and physical signs and symptoms including heart palpitations, sweating, shaking, feeling short of breath, chest pain, nausea, and chills (Oltmanns et al., 2002).

Within the general population, anxiety is one of the most prevalent mood disorders, reported by approximately half the general population (Konstam et al., 2005). While this prevalence rate seems high, it should be understood that the severity of anxiety occurs along a continuum, ranging from normal to pathologic levels (Konstam et al., 2005). The majority of individuals reporting anxiety do so along the less severe end of the anxiety continuum, such as minor phobias (Oltmanns et al., 2002). The degree of anxiety an individual experiences can be understood as a state or a trait. Trait anxiety refers to anxiety which is constantly present and experienced consistently over time, whereas state anxiety refers to short term anxiety occurring temporarily (Spielberger & Sarason, 2005). More severe forms of anxiety, including social anxiety, post traumatic stress, panic disorders or obsessive-compulsive disorders, occur more infrequently (Konstam et al., 2005; Oltmanns et al., 2002).

The source of the anxiety is often unknown and may be difficult to identify (Bay & Algase, 1999). Antecedents of anxiety include feeling one's current, stable state at risk for disruption, expecting a change to occur, sources of loss, such as income, friends or family, or significant changes to one's life (Bay & Algase, 1999). Responses to anxiety may be subjective or objective. The presence of anxiety can be visible, or it can be invisible and noticeable only by the individual experiencing it (Bay & Algase, 1999). The subjective experience includes feelings of

worry, apprehension, fear, feeling unsettled, and objective signs of anxiety include agitation, nervous tremors, cardiovascular excitation, and expressing a focus upon oneself (Bay & Algase, 1999).

Anxiety can negatively affect cognition and behaviour (Konstam et al., 2005), thus an anxious state can impact one's decision making abilities, motivation, energy levels, and actions (Riegel et al., 2009). It is often discussed in HF in conjunction with depression, yet there is considerably less research focused upon anxiety alone within the HF literature (Konstam et al., 2005). Presently, no studies have demonstrated a direct relationship between the presence of anxiety among individuals with HF, and a worsened prognosis (Falk et al., 2009). However, the frequency with which anxiety occurs concurrently with depression among this population, with 50% to 70% of individuals with depression reporting anxiety, suggests there is value to examine anxiety more frequently and in greater detail (Tsuchihashi-Mikaya et al., 2009).

Being diagnosed with HF involves multiple changes to one's lifestyle, an expectation to learn a lot of new, complex information, and feeling a lack of control over one's body (DiMatteo et al., 2000). When an individual is diagnosed with a chronic illness, such as HF, this diagnosis can be viewed as a threatening situation and ultimately lead to increased rates of anxiety. Anxiety can present itself upon being diagnosed with HF and either worsen or improve over time, depending on the individual. Anxiety can also be pre-existing and be exacerbated by a diagnosis of HF (MacMahon & Lip, 2002). It is unclear which occurs more often. Anxiety in HF can be a spiraling process, where the physical symptoms of anxiety such as tachycardia, chest pains, and sweating, are interpreted by the individual as resulting from their HF, which causes further anxiety, and this cycle to continue (MacMahon & Lip, 2002).

The physiological impact of being in an anxious state, such as the stimulation of the sympathetic nervous system, has implications in HF by increasing the workload of the already stressed cardiovascular system (DiMatteo et al., 2000). Less understood is the indirect effect of anxiety on the outcomes for people with HF, specifically from a behavioural standpoint (DiMatteo et al., 2000). The literature suggests that the presence of anxiety among individuals with chronic illnesses, such as HF, may negatively impact their ability to care for themselves. As explained by Riegel and colleagues (2009), "[p]atients who are anxious may be unable to learn or act on new information about making necessary lifestyle changes" (p.1148). This is echoed by Cully and colleagues (2009), who suggested that anxiety can impact an individual's ability to manage the physical burdens of HF, as well as follow the recommended medical treatment. While the evidence supporting anxiety as a predictor of how well a person self-manages their illness is considerably less apparent in the literature than depression (Konstam et al., 2005), the frequency with which anxiety occurs with depression (MacMahon & Lip, 2002) suggests that its presence may also factor into how well an individual performs self-management.

Conceptual definition. For the purposes of this systematic review, the definition of anxiety encompassed the anxious feelings, cognitions, and behaviours as described above. Anxiety was understood as occurring along a continuum from mild to severe. As such, studies reporting anxiety-related symptoms to severe anxiety were included. The definition of anxiety for the purposes of this paper also included the somatic symptoms of anxiety, in order to be inclusive of the literature.

Operational definition. Anxiety was defined operationally as a score on a tool designed to assess a continuum of physiological and emotional signs and symptoms associated with anxiety. Some examples of tools used to measure anxiety include the Hospital Anxiety and Depression

Scale (HADS), the State Trait Anxiety Inventory (STAI), or the Brief Symptoms Inventory (BSI). Refer to Appendix C for a list and description of common tools for measuring anxiety.

Conceptual Map

Individuals living with HF experience elevated rates of depression and anxiety (Konstam et al., 2005; Lea, 2009; Riegel et al., 2009). The nature of depression and anxiety suggest they may adversely affect an individual's ability to manage their chronic illness (Gonzalez et al., 2008; Katon et al., 2007). Depression is associated with emotional, behavioural, and cognitive symptoms, such as feelings of hopelessness, worthlessness, and having a negative outlook on life (Oltmanns et al., 2002). The negative emotions of depression are incongruent with the positive outlook and beliefs that are inherently required of an individual who desires to engage in self-management. In addition, the cognitive deficits of depression, such as poor memory, concentration, or decision-making may adversely affect the performance of behavioural tasks which require a level of cognitive astuteness. Similarly, the presence of anxiety may impact an individual's ability to take in new information, deal with challenges, and carry out instructions (Cully et al., 2009; Riegel et al., 2009), all of which are required for performing the behaviours of HF self-management. Thus, as depression and anxiety increase in severity, and the negative signs and symptoms increase in severity and frequency (ie., scores on tools indicate worse depression and anxiety), it was proposed that more barriers are placed on the performance of self-management, and self-management would worsen. However, the extent to which this relationship has been demonstrated in the literature was unknown, and this study brought together the literature and begin to create an understanding of this topic.

Research Questions

The conduct of this study was guided by three primary research questions:

1) What are the characteristics of studies that examined self-management, and depression and/or anxiety, in individuals living with heart failure? In particular:

   a) What proportion of studies examined self-management with depression alone?

   b) What proportion of studies examined self-management with anxiety alone?

   c) What proportion of studies examined self-management with depression and anxiety together?

   d) What study designs and data collection methods were used?

   e) When were the studies conducted?

   f) In which countries were studies conducted?

   g) In which settings were studies conducted?

   h) What were the conceptualizations for the key variables of interest?

   i) What were the limitations of studies?

   j) Were the indicators of data quality of response rate, reliability of tools and power analysis discussed across studies?

   k) What was the mean sample size of studies?

2) What were the characteristics of the individuals included across studies? Specifically:

   a) What was the average age of the study samples?

   b) What was the most commonly reported gender, race, marital status, class of HF, level of education, and employment status, across the study samples?

   c) What was the average length of time individuals had been living with HF across the study samples?

3) What were the findings in relation to the variables of interest? Specifically:

a) What tools were used to assess self-management? What were the key findings in the studies related to self-management?

b) What tools were used to assess depression? What were the key findings in the studies related to depression?

c) What tools were used to assess anxiety? What were the key findings in the studies related to anxiety?

d) What was the relationship between self-management and depression?

e) What was the relationship between self-management and anxiety?

CHAPTER 3

Methodology

The following section includes the methodology used to identify and select appropriate studies included in the systematic review. The search strategy and inclusion criteria are detailed below. Please refer to Appendix D for a depiction of the search strategy.

Exclusion and Inclusion Criteria

Types of studies. Criteria for inclusion in this review included studies that were written in English, as translation services were not accessible to the writer, and were peer-reviewed, to maintain the level of quality of the articles at a scholarly level. Studies must have included one or more of the behaviours of HF self-management as defined for the purposes of this study. It was not realistic to expect that all studies examining HF self-management would investigate all of the behaviours, or the same behaviours associated with HF self-management, therefore flexibility was granted in this aspect. Articles were considered for inclusion if the tools used within the study to examine self-management measured one or more components of self-management. In addition to an assessment of self-management, studies must have included an assessment of the subjects' levels of depression or anxiety, or both. To remain inclusive in this systematic review, non-experimental, experimental or quasi-experimental studies were included, and may have been longitudinal, cross-sectional, or retrospective. Mixed methods studies involving qualitative assessments of the variables of interest were considered for inclusion as long as the variables of interest were also measured with a quantitative tool. Measurement of variables of interest may have involved one or multiple tools. Although not necessarily the primary focus of the studies, authors must have explored, to some degree the relationship between self-management (as they defined it) and depression, anxiety, or both. Finally, data were collected and discussed on several

aspects of rigour (data quality). However, because there was a small number of articles available which met the inclusion criteria, articles were not excluded based upon rigour.

Types of participants. Studies were included in the review if they involved adult individuals, male or female, over age 18 years, living with a confirmed diagnosis of chronic HF, NYHA classification I to IV. Studies examining individuals with HF under 18 years were not included as the expectations of self-management of a chronic illness would be different for children. Study samples may have included individuals from outpatient or inpatient settings, as an assessment of self-management may have been made in either setting. However, studies that included in their sample individuals living with a live-in caretaker, or receiving palliative care were excluded, as the assessment of self-management would be different among these individuals than among the population of interest in this systematic review. No limitations to study participants were placed on race, income, level of education, or any other social determinant of health, as there was no clear indication to do so.

Search strategy. A systematic search of the literature was conducted to identify pertinent studies to include in this systematic review. Professional assistance was sought from a qualified research librarian at the Ryerson University Library in conducting the early searches. The electronic databases primarily searched on a monthly basis, from September 1, 2010 to October 31, 2011 included: ClNAHL, Medline, and Cochrane Database of Systematic Reviews. Additional databases included Proquest Nursing, EMBASE, and PsychINFO. A typical search used is described. In Medline, the terms heart failure, HF, CHF, congestive heart failure, and chronic heart failure were searched with the operand OR, resulting in 40,391 results. Anxiety, depression, psychosocial, psychological, emotional, and mental health were then searched with the operand OR, resulting in 161,807 results. Finally, self-management was searched with related

terms including self-care, self-regulation, self-monitoring, compliance, non-compliance, adherence, non-adherence, medication, diet, exercise, fluid monitoring, daily weight, cardiac rehabilitation, appointment, consulting behaviour, influenza vaccination, alcohol, smoking, and symptom monitoring, with the operand OR, resulting in 157,625 results. These terms were used as they captured the conceptual definition of self-management, depression, and anxiety as defined for this thesis. Following these initial searches, the three results were combined with the operand AND, resulting in 18 results. These articles were reviewed individually to determine their suitability for inclusion in the review.

Results comprised of commentaries on research articles, duplicates of articles, book results, and articles in which the population of interest did not have a diagnosis of HF were excluded as they did not meet the inclusion criteria described previously. No limitations were placed on ranges of years, in order to remain inclusive of the literature and to gain an understanding of the historical time frame of this topic. Electronic search results found to be suitable based on the previously mentioned criteria were included in the sample. Reference lists from relevant articles, systematic and literature reviews, and meta-analyses were searched as well for appropriate studies for inclusion.

Other sources of information such as the Canadian Institute of Health Research, Health Canada, American Heart Association, Canadian Heart Failure Network, Heart and Stroke Foundation of Canada, and Canadian Cardiovascular Society were hand searched for relevant articles. Internet search engines (GoogleScholar) were also used with the same search strategy as above. Masters and doctoral theses, conference materials, and presentations were searched as well. The table of contents of relevant journals, such as the European Journal of Heart Failure, Congestive Heart Failure, and Heart Failure Reviews were hand searched for appropriate articles.

Studies that were identified by the writer were reviewed by an expert, and a final decision made together regarding inclusion in the systematic review. From the initial Medline results, and the subsequent search strategy described above in other databases and search engines, a total of 14 articles were found to be suitable and included in this systematic review.

Data Collection

Data collection tables were created to record data that were extracted for the purpose of addressing the research questions. Data collected from each article included: study reference (title of study, name of publication, year of publication, authors), study design, study setting, total number of subjects, characteristics of subjects, method of assessing self-management, reliability and validity of tools to assess self-management, method of assessing depression, reliability and validity of tools to assess depression, method of assessing anxiety, reliability and validity of tools to assess anxiety, study purpose, statistical analysis, and statistical findings relevant to this study. These data were reported as they were found in the articles. Data quality was assessed for each study as well, with a focus on three key indicators of data quality: response rates, reliability of tools, and power analysis. Many indicators of data quality exist, however these three indicators were selected as examining response rate would address the internal validity across studies if a large number of participants failed to complete the studies, examining reliability of tools would address the statistical conclusion validity across these studies, and assessing power analysis would identify potential type II errors (Burns & Grove, 2009). Data quality will be further discussed in the results and discussion sections.

Inter-rater Reliability Assessment of Data Extraction

Data were extracted from all fourteen articles. Inter-rater reliability was assessed to demonstrate consistency in data extraction. This was accomplished by approaching a qualified

individual, familiar with data collection and academic nursing articles, to independently collect data from 2 of the 14 articles. Data extracted by the second rater were compared to that extracted by the first rater. A value of 0.80 or greater was considered an acceptable level of inter-rater reliability, as this is a commonly accepted value (Burns & Grove, 2009), thus of the 162 variables extracted by the writer and the inter-rater, at least 130 would have to be the same (130/162 = 0.8). The writer met with the second rater and verbally discussed the protocol used to extract data. The second rater was provided with the data dictionary, and two randomly selected articles, from which she independently extracted data. Out of 162 possible variables extracted from each article, the second rater achieved identical responses as the writer on all 162 variables, thereby achieving 100% inter-rater reliability, and collection of data by the writer was deemed acceptable.

Data Analysis

Descriptive statistics were used to 1) delineate the characteristics of the studies included in this systematic review, 2) describe the characteristics of individuals comprising the samples, 3) describe the levels of self-management, depression, and anxiety across studies, and 4) identify results reported in studies with regard to the relationship between self-management, and depression and/or anxiety. Nominal and ordinal data were presented as percentages. Interval and ratio data were organized by measures of central tendency (mean, median and mode) and dispersion (range, standard deviation). Statistical software (IBM SPSS Version 19) was used to organize data and perform statistical calculations. The level of alpha for statistical analysis in this systematic review was 0.05, as this is an accepted level of alpha for use in systematic reviews (Burns & Grove, 2009), and determined statistical significance of study findings.

CHAPTER 4

Results

The following section will be structured according to the questions identified in Chapter 2. A description of the characteristics of the studies included in this review is first provided, followed by a description of the characteristics of participants within the studies. This chapter will conclude with a description of the key findings across studies based upon the variables of interest: self-management, depression, and anxiety.

Characteristics of Studies that examined Self-Management, Depression, and Anxiety

In total, 14 studies were included in this systematic review. All involved individuals living with HF. The variables of interest were represented across the studies, with all (100%) addressing self-management, nine (64.3%) studies examining self-management and depression (Cameron et al., 2009; Cholowski & Cantwell, 2007; Holzapfel et al., 2009; Johansson et al., 2011; Kato et al., 2009; Morgan et al., 2006; Muzzarelli et al., 2010; Riegel et al., 2007; van der Wal et al., 2007), one (7.1%) study examining both self-management and anxiety (De Jong et al., 2011), and four (28.6%) studies examining all three variables: self-management depression and anxiety (Evangelista et al., 2001; Corvera-Tindel et al., 2004; Luyster et al, 2009; Schweitzer et al., 2007) (Appendix E).

All studies were quantitative in nature, except for one (7.1%) (Riegel et al., 2007), which used a mixed methods (quantitative and qualitative) approach and studied both self-management and depression. It remained part of the sample as self-management was measured quantitatively. All studies (100%) were non-experimental and cross-sectional, with the exception of Corvera-Tindel et al.'s (2004) study in which data were collected at multiple points in time. The dates of studies included in this review spanned a decade, ranging from 2001 to 2011, with the majority (78.6%)

of studies conducted in the last six years. Almost half (42.9%) of the studies were carried out in the United States (Corvera-Tindel et al., 2004; De Jong et al., 2011; Evangelista et al., 2001; Morgan et al., 2006; Luyster et al., 2009; Riegel et al., 2007), with the remaining studies being conducted across Europe (28.6%) (Holzapfel et al., 2009; Johansson et al., 2011; Muzzarelli et al., 2010; van der Wal et al., 2007), Australia (21.4%) (Cameron et al., 2009; Cholowski & Cantwell, 2007; Schweitzer et al., 2007), and Japan (7.1%) (Kato et al., 2009). One study (7.1%) took place jointly in the United States and Canada (Morgan et al., 2006). Study settings included inpatient (28.6%), outpatient (57.1%), and both inpatient and outpatient (14.3%) environments. Among those studies conducted in outpatient settings, the settings consisted of cardiovascular or HF clinics (Evangelista et al., 2001; Holzapfel et al., 2009; Kato et al., 2009; Luyster et al., 2009; Riegel et al., 2007), university based medical centres and clinics (De Jong et al., 2011), cardiac rehabilitation centres (Cholowski & Cantwell, 2007), and one study recruited their sample from an existing cardiovascular outcomes research consortium (Morgan et al., 2006).

The conceptualization of self-management varied across studies. The terms 'self-care' and 'self-management' were used interchangeably without definitions (Holzapfel et al., 2009). Johansson et al. (2011) defined self-care, but were only interested in consulting behaviour. Morgan and colleagues (2006) and Muzzarelli and colleagues (2010) did not use the terms self-care or self-management, and were interested only in one behaviour, specifically taking medication. Similarly, Schweitzer and colleagues (2007) also did not use the terms self-care or self-management, but were interested in several behaviours. Several authors described their view of self-care (Cameron et al., 2009; Riegel et al., 2007), but were interested in self-care maintenance and self-care management (Cameron et al., 2009). Others used adherence (De Jong et al., 2011; Kato et al., 2009; Luyster et al., 2009) and compliance (Cholowski & Cantwell,

2007; Corvera-Tindel et al., 2004; Evangelista et al., 2001; van der Wal et al., 2007) as their conceptualization of self-management, however these terms were not defined.

Conceptualization of depression and anxiety also varied across studies. Across the nine studies examining depression, several authors viewed depression as a potential predictor of HF self-management, but did not provide a definition or conceptualization of this term (Cameron et al., 2009; Evangelista et al., 2001; Holzapfel et al., 2009; Johansson et al., 2011; Morgan et al., 2006; Muzzarelli et al., 2010; van der Wal et al., 2007). Two authors did not provide a definition of depression, or discuss their conceptualization of depression in relation to self-management, despite including this as a key variable in their studies (Cholowski & Cantwell, 2007; Riegel et al., 2007). None of the studies provided a definition or conceptualization of depression, and without this, reasons for their selection of a tool for measuring depression were not explicated.

In the single study examining self-management and anxiety, De Jong and colleagues (2011) did not provide a definition of anxiety, but they proposed a link between the behavioural and physiological impact of anxiety on outcomes in HF. Among the four articles which studied self-management, depression and anxiety, two did not conceptually differentiate between depression and anxiety. Corvera-Tindel and colleagues (2004) viewed the concepts jointly as emotional dysphoria, and Evangelista and colleagues (2001) viewed the concepts generally as mental health, which was reflected in their selection of tools to measure these concepts. The remaining authors (Luyster et al., 2009; Schweitzer et al., 2007) studied both depression and anxiety, but viewed them as separate concepts and measured them independently from one another, both using the BDI for depression and the STAI for anxiety.

Limitations were discussed by several authors. Studies cited sample characteristics as a limitation of their findings. For instance, the majority of one sample consisted of individuals

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newly diagnosed with HF (Cholowski & Cantwell, 2007), which authors reasoned may impact the report of self-management. Individuals newly diagnosed with HF may be more likely to take on behaviour changes in the initial stages of their illness, while individuals living with HF for a longer period of time may have returned to their habitual lifestyles (Cholowski & Cantwell, 2007). One author cited sampling bias as a limitation, as women were not well represented in their sample (Cameron et al., 2009). Four studies cited small sample size (De Jong et al., 2011; Kato et al., 2009; Muzzarelli et al., 2010; Riegel et al., 2007), and other studies cited a homongenous (all male) sample (Evangelista et al., 2001) and convenience sampling (Morgan et al., 2006) as a limitation of generalizability.

Authors also cited study design as a limitation of their findings. For instance, with cross-sectional design, it was not possible to infer causality (Holzapfel et al., 2009; Johansson et al., 2011). The use of self-report tools was also cited by several authors as a limitation (Evangelista et al., 2001; Holzapfel et al., 2009; Kato et al., 2009; Luyster et al., 2009; Schweitzer et al., 2007). Finally, Muzzarelli and colleagues (2010) cited the use of serum digoxin levels as their measure of self-management as a limitation, due to the inherent limits of this method of measurement. With this process, the assessment of medication taking is based on digoxin alone, and not on other HF medications. As well, the variation in participant behaviour such as timing between taking medication and serum testing, or taking other medications that interfere pharmacologically with digoxin contributed to the limits of this method of assessment.

As identified in Chapter 3, data quality was assessed across all studies in relation to some key indicators including response rate, reliability of tools, and power analysis. With regard to response rate, refusal and dropout rates were examined. Three (21.4%) of the 14 studies included a discussion of refusal rate (Cameron et al., 2009; Cholowski & Cantwell, 2007; Holzapfel et al.,

2009). Refusal rates ranged from 4% (Cameron et al., 2009) to 14.6% (Holzapfel et al., 2009). The mean refusal rate across these three studies was 9.5%. Reasons for refusal included lack of time and participation in other studies (Holzapfel et al., 2009). Two (14.3%) studies were unable to provide information on individuals who refused to participate as no data were collected in this regard (Cameron et al., 2009; Cholowski & Cantwell, 2007).

Six (42.9%) of the 14 studies included a discussion of dropout rates rather than refusal rates (Corvera-Tindel et al., 2004; Evangelista et al., 2001; Kato et al., 2009; Morgan et al., 2006; Muzzarelli et al., 2010; van der Wal et al., 2007). Whereas refusal rate indicates a proportion of individuals who were approached and initially refused to participate in the study, dropout rate indicates a proportion of individuals who were enrolled in the study, but did not complete the study for a particular reason. The dropout rates ranged from 4.4% (Morgan et al., 2006) to 22.5% (Muzzarelli et al., 2010), with a mean dropout rate across these six studies of 9.8%. Two authors provided reasons for dropout including loss to follow up, and failure to complete or return all of the required tools (Kato et al., 2009; van der Wal et al., 2007). Other reasons included hospitalization, lack of time (Evangelista et al., 2001), and death (Corvera-Tindel et al., 2004). Two authors (Morgan et al., 2006; van der Wal et al., 2007) examined the characteristics of participants who did and did not drop out, and no differences in gender or left ventricular ejection fraction (LVEF) were found between the two groups in either study. The highest dropout rate reported was in the study by Muzzarelli and colleagues (2010), with 22.5% dropping out for multiple reasons (death, withdrawal of consent, or medical reasons). Comparisons made between those who did and did not complete this study did not reveal any differences in characteristics.

Of the 14 studies, 12 (85.7%) reported on the reliability of their selected tools, to some degree, and two did not (Johansson et al., 2010; Muzzarelli et al., 2010). Five authors reported on the reliability of all of the tools they used (Cameron et al., 2009; Evangelista et al., 2001; Kato et al., 2009; Luyster et al., 2009; Riegel et al., 2007) and the other seven authors reported on the reliability for at least one of the tools included for use in their study. Two authors reported reliability scores that were generated through the conduct of their study (Corvera-Tindel et al., 2004; Schweitzer et al., 2007). Others reported on the reliability of the tool based on the original work associated with the creation and testing of the tools (Cameron et al., 2009; Cholowski & Cantwell, 2007; De Jong et al., 2011; Evangelista et al., 2001; Holzapfel et al., 2009; Kato et al., 2009; Luyster et al., 2009; Morgan et al., 2006; Riegel et al., 2007; van der Wal et al., 2007). Also, when reported from the original work, reliability varied in relation to testing performed either in general populations or specific testing in HF populations.

Among the 11 tools measuring self-management, the three most frequently used self-report tools with reported reliability were the European Heart Failure Self-Care Behaviour Scale (EHFSCB) (Holzapfel et al., 2009; Kato et al., 2009), the Self-Care of Heart Failure Index (SCHFI) (Cameron et al., 2009; Riegel et al., 2007; Schweitzer et al., 2007), and the Heart Failure Compliance Questionnaire (HFCQ) (Evangelista et al., 2001; Schweitzer et al., 2007; van der Wal et al., 2007). Both Holzapfel and colleagues (2009) and Kato and colleagues (2009) discussed the reliability of the EHFSCB with previous reports of psychometric testing of the tool that had been performed in their populations of interest, namely in European and Japanese populations, respectively. Internal consistency of the tool was reported with a Cronbach's alpha of .81 among individuals with HF (Jaarsma et al., 2003). This tool has also been found to be valid and reliable when translated into Japanese. Internal consistency was satisfactory at .71, and

test-retest reliability was found to be adequate, with a correlation coefficient of .69 (Kato et al., 2008).

Among the authors who used the SCHFI (Cameron et al., 2009; Riegel et al., 2007; Schweitzer et al., 2007), the reliability of this tool was supported in all three studies by the psychometric testing performed by the tool's original authors. Adequate internal consistency for the self-care management portion of the tool was reported (Cronbach's alpha = .70) and the self-care maintenance portion of the tool was found to have a Cronbach's alpha of .55, which instrument authors explained reflected the behaviours in the scale being independent of one another (Riegel et al., 2004).

Among the authors using the HFCQ, Evangelista and colleagues (2001) performed reliability testing (internal consistency) of the tool as part of their study, and van der Wal and colleagues (2007) cited Evangelista et al. in their discussion of reliability of the tool. Schweitzer and colleagues (2007) used the HFCQ, but did not discuss the reliability of this tool. A Cronbach's alpha of .68 was reported for the internal consistency of the tool (Evangelista et al., 2001).

None of the authors who created tools for measuring self-management specifically for use in their studies (Cholwoski & Cantwell, 2007; Morgan et al., 2006; Schweitzer et al., 2007) included a discussion of validity or reliability testing for these tools. In the remaining studies, the tools that were used to measure self-management including the CARDIA questionnaire, serum digoxin testing (Muzzarelli et al., 2010), medication event monitoring system, urine sodium testing (De Jong et al., 2011), and the pedometer (Corvera-Tindel et al., 2004) were not supported with discussions of reliability.

The most frequently used depression inventories with reliability reported to be adequate were the Centre for Epidemiological Studies Depression Scale (CESD) (Johansson et al., 2011; Kato

et al., 2009; van der Wal et al., 2007), and the Beck Depression Inventory (BDI) (Cholowski & Cantwell, 2007; Luyster et al., 2009; Schweitzer et al., 2007). The BDI has been shown to have good internal consistency with a Cronbach's alpha of .81, and test-retest reliability coefficient of .83 (Beck et al., 1988; Lane et al., 2002). The CESD has been shown to have internal consistency with a Cronbach's alpha of .85 (Radloff, 1977). The most frequently used anxiety inventory with demonstrated reliability was the State-Trait Anxiety Inventory (Luyster et al., 2009; Schweitzer et al., 2007). In each study, reliability scores for the tools were reported, with internal consistency greater than .80, and test-retest reliability coefficients ranging from .73 to .86.

This review contained studies with sample sizes that ranged from 29 (Riegel et al., 2007) to 958 (Johansson et al., 2011). The median sample size was 95, with 10 of the 14 studies (71.4%) involving no more than 150 individuals. As sample sizes tended to be small across studies, power analysis was selected as an indicator of data quality in this review to assess authors' considerations regarding sample size and their findings. However, power analysis was discussed in only one (7.1%) of the 14 studies (Cameron et al., 2009).

Characteristics of Individuals Included Across Studies

The studies in this systematic review contained 3465 study participants in total. The mean age of the sample was presented in all studies. In several studies, mean age was grouped in accordance to specific variables such as gender (Cholowski & Cantwell, 2007) and performance of self-management (Morgan et al., 2006; Riegel et al., 2007). Across the 14 studies, the mean age among all samples was 65.53 years calculated from sample means ranging from 54.14 to 73 years of age. The majority of study participants were male (n=2354, 67.9%) and in studies reporting on race, were of Caucasian ancestry (n = 632, 72.7%) (De Jong et al. 2011; Evangelista et al., 2001; Luyster et al., 2009; Morgan et al., 2006; Riegel et al., 2007). Within these five

studies reporting on race, other races reported in fewer proportions were African American, Asian and Latin American.

Nine studies examined marital status, and the average percentage of individuals who were married or common law was 65.6%, with divorced (10.3%), widowed (12.6%) or single (12.7%) individuals occurring on average in smaller proportions (Cameron et al., 2009; De Jong et al., 2011; Evangelista et al., 2001; Johansson et al., 2011; Kato et al., 2009; Luyster et al., 2009; Riegel et al., 2007; Schweitzer et al., 2007; van der Wal et al., 2007). Level of education was a descriptor in half of the studies (Cameron et al., 2009; De Jong et al., 2011; Evangelista et al., 2001; Kato et al., 2009; Luyster et al., 2009; Riegel et al., 2007; Schweitzer et al., 2007). Among the five studies reporting percentages, an average of 36.0% did not complete high school, and more than a third (36.7%) had either completed or partially completed high school or trade school level education. Higher levels of education on average occurred in similar proportions (34.9%). Employment status was also examined in four (28.6%) studies (Cameron et al., 2009; Evangelista et al., 2001; Kato et al., 2009; Schweitzer et al., 2007). On average, 71.4% of individuals were identified as retired or unemployed, and roughly 26% of sample participants were reported as working part-time or full-time.

The majority of studies (85.7%) looked at NYHA classification of HF as a descriptor of their sample. Findings were reported in different ways, with three studies (21.4%) reporting mean classification (2.22, or Class II), three studies (21.4%) grouped class III and IV together (Cameron et al., 2009; Johansson et al., 2011; Riegel et al., 2007) and reported an average percentage of 72.3% in this category. However, several studies examined all four classes individually, and most individuals were in Class II (45.25%) and Class III (35.3%) HF, with very few in Class IV. Length of time with HF was a descriptor of the sample in only four (28.6%)

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studies (Corvera-Tindel et al., 2004; Kato et al., 2009; Riegel et al., 2007; van der Wal et al., 2007), and the results were reported in quite a varied manner. Two (14.3%) studies reported mean length of time living with HF, ranging from 37.5 and 69 months (Corvera-Tindel et al., 2004; Riegel et al., 2007), while two (14.3%) studies reported median length of time with HF as 2.6 years (Kato et al., 2009), and the other as 4 months (van der Wal et al., 2007).

Findings Related to Variables of Interest

The fourteen studies (100%) included self-management as the outcome of interest. In thirteen (92.9%) studies, it was the primary outcome of interest, and in one (7.1%) it was the secondary outcome of interest (van der Wal et al., 2007)**.** Please refer to Appendix E for tables of studies' results.

Tools measuring self-management. A total of 11 tools were used to assess self-management across all studies. Table 1 presents each of the components of self-management as defined for this systematic review, the respective tools found in studies that measured the component, and the authors who examined the component by tool. Appendix A presents a table providing further information pertaining to the tools that measured self-management. The most frequently used tools were the Heart Failure Compliance Questionnaire (HFCQ) (n = 4, 28.6%), the Self-Care of Heart Failure Index (SCHFI) (n = 3, 21.4%), and the European Heart Failure Self-Care Behaviour Scale (EHFSCB) (n = 2, 14.3%). Also, tools were created by various authors to measure the specific component of self-management in which they were interested. For instance, Cholowski and Cantwell (2007) and Morgan and colleagues (2006) were interested in medication taking and created questionnaires with Likert scales as their measurement of self-management related to medication taking. Schweitzer and colleagues (2007) created a tool to measure seven behaviours (weighing, diet, fluid intake, medication taking, exercise, alcohol

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cessation and smoking cessation) as they argued that no other tool captured all their behaviours of interest.

The nine behaviours of HF self-management defined for this systematic review were assessed alone or in various combinations across all studies. The most frequently examined behaviour was medication taking, as this was examined in 11 (78.6%) studies, either alone or in addition to other behaviours (Cameron et al., 2009; Cholowski & Cantwell, 2007; De Jong et al., 2011; Evangelista et al., 2001; Holzapfel et al., 2009; Kato et al., 2009; Morgan et al., 2006; Muzzarelli et al., 2010; Riegel et al., 2007; Schweitzer et al., 2007; Van der Wal et al., 2007). Schweitzer and colleagues (2007) used three tools to measure medication taking. Medication taking was measured with the greatest number of tools, with nine measures, ranging from self-report to physiological measurement instruments. Diet and exercise also involved both self-report and physiological measures (Cameron et al., 2009; Corvera-Tindel et al., 2004; De Jong et al., 2011; Evangelista et al., 2001; Holzapfel et al., 2009; Kato et al., 2009; Luyster et al., 2009; Riegel et al., 2007; Schweitzer et al., 2007; Van der Wal et al., 2007). Alcohol and smoking cessation were the least examined components of self-management, with only one author (Schweitzer et al., 2007) examining these behaviours, using a self-report tool.

Table 1

Tools used to measure specific components of self-management.

Component of SM	Tools used to measure component	Authors who used this tool
Medication	European Heart Failure Self-Care Behaviour Scale (EHFSCB)	Holzapfel et al., 2009 Kato et al., 2009
	Self-Care of Heart Failure Index (SCHFI)	Cameron et al., 2009 Riegel et al., 2007 Schweitzer et al., 2007
	Heart Failure Compliance Questionnaire (HFCQ)	Van der Wal et al., 2007 Evangelista et al., 2001 Schweitzer et al., 2007
	CARDIA questionnaire	Muzzarelli et al., 2010
	4 question study-specific tool	Cholowski & Cantwell, 2007
	1 question study-specific tool	Morgan et al., 2006
	Study-specific tool	Schweitzer et al., 2007
	Medication Event Monitoring System (MEMS)	De Jong et al., 2011
	Serum Digoxin levels	Muzzarelli et al., 2010
Diet	European Heart Failure Self-Care Behaviour Scale (EHFSCB)	Holzapfel et al., 2009 Kato et al., 2009
	Self-Care of Heart Failure Index (SCHFI)	Cameron et al., 2009 Riegel et al., 2007 Schweitzer et al., 2007

Component of SM	Tools used to measure component	Authors who used this tool
	Heart Failure Compliance Questionnaire (HFCQ)	Van der Wal et al., 2007
		Evangelista et al., 2001
		Schweitzer et al., 2007
		Luyster et al., 2009
	Study-specific tool	Schweitzer et al., 2007
	Urine sodium levels	De Jong et al., 2011
Exercise	European Heart Failure Self-Care Behaviour Scale (EHFSCB)	Holzapfel et al., 2009
		Kato et al., 2009
	Self-Care of Heart Failure Index (SCHFI)	Cameron et al., 2009
		Riegel et al., 2007
	Heart Failure Compliance Questionnaire (HFCQ)	Evangelista et al., 2001
		Schweitzer et al., 2007
	Study specific tool	Schweitzer et al., 2007
	Completion of a walking program with pedometer	Corvera-Tindel et al., 2004
Fluid and weight monitoring	European Heart Failure Self-Care Behaviour Scale (EHFSCB)	Holzapfel et al., 2009
		Kato et al., 2009
	Self-Care of Heart Failure Index (SCHFI)	Cameron et al., 2009
		Riegel et al., 2007
		Schweitzer et al., 2007
	Heart Failure Compliance Questionnaire (HFCQ)	Evangelista et al., 2001
		Van der Wal et al., 2007
	Study-specific tool	Schweitzer et al., 2007

Component of SM	Tools used to measure component	Authors who used this tool
Consulting behaviour	European Heart Failure Self-Care Behaviour Scale (EHFSCB)	Holzapfel et al., 2009 Kato et al., 2009
	Self-Care of Heart Failure Index (SCHFI)	Cameron et al., 2009 Riegel et al., 2007 Schweitzer et al., 2007
	Consulting Behaviour Subsection of EHFSCB-9	Johansson et al., 2011
Monitoring symptoms	European Heart Failure Self-Care Behaviour Scale (EHFSCB)	Holzapfel et al., 2009 Kato et al., 2009
	Self-Care of Heart Failure Index (SCHFI)	Cameron et al., 2009 Riegel et al., 2007 Schweitzer et al., 2007
Protective behaviours (annual influenza vaccination)	Self-Care of Heart Failure Index (SCHFI)	Cameron et al., 2009 Riegel et al., 2007 Schweitzer et al., 2007
Alcohol cessation	Heart Failure Compliance Questionnaire (HFCQ)	Schweitzer et al., 2007
	Study-specific tool	Schweitzer et al., 2007
Smoking cessation	Heart Failure Compliance Questionnaire (HFCQ)	Schweitzer et al., 2007
	Study-specific tool	Schweitzer et al., 2007

Authors who used self-report tools reported their findings differently from one another, resulting in varied reports of findings across studies. While some authors reported on a percentage of individuals who performed self-management (Corvera-Tindel et al., 2004; De Jong et al., 2011; Evangelista et al., 2001; Luyster et al., 2009; Morgan et al., 2006; Muzzarelli et al., 2010; Schweitzer et al., 2007; Van der Wal et al., 2007), other authors reported mean scores obtained from tools (Cameron et al., 2009; Cholowski & Cantwell, 2007; Holzapfel et al., 2009; Johansson et al., 2011 ; Kato et al., 2009; Riegel et al., 2007). No authors provided rationale to support their selection of one tool over another, beyond the tool meeting the needs of measuring the component of self-management they were interested in studying.

The administration of tools varied depending on the study and the tools used. Several authors used self-report tools, which were completed through interview by the researchers. This method was utilized with the HFCQ in two studies (Evangelista et al., 2001; van der Wal et al., 2007), the SCHFI in two studies (Cameron et al., 2009; Riegel et al., 2007), the EHFSCB in one study (Johansson et al., 2011), and the study specific tool created by Cholowski & Cantwell (2007). Cholowski and Cantwell (2007) also gave participants the option of being interviewed at the time of recruitment or in their homes. Other authors asked participants to independently complete the forms, either at home or at the time of recruitment (Kato et al., 2009; Luyster et al., 2009), or did not make this distinction (Holzapfel et al., 2009; Morgan et al., 2006). Finally, one study involved supervising the participants as they completed the self-management tools (Schweitzer et al., 2007).

For tools such as the urine sodium, the medication event monitoring system (MEMS) (De Jong et al., 2011), and the pedometer (Corvera-Tindel et al., 2004), participants were given instruction on the use of the tools, and utilized the tool independently. With serum digoxin

concentration, instructions were given to participants regarding the dosing and timing of medication taking and having blood tests drawn (Muzzarelli et al., 2010). These authors supported their findings with a self-report tool (CARDIA) in addition to serum drug levels, which was completed by participants independently.

Findings related to self-management. Findings related to self-management are presented in Appendix E. Across the studies, these findings were inconsistently presented, which created difficulty in summarizing data and presenting an overall evaluation of the level of self-management in the 14 studies.

Seven studies (50%) reported high levels of self-management (overall self-management or particular behaviours) (Cholowski & Cantwell, 2007; Corvera-Tindel et al., 2004; Holzapfel et al., 2009; Luyster et al., 2009; Morgan et al., 2006; Muzzarelli et al., 2010; Riegel et al., 2007). Studies that presented their findings on self-management as a mean score on a particular tool reported overall high scores (Cholowski & Cantwell, 2007; Holzapfel et al., 2009). For instance, scores on the EHFSCB (Holzapfel et al., 2009), and scores on a study-specific tool measuring medication taking (Cholowski & Cantwell, 2007), were high. In the mixed methods study (Riegel et al., 2007), participants were, through qualitative methods, categorized as poor, good, or expert in self-care. Across these three groupings, the SCHFI scores were on average 70 or higher, which indicated overall high levels of self-reported self-management. Others presented their findings on self-management as percentages. For instance, 87.7% of the sample in one study did not report difficulty taking medication (Morgan et al., 2006), and in another study 78.8% of the sample performed an exercise program as directed (Corvera-Tindel et al., 2004). Luyster and colleagues (2009) found 79% of their sample reported following dietary guidelines either most or all of the time. Muzzarelli and colleagues (2010) used multiple methods (serum

digoxin concentration and CARDIA questionnaire) to measure self-management. They found

corresponding results with 85% reporting high levels of self-management on the CARDIA, and

80% presenting with serum levels indicating having taken medication as directed. With both

tools, Muzzarelli and colleagues (2010) were able to demonstrate high levels of self-management

from their sample. Thus, seven studies reported high levels of self-management performance

among their samples.

Among these seven studies reporting high levels of self-management, three (42.9%) studies

(Holzapfel et al., 2009; Luyster et al., 2009; Riegel et al., 2007) used tools for measuring self-

management that had demonstrated reliability and validity testing: the EHFSCB, HFCQ, and

SCHFI. The other four studies (57.1%) (Cholowski & Cantwell, 2007; Corvera-Tindel et al.,

2004; Morgan et al., 2006; Muzzarelli et al., 2010) used tools that had either not undergone

reliability testing, or reliability scores were not reported. These included tools created either by

study authors, or measurements of distance walked, urine sodium levels, and serum digoxin

levels.

Of the 14 studies, two (14.3%) reported poor performance of self-management among their

sample (Cameron et al., 2009; Johansson et al., 2011). Of these two studies, Cameron and

colleagues (2009), using the SCHFI, reported mean scores that were below the cut-off of 70,

indicating overall lower levels of self-management. In the second study, Johansson and

colleagues (2011), using the EHFSCB, also reported a mean score representing lower levels of

self-management overall. However, with regard to the section addressing consulting behaviour,

which was their behaviour of interest, scores obtained indicated good overall performance of this

behaviour. Among these two studies reporting low levels of self-management, both authors

utilized tools with demonstrated reliability testing for measuring self-management: the EHFSCB and the SCHFI.

Of the 14 studies, five (35.7%) reported mixed findings on self-management. In one of these five studies (Schweitzer et al., 2007), various self-management behaviours were reported at a high level, such as medication taking (91.2% of sample) and smoking cessation (87.3%), whereas other behaviours were performed by a small proportion of the sample, such as following dietary guidelines (9.8%), alcohol cessation (33.3%) and daily weighing (34.3%). Another study (De Jong et al., 2011) looked at two behaviours in particular and found that diet was poorly followed by 76% of the sample, but medication taking was performed well by 56% of the sample. Similarly, van der Wal and colleagues (2007) found 98.6% of the sample self-reported taking medications as directed, 77% followed dietary guidelines, however only 33% weighed themselves daily. Self-reported medication taking as directed was also reported as occurring in 98.3% of the sample in the study by Kato and colleagues (2009). Consulting behaviour, as assessed relating to four different symptom exacerbations, ranged from 34.3% to 50.9% of the sample (Kato et al., 2009). Finally, another study found overall self-management occurred at high levels in 84.9% of their sample (Evangelista et al., 2001), however variations existed among behaviours. Medication, smoking and alcohol cessation scores were higher than 90%, indicating high levels of performance of these behaviours, whereas diet and exercise scores were less than 75%, which indicated to the authors that these behaviours were performed poorly overall.

In summary, the overall levels of self-management across all 14 studies were mixed. Half of the studies reported high levels of self-management. Five studies reported mixed results which revealed that medication taking and smoking cessation tended to occur at high levels, following dietary recommendations occurred at high and low levels, daily weighing, consulting behaviour

and exercise tended to occur at low levels. Alcohol cessation was reported by one study to occur at high levels and at low levels in another study. Two studies reported overall low levels of self-management.

Tools measuring depression. Across the 13 studies examining depression as a variable of interest, nine different tools were used to assess depression. A table can be found in Appendix B which presents a list and description of tools measuring depression. Of these nine tools, the most frequently used were the Centre for Epidemiological Studies Depression Scale (CESD), used in three (23.1%) of the 13 studies (Johansson et al., 2011; Kato et al., 2009; van der Wal et al., 2007), and the Beck Depression Inventory (BDI), also used in three (23.1%) of the 13 studies (Cholowski & Cantwell, 2007; Luyster et al., 2009; Schweitzer et al., 2007). The Patient Health Questionnaire (PHQ-9) followed with two (15.4%) of the 13 authors using this tool (Holzapel et al., 2009; Riegel et al., 2007). All tools were completed by the study participants. The only exception came from the study by Holzapfel and colleagues (2009), who used the Structured Clinical Interview for the DSM-IV (SCID) to assess depression, in addition to the PHQ-9. Holzapfel and colleagues (2009) did not describe how the SCID was administered, however, they did indicate that the tool was administered by someone other than the participant.

The administration of tools for measuring depression varied across studies. The majority of studies collected data on depression through the use of self-report tools administered through interviews (Cameron et al., 2009; Johansson et al., 2011; van der Wal et al., 2007). Authors asked participants to independently complete tools on depression (Cholowski & Cantwell, 2007; Corvera-Tindel et al., 2004; Morgan et al., 2006; Muzzarelli et al., 2010), or gave participants the choice to complete the tool at the time of recruitment or at home (Kato et al., 2009; Luyster et al. 2009). One author instructed participants to complete the tools at home (Evangelista et al., 2001),

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and one author supervised participants as they completed the tool independently (Schweitzer et al., 2007). One study used two tools to measure depression, with one tool being a self-report tool completed independently, followed by an interview (Holzapfel et al., 2009). Finally, one study did not specify how their depression measure was administered (Riegel et al., 2007).

   Findings related to depression. Thirteen (92.9%) studies in this systematic review examined depression, either alone or with anxiety. Of these 13, nine (69.2%) studies examined depression alone (Cameron et al., 2009; Cholowski & Cantwell, 2007; Holzapfel et al., 2009; Johansson et al., 2011; Kato et al., 2009; Morgan et al., 2006; Muzzarelli et al., 2010; Riegel et al., 2007; van der Wal et al., 2007) and four (30.8%) examined depression with anxiety (Corvera-Tindel et al., 2004; Evangelista et al., 2001; Luyster et al., 2009; Schweitzer et al., 2007). The overall levels of depression of participants across these 13 studies were presented in varied ways by the authors.

   Six authors were interested in the presence or absence of depressive symptoms. Three authors used the CESD, and found 25.9% (Kato et al., 2009), 39% (Johansson et al., 2011), and 40% (van der Wal et al., 2007) of their sample had depressive symptoms (a score greater than 16 on the CESD). Cameron and colleagues (2009) used the CDS and found 53% of their sample had depressive symptoms. Luyster and colleagues (2009) reported 24% of their sample had depressive symptoms as indicated on the BDI. Finally, Morgan and colleagues (2006) used the MOSD and found 29% of their sample had depressive symptoms. Thus, among these six studies looking at the presence or absence of depressive symptoms, the percentages of samples with depressive symptoms ranged from 24% to 53%.

   Low levels of depression were reported overall in five of the studies. Cholowski and Cantwell (2007) reported a mean score on the BDI of their sample indicating mild mood disturbance only. In another study (Riegel et al., 2007), mean scores of the sample on the PHQ-9 were presented

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across three groups, those poor, good, and expert in self-care. Mean scores ranged from 2.4 to 8.2, indicating depression not requiring treatment to mild depressive disorder, respectively. Another study using the GDS reported a mean score of 3.8 indicating mild to moderate depression (Muzzarelli et al., 2010). Evangelista and colleagues (2001) used the MOSF-36 and reported a mean score that indicated better mental health (lower levels of depression) than the other three studies, and Corvera-Tindel and colleagues (2004) used the MAACL and reported a mean score that indicated lower levels of dysphoria (depressed feelings) than the other three studies. Thus, across these five studies, despite the levels of depression being reported in different ways, overall low levels of depression were reported.

The remaining two studies reported their findings on depression across the continuum of depression. Schweitzer and colleagues (2007) using the BDI reported that 66.7% of their sample reported minimal depression, 21.6% reported mild depression, 6.9% reported moderate depression, and 5.9% reported severe depression. Similarly, Holzapfel and colleagues (2009) using the PHQ-9 and the SCID reported 16.7% of their sample had a diagnosis of depression, among which 10.4% were found to have major depression, and 6.3% were found to have minor depression.

In summary, across the 13 studies that examined depression, depressive symptoms were present in 24% to 53% of the samples in studies reporting on depression in this manner. The mean levels of depression reported in other studies were minimal to moderate, and when a clinical diagnosis of depression was made, 16.7% of a sample was diagnosed with depression.

Tools measuring anxiety. Among the five studies that included anxiety as a variable of interest, four tools were used to measure the level of anxiety. These tools included the State-Trait Anxiety Inventory (STAI), which was used by two authors (Luyster et al., 2009; Schweitzer et

al., 2007), the Brief Symptom Inventory (BSI) (De Jong et al., 2011), the anxiety related

components of the Medical Outcomes Survey Short Form (MOSF-36) (Evangelista et al., 2001),

and the Multiple Affect Adjective Checklist (MAACL) (Corvera-Tindel et al., 2004). Please

refer to the table in Appendix C for a list and description of tools measuring anxiety.

Tools measuring anxiety were administered in a number of ways. Some samples completed

the tool independently at the time of recruitment (Corvera-Tindel et al., 2004; De Jong et al.,

2011), one sample was asked to complete the tools at home (Evangelista et al., 2001), another

sample was supervised as they completed the tool (Schweitzer et al., 2007), and one sample was

given the option of completing the tool at the time of recruitment or at home (Luyster et al.,

2009).

Findings related to anxiety. Of the 14 studies in this systematic review, only one (7.1%)

examined anxiety alone (De Jong et al., 2011), and four (28.6%) examined anxiety and

depression together (Corvera-Tindel et al., 2004; Evangelista et al., 2001; Luyster et al., 2009;

Schweitzer et al., 2007). Findings on the levels and severity of anxiety were mixed.

Two authors used the STAI. Schweitzer and colleagues (2007) reported a mean score for

anxiety of 35.47 as measured with the STAI, and found 31.4% of their sample reported clinically

significant anxiety. Luyster and colleagues (2009) also used the STAI, and reported a mean score

of 35.6 and a percentage of the sample with clinically significant anxiety at 36%. Normative

scores on the STAI are 33.86 for males, and 31.79 for females among healthy working adults

(De Jong & Hall, 2006). De Jong and colleagues (2011) also reported a percentage of their

sample with high levels of anxiety. They used the anxiety subscale of the BSI, and reported a

mean score of 0.71, and 54.1% of their sample reporting high levels of anxiety. Normative data

on the BSI scores for healthy adults are 0.35 (SD = .45) (De Jong & Hall, 2006). Thus, among these studies reporting levels of anxiety as a percentage of their sample, 31.4% to 54.1% of samples had high levels of anxiety and scores on the various tools were higher than norm-referenced scores.

Evangelista and colleagues (2001) used the MOSF-36 which captures both depression and anxiety, and an overall mental health score of 55.6 on this tool was reported indicating better mental health (less anxiety and depression) on a scale of 0 to 100. However, it is not known what this indicates in relation to anxiety alone. Corvera-Tindel and colleagues (2004) used the MAACL, where higher scores indicate more dysphoria (depressed or anxious feelings). The mean scores for anxiety across the two categories (those who did and did not perform self-management well) were 4.8 and 5.6, out of 21 possible points. Thus, overall low levels of anxiety were present in these two studies.

In summary, findings were mixed with respect to the presence and level of anxiety. Among studies using tools that examined anxiety alone, high levels of anxiety were reported in 31.4% to 54.1% of the samples, and scores were higher than norm referenced scores. Among the two studies using tools that examined anxiety in addition to depression, overall low levels of anxiety were reported.

Findings related to self-management and depression. Depression was examined either alone, in nine studies (64.3%) (Cameron et al., 2009; Cholowski & Cantwell, 2007; Holzapfel et al., 2009; Johansson et al., 2011; Kato et al., 2009; Morgan et al., 2006; Muzzarelli et al., 2010; Riegel et al., 2007; van der Wal et al., 2007) or with anxiety, in four studies (28.6%) (Corvera-

Tindel et al., 2004; Evangelista et al., 2001; Luyster et al., 2009; Schweitzer et al., 2007). Refer to Appendix E for a detailed summary of the results from each study.

Among the 13 studies examining self-management and depression, three studies (23.1%) examined correlations between self-management and depression, and reported statistically significant findings (Johansson et al., 2011; Luyster et al., 2009; Morgan et al., 2006). Studies were interested in overall self-management (Johansson et al., 2011), or particular behaviours such as following dietary guidelines (Luyster et al., 2009) and medication taking (Morgan et al., 2006). Johansson and colleagues (2011) reported a weak correlation between more depressive symptoms and higher self-management scores (worse self-management), as measured with the EHFSCB ($r = .08$, $p = .015$). However, when examining consulting behaviour alone, no correlation was found. Luyster and colleagues (2009) examined diet and depression and reported a moderate strength correlation ($r = -.51$, $p < .01$) that indicated worse depression correlated with lower levels of following dietary guidelines. Finally, Morgan and colleagues (2006) performed chi square analysis and found statistically significant differences. Among the group reporting difficulty with taking medication, 43.8% had depressive symptoms compared to 27.1% of those reporting no difficulty with medication ($p = .006$). Thus, three studies reported statistically significant findings which suggested that a relationship exists between self-management and depression. The nature of this relationship that was indicated by findings was that worse depression correlated with worse self-management behaviour performance, however, the strength of these relationships ranged from weak to moderate.

Other studies reported on the variance in self-management. Cameron and colleagues (2009) performed multiple regression analysis to determine the degree of variance in self-care maintenance and self-care management scores that was explained by age, gender, cognitive

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function, co-morbidity, depression, social situation and self-confidence. Findings indicated mixed results. These seven variables explained 39% (F [7, 42] = 3.80, p = .003) of the variance in self-care maintenance scores (ie. behaviours such as adhering to a low sodium diet), with depression minimally contributing to this model (β = -.16, p = .28). However the finding related to depression was not statistically significant. These seven variables also explained 38% (F [7, 42] = 3.73, p = .003) of the variance in self-care management scores (ie. identifying symptom changes, implementing remedies), with depression contributing to this model (β = .32, p = .04). This finding related to depression was statistically significant. Luyster and colleagues (2009) did report correlations as mentioned previously, however they also performed multiple regression analysis and reported that psychosocial factors (depression, anxiety, and social support) accounted for 22% of the variability in performance of dietary recommendations, after controlling for the effects of covariates including age, marital status, and race (F = 6.58, p < .000). However, from this regression analysis, it was not known how much of this variability was attributed to depression alone. These studies suggest that other factors may be impacting self-management, as depression only minimally contributed to the variance in self-management scores.

Six studies (46.2%) reported findings between self-management and depression which were not expected (Holzapfel et al., 2009), mixed (Cholowski & Cantwell, 2007), or not statistically significant (Kato et al., 2009; Muzzarelli et al., 2010; Riegel et al., 2007; Schweitzer et al., 2007). Holzapfel and colleagues (2009) examined self-management among three groups with varying levels of depression (major, minor and none) and analysis of covariance, with age and gender as covariates, revealed that there were significant differences among the three groups (F|82, 282| = 5.9, p = .003). Post hoc t tests revealed that individuals with minor depression

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reported significantly lower levels of self-management than those with major depression or no depression. The authors noted that the finding was unexpected and suggested a non-linear relationship between self-management and depression existed. Furthermore, Holzapfel and colleagues conducted linear regression analysis to examine predictors of self-management. Findings suggested minor depression contributed to self-management ($\beta = -.19$, $p = .001$), as well as other variables such as age ($p < .001$), multiple morbidity ($p = .01$), left ventricular ejection fraction ($p = .001$) and family status ($p = .01$). Cholowski and Cantwell (2007) reported that depression correlated with carelessness related to medication taking ($r = -.31$, $p < .05$). Specifically, higher levels of depression moderately were correlated with more carelessness with medication taking. However, findings related to forgetfulness, or not taking medication if feeling better or worse, were not statistically significant.

Kato and colleagues (2009) found a correlation between depression and previous hospitalization ($r = -.028$, $p = .85$). Since findings were not statistically significant, depression was not included in their regression analysis to identify predictors of self-management. However, they did identify other predictors of worse self-management which were statistically significant, including diabetes ($p = .03$) and being employed ($p = .02$). Muzzarelli and colleagues (2010) reported that the group taking medication as directed had a higher mean depression score (4.3, SD = 2.8), suggesting worse depression, than those who were not taking medication as directed (3.3, SD = 2.4). However, findings were not statistically significant ($p = .30$). Riegel and colleagues (2007) found higher depression scores among those deemed poor and expert in self-management, and found lower depression scores among those deemed good at self-management. Similar to Holzapfel et al. (2009), Riegel and colleagues suggested a non-linear relationship between self-management and depression, however, the findings were not statistically significant

(p > .05). Finally, Schweitzer and colleagues (2007) explored the relationship between daily weighing, diet, fluid restricting, medication, exercise, smoking cessation and alcohol cessation, and depression, and findings were varied. However, none of the findings were statistically significant (p > .05).

Four studies (30.8%) examined both depression and anxiety (Corver-Tindel et al., 2004; Evangelista et al., 2001; Luyster et al., 2009; Schweitzer et al., 2007). While Luyster and colleagues (2009) and Schweitzer and colleagues (2007) used different tools to measure depression and anxiety, Corvera-Tindel et al. (2004) and Evangelista et al. (2001) used tools which captured both depression and anxiety. Corvera-Tindel and colleagues (2004) used the MAACL, which included both depression and anxiety, and scores for both concepts were calculated separately. However, Evangelista and colleagues (2001) used the MOSF-36, which provided an overall mental health score (capturing both depression and anxiety). Thus, it was not possible to distinguish between depression and anxiety in one study (Evangelista et al., 2001). Corvera-Tindel and colleagues (2004) reported that mean dysphoria scores (for depression only) among those performing self-management well (11.2, SD = 5.6) and those who were not (11.2, SD = 5.5), were the same (p = .99), suggesting there was no difference in the level of depression between the two groups, however this finding was not statistically significant. Evangelista and colleagues (2001) examined self-management in terms of diet and exercise. They reported a moderate strength correlation between overall self-management and mental health (including depression and anxiety) (r = .317, p < .001) indicating that better mental health was correlated with better self-management. They also reported a weak correlation between diet and mental health (r = .262, p < .05), and a moderate strength correlation between exercise and mental health (r=0.468, p < .001), with better mental health scores correlated with higher levels of behaviour

performance. Their findings were statistically significant. However, the extent to which the findings were attributed to depression alone is not known.

Among the 13 studies, one (7.7%) did not directly examine the relationship between self-management and depression. Van der Wal and colleagues (2007) examined the relationship between depression and "beliefs about the barriers to compliance", which was a moderator variable between depression and self-management. The authors found that individuals with more depressive symptoms perceived more barriers to taking medication and following dietary recommendations, and individuals who reported more barriers reported worse performance of self-management (van der Wal et al., 2007). This study was still included in the sample as it provided data regarding levels of self-management and depression, which met the inclusion criteria for this review. However, the authors chose not to examine the relationship between these two variables directly.

In summary, the findings in this review related to self-management and depression were mixed. Correlations that were identified between self-management and depression, which were statistically significant, indicated a weak to moderate strength relationship between self-management and depression. Particularly, higher levels of depression correlated with lower levels of overall self-management, and specifically medication taking and following dietary recommendations. Depression was also reported to minimally predict the variance in self-management, with statistically significant findings in relation to self-care management. Depression also minimally contributed to the variance in following dietary recommendations. Other predictors of self-management were identified besides depression, including co-morbidities, employment status, left ventricular ejection fraction, age, and family status. An unexpected and statistically significant finding in two studies was that the relationship between

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self-management and depression was non-linear. Studies looking at depression and anxiety together found moderate correlations between mental health (depression and anxiety) and overall self-management and performance of exercise, and a weak correlation with following dietary recommendations.

Among the studies examining depression and self-management reporting significant results, the median sample size was 187.5 (ranging from 51 to 958), and among the studies reporting non-significant results, the median sample size was 40 (ranging from 29 to 116). In both groups, the level of significance for statistical testing in all studies was set at .05.

Findings related to self-management and anxiety. The correlation between anxiety alone and self-management was examined in one study (De Jong et al., 2011), and with depression in four studies (Corvera-Tindel et al., 2004; Evangelista et al., 2001; Luyster et al., 2009; Schweitzer et al., 2007). De Jong and colleagues (2011) reported a statistically significant, weak correlation between anxiety and medication taking (r = .18, p = .04) indicating that higher levels of anxiety correlated with lower levels of medication taking, and a non-significant correlation between anxiety and following dietary guidelines (r = .04, p = .67). In contrast, Luyster and colleagues (2009) also reported on the correlation between anxiety and following dietary guidelines, however reported statistically significant findings (r = -.48, p < .01) that indicated a moderate strength correlation between higher levels of anxiety and lower levels of following dietary guidelines.

Schweitzer and colleagues (2007) looked at multiple behaviours of self-management, and had varied findings with regard to anxiety. Anxiety failed to predict daily weighing and fluid intake, performance of dietary recommendations, medication taking, or exercise performance (p > .05).

However, anxiety did account for 3.3% of the variability in smoking cessation (t = -2.01, p < .05) and 3.4% of the variability in alcohol cessation (t = 2.24, p < .05).

Corvera-Tindel and colleagues (2004) and Evangelista and colleagues (2001) examined anxiety with depression, as discussed in the previous section. Corvera-Tindel and colleagues (2004) reported that mean dysphoria (anxiety only) scores for those performing self-management well (5.6, SD = 3.6) were higher than among those not performing self-management well (4.8, SD = 3.5). However, these findings were not statistically significant (p = .21). Evangelista and colleagues (2001) reported that mental health (anxiety and depression) correlated with exercise (r = .468, p < .001), and diet (r = .262, p < .05) (Evangelista et al., 2001). However, as with depression, it is difficult to know the extent to which anxiety contributed to the study findings.

Of the studies examining anxiety and self-management, reporting significant results, the mean sample size was 85, and in the single study reporting non-significant results, the sample size was 39. In the studies reporting mixed results, the mean sample size was 124.5.

In summary, the findings from this review regarding anxiety and self-management were inconsistent. Among the findings that were statistically significant, a weak correlation was reported between higher levels of anxiety and lower levels of medication taking, and a moderate correlation was reported between higher levels of anxiety and lower levels of performing dietary recommendations. Anxiety was also found to minimally predict alcohol and smoking cessation. When studied concurrently with depression as mental health, a moderate correlation was reported between higher levels of mental health (less anxiety) and higher levels of exercise performance, and a weak correlation was reported between higher levels of mental health (less anxiety) and higher levels of following dietary recommendations. Among the findings that were not statistically significant, anxiety did not significantly correlate with dietary guidelines, and did

not significantly predict the variance in daily weighing and fluid intake, performance of dietary

recommendations, medication taking, or exercise performance.

CHAPTER 5

Discussion

The following chapter includes the findings on the characteristics of studies included in this review and the characteristics of individuals across studies, by comparing findings from this review with that of existing literature. Study findings related to the variables of interest, self-management, depression and anxiety, will also be discussed in relation to existing literature. A summary of findings is presented first.

Summary of Findings

There are five key findings from this systematic review that are summarized below. They are listed in the order in which they were presented in Chapter 4: 1) across all studies, the findings on the performance of self-management were mixed. Seven studies reported high levels of self-management, two studies reported low levels of self-management, and five studies reported mixed levels of self-management performance according to specific behaviours, 2) among the studies examining depression, the proportion of samples reporting the presence of depressive symptoms ranged from approximately a quarter to a half, and the level of depression was overall minimal to moderate, 3) among the studies examining anxiety alone, approximately a third to a half of the samples reported high levels of anxiety, and in the two studies that measured anxiety and depression with the same tool, anxiety was reported at low levels, 4) among the studies examining the relationship between self-management and depression, three reported a statistically significant, weak to moderate strength correlation between higher levels of self-management and higher levels of depression. Another study reported a similar statistically significant, but weak correlation, however depression and anxiety were grouped together. Depression was found to minimally contribute to the variance in self-management scores. Four

studies reported results that were not statistically significant. Finally, two studies had findings suggesting that the relationship between depression and self-management was non-linear, however in one study, findings were statistically significant and in the other study, they were not, and 5) among the studies examining self-management and anxiety, two studies had statistically significant findings indicating a weak to moderate strength correlation between self-management and anxiety. In the study that grouped anxiety with depression, a statistically significant, weak to moderate strength correlation was found. One study reported statistically significant findings that indicated anxiety minimally predicted smoking and alcohol cessation. Finally, one study did not have any statistically significant findings related to anxiety and self-management.

Study Characteristics

The majority of studies included in this review focused on the relationship between self-management and depression, with less focus upon self-management and anxiety. This was an expected finding, since this trend is noted throughout the literature (Cully et al., 2009; Konstam et al., 2005; MacMahon & Lip, 2002). This trend is of concern as researchers are recognizing that despite anxiety often being reported concurrently with depression in HF, it has not been studied to the same extent (MacMahon & Lip, 2002), suggesting that relatively greater importance has been placed on understanding depression than anxiety, thus far. Reasons for this are not clear or understood. However, the availability of tools is one possible reason. Researchers have noted that the relative lack of work focusing on anxiety among individuals with HF limits the ability to draw conclusions regarding the role of anxiety in HF at the present time (Pelle et al., 2008; Riegel et al., 2009).

Despite a search strategy that was not restrictive with regard to the year of publication, the dates of the studies indicated the infancy of this subject matter, spanning only the last 10 years

from 2001 to 2011. This is a general finding across the literature, with researchers voicing their concerns that the study of depression and anxiety in HF thus far has been limited (Lane, Chong & Lip, 2009; Riegel et al., 2009). Cully and colleagues (2009) noted that no studies existed that detail the assessment and treatment of mental health for the outpatient HF population. This topic is timely, as the prevalence of chronic illnesses, such as HF, continues to increase, and there is a greater need for research to address the barriers of living with HF, and identify solutions.

The design of studies included in this systematic review was predominantly non-experimental, and cross-sectional. Cross-sectional designs allow for the various stages or changes within a phenomenon to be described (Burns & Grove, 2009). The selection of participants experiencing different stages of a phenomenon at one point in time provides a comprehensive understanding of the totality of that experience (Burns & Grove, 2009). For instance, the range of HF classification and length of diagnosis captured among the studies' samples provided a representation of the variables of interest as they occur across the span of the HF experience. As well, cross-sectional design is a commonly used study design in nursing research (Burns & Grove, 2009). Regardless, cross-sectional design was a common limitation cited by authors, as the use of this study design did not contribute to an understanding of the direction of causality between the variables of interest. Longitudinal study designs, or prospective designs, may have allowed for a greater understanding of the direction of causality, as changes in the variables of interest may be examined in the same individuals over time.

Studies included in this review predominantly came from the USA, followed by Europe, Australia and Japan. More studies coming from the USA and Europe may be attributed to geographic size or population size. The under-representation of Japan or other Asian countries in this sample initially suggested the possibility of a relatively lower prevalence of HF among these

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countries. However, it is important to note that researchers have found the incidence of HF to be steadily rising in countries such as Japan, as a result of more Westernized lifestyles, and the epidemiological data are increasingly comparable to that of North America (Tatsumi et al., 2007). It is also important to note that only studies in English were included in this review, which may have limited the representation of research from other countries. Furthermore, in the single study from Japan (Kato et al., 2009) the proportion of depressed individuals, as measured in this study with the CESD, was the smallest across all studies, possibly suggesting a lower prevalence of mental health issues in Japan. Alternatively, this finding could also suggest the presence of stigma and subsequent under-reporting of mental health issues, like depression and anxiety, in Asian cultures (Ng, 1997). Another possible explanation for this finding may be attributed to the appropriateness of using the same assessment tool across different cultures, when that tool has not undergone reliability and validity testing in other cultures or languages (Beaton, Bombardier, Guillemin, & Ferraz, 2000). In other words, depending on where a tool was developed, imperceptible characteristics and differences, such as a reflection of a particular societal norm, may impact the study and measurement of a particular concept (Beaton et al., 2000), such as depression or anxiety.

Across the studies, the country of origin highlighted some key points. For instance, the relative lack of studies taking place in Canada was of concern as it suggested the possibility that Canadian research has not examined this area of HF research thus far. This is a notable finding as the incidence and prevalence of HF in Canada is proportional to that in the United States (Heart & Stroke Foundation, 2010; McMurray & Stewart, 2002), and the importance of improving HF self-management is no different in Canada.

The majority of studies took place in an outpatient setting. This was expected as individuals with HF spend the majority of their time out of hospital, independently managing their illness. As such, results obtained from outpatient samples may better reflect how individuals actually manage their illness. This is also an encouraging finding as the management of HF care, as with other chronic illnesses, should be moving out of hospitals, with more focus on managing one's HF with strategies and resources from the community (Bodenheimer, Wagner, & Grumbach, 2002). Samples were mostly recruited from HF clinics and university based medical centres, which excluded investigating individuals who perhaps did not have such easy access to facilities with professional knowledge and expertise. No studies included individuals from home care agencies, or independent living retirement homes as part of their inclusion criteria. As such, the levels of anxiety, depression, and self-management among these individuals with HF, from this review, are not known.

Examining response rate (refusal rates and dropout rates) as an indicator of data quality provides an examination of the internal validity of a study's findings (Burns & Grove, 2009). Depending on what is required of participants in a study, for instance how appealing or inconvenient participants may find the study to be, differences may exist between those who choose to participate in a study, and those who do not (Burns & Grove, 2009). A greater number of individuals declining to participate may indicate the presence of bias among the individuals who choose to participate in a study, and in these cases it is helpful for authors to provide the reasons for refusal, as well as to discuss the differences in characteristics between individuals who choose to participate, and those who do not (Burns & Grove, 2009).

Response rates were not reported by all studies in this review. Specifically, only three studies reported on refusal rate, and six studies reported on dropout rates. The under-reporting of

response rates in nursing research has been identified as a barrier to evidence-based nursing research (Badger & Werrett, 2005). Among the studies reporting refusal rates, only one reported the reasons for refusal, which included lack of time and participation in other studies. The refusal rates were on average fairly low in this review, ranging from 4% to 14.6%. More studies reported on dropout rate instead of refusal rate, and dropout rates were overall higher than refusal rates, ranging from 4.4% to 22.5%. The relative focus on dropout rates among researchers provides valuable findings regarding the reasons participants in HF research may not complete studies. Findings may indicate an overall willingness of individuals with HF to participate in research initially, however due to unexpected circumstances, they are unable to complete the studies. This is only one possibility, and more findings on refusal rates are needed before any concrete explanation can be provided. Reasons for dropout reported among the studies in this review included loss to follow-up, failure to complete or return tools, lack of time, hospitalization or death. This could be explained by the unstable and unpredictable nature of HF progression. Several studies reported that differences in characteristics between groups were examined, however the particular characteristics examined were not discussed and authors report that overall no differences were found. The consensus within the literature on acceptable response rates is varied, however some researchers have suggested that response (acceptance) rates of 60-69% are acceptable, and 75% has been suggested as a desirable response rate for surveys (Badger & Werrett, 2005), thus the response rates across studies reporting on this in this review were acceptable.

An assessment of the reliability of measurement tools is an indicator of data quality, particularly of statistical conclusion validity (Burns & Grove, 2009). It was important to assess if study authors placed consideration and effort on selecting reliable tools for measuring the

variables of interest (self-management, depression, and anxiety). Overall, the selection of tools for measuring depression and anxiety by study authors were tools that had reported adequate reliability. However, not all of the tools for measuring self-management had demonstrated reliability. This included tools that were created in several studies by the authors themselves, without previous testing. As such, findings from these studies must be critiqued as they were not obtained with the use of a tool with demonstrated reliability. However, this challenge may be overcome. For instance, while Schweitzer and colleagues (2007) used a tool for measuring self-management which they created, their measurement was supported with the use of a tool that had reliability testing. However, the fact that researchers felt the need to create a tool suggests that the current tools may not be viewed as the best measure of self-management. Of the tools that measured self-management that were identified in this review, the EHFSCB had the strongest psychometric properties with a Chronbach's alpha for internal consistency of 0.81 (Jaarsma et al., 2003), and captured the most behaviours of HF self-management as defined in this review, with the exception of smoking and alcohol cessation.

Power analysis is an important indicator of data quality as the likelihood of concluding that there is no significant difference between samples when in fact there is may increase if there is low statistical power (Burns & Grove, 2009), known as a type II error. Across all 14 studies, only one author explicitly discussed power. The other authors did not provide a rationale or discussion of their determination of sample size. According to Burns and Grove (2009), power analyses should be reported when authors did not reject the null hypothesis. Thus, if the study failed to detect significant relationships, power should be reported by authors, as findings may be due to inadequate sample size (Burns & Grove, 2009). Reporting power adds strength to the

meaning of findings, and also identifies changes that should be made to research methods in future studies.

Overall, the quality of data from these 14 studies based on these three indicators of data quality, was mixed. While some studies used valid and reliable tools to measure the variables of interest, and reported on refusal rates, others did not. Refusal and dropout rates were not reported in all studies. The lack of discussion of power analysis in the majority of studies presents some questions about study findings, particularly if studies reported findings that were not statistically significant and had a small sample size (Muzzarelli et al., 2010).

Sample sizes across studies spanned a large range, depending on the length of time spent on the study, and the nature of the research. The smallest sample size was from Riegel and colleagues (2007). Analysis of their data (quantitative and qualitative) may have been more labour intensive, thus necessitating a smaller sample size (Burns & Grove, 2009). However, the quantitative component should still have been supported by an adequate sample size to support statistical testing. Sample size was a variable of interest in this systematic review in order to identify any patterns between sample size and statistically significant findings. As stated in the previous chapter, in general, statistically significant findings were reported in studies involving larger sample sizes. This is expected as larger sample sizes may increase the power of a study, which increases the ability of a study to detect relationships that exist in a population (Burns & Grove, 2009). Overall, several statistically significant relationships that were detected in this review were supported by a large sample size, however several of these studies also reported findings that were not statistically significant.

Sample Characteristics

The findings from this review on sample characteristics are similar to descriptions of samples provided in other research involving individuals with HF (Friedmann et al., 2006; Lee, Yu, Woo & Thompson, 2005; Moser et al., 2010; Powell et al., 2010). The mean age was approximately 66 years, participants were mostly male, married or common-law, and had a high school education or less. With the exception of the study from Japan, samples consisted of primarily Caucasian individuals. Besides race, the study from Japan shared similar sample characteristics in all other regards, with the other studies. Individuals in the studies were largely retired or unemployed, living with HF class II to III and had been living with HF for more than six months.

Self-Management

Several concerns exist in HF research with regard to the selection of tools measuring self-management. Selection of a tool to measure a variable must be chosen to match the conceptual definition of the variable (Burns & Groves, 2009). Across studies included in this review, the conceptualization of self-management was overall not extensively discussed. Therefore, it was not always clear why researchers selected one tool for measuring self-management over another tool. Also, not all tools used across studies to measure self-management had demonstrated reliability and validity testing. Some tools were created by the study authors and did not have reliability or validity testing. The quality of such tools may be questionable, may reflect biases and there is no set way for interpreting results (Waltz, Strickland, & Lenz, 2005).

There are shortcomings to all methods used to measure self-management, and there is no gold standard. Several studies utilized multiple methods to measure self-management within their study (Muzzarelli et al., 2010; Schweitzer et al., 2007), while others did not. This may have importance to the quality of the data, as explained by Muzzarelli and colleagues (2010),

"combining different methods to assess adherence to medical therapy may significantly increase the quality of data" (p.394). The use of multiple assessment tools, as Muzzarelli and colleagues (2010) did with the use of a serum drug concentration, in addition to a questionnaire, was helpful in strengthening their measurement of self-management. However, the use of too many tools remains a concern as it may also contribute to survey fatigue or attrition rates.

The findings from this systematic review bring attention to the fact that the performance of self-management is largely evaluated by self-report, and this method may not accurately reflect what behaviours are actually being performed. Furthermore, this potential misrepresentation of behaviour may be even more evident among individuals with anxiety or depression. As noted by Holzapfel and colleagues (2009), the self-management reported by patients may differ from their actual behaviours, and one explanation for their findings may be a possible interaction between major depression and the tendency to complete tools in a socially desirable way. In other words, individuals with major depression may be more likely to complete questionnaires in a manner representing how they know they should behave, rather than how they actually behave (Holzapfel et al., 2009). Thus, it may be beneficial to further examine how it is that individuals with depression or anxiety tend to fill out self-report tools.

Medication taking, performing dietary recommendations and exercise were the three behaviours of self-management most frequently examined in the studies included in this review. Medication taking is an important part of the HF self-management regimen, and individuals with HF are often required to take multiple medications, and to make decisions regarding medications based on changes in their symptoms (Lainscak et al., 2011; Riegel et al., 2009). Thus, studying the performance of this behaviour is important. Exercise is a highly recommended non-pharmacological strategy for managing HF, and has been shown to improve symptoms and

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quality of life among individuals with stable HF (Arnold et al., 2006). Finally, performance of

dietary recommendations, particularly sodium restriction, is an often studied behaviour of self-

management, as individuals with HF seem to have increased difficulty with following the

recommendations of salt intake, which may lead to fluid overload, worsened HF symptoms and

hospitalization (Lainscak et al., 2011; Riegel et al., 2009).

Receiving an annual influenza vaccination was a behaviour that was not highly studied in this

review. This behaviour is important as protecting against influenza or pneumonia can reduce the

risk of infections of the respiratory system, which may potentially place great stress on an

already sick heart (Lainscak et al., 2011), as well as reduce the incidence of hospitalization

related to HF (Nichol et al., 1996). There has been a lack of robust evidence to support the

annual influenza vaccination as part of HF self-management (Lainscak et al., 2011), and as such

clinicians may be less confident in suggesting this to patients. However, more recent evidence

exists to support its use among older adults and the general cardiac population (Lainscak et al.,

2011). Smoking and alcohol cessation were the least studied behaviours. Smoking is one of the

most preventable risk factors for cardiovascular disease (Lainscak et al., 2011) and should be

performed by individuals with HF who smoke in order to limit the worsening condition of their

heart. It is possible that these behaviours are studied to a lesser degree because they may not be

applicable to all individuals with HF, whereas medication taking or following dietary

recommendations are.

Interestingly, among the studies with overall high levels of self-management, medication

taking, exercise, and following dietary guidelines were all reported to occur at high levels. Also,

in the five studies reporting mixed results, in other words some behaviours were performed at

high levels and some not, medication taking was reported at high levels consistently. These

findings were similar to a finding in the broader HF literature, which reported that medication taking occurred at high levels among a sample of individuals with HF (van der Wal et al., 2006). Thus, the findings of this review, as well as the broader HF literature, have identified that medication taking is reported to occur at high levels in individuals with HF. However, individuals living with HF often experience symptom exacerbation and hospital admission, and reasons cited for this have been linked to poor performance of taking medication (Riegel et al., 2009), which largely contradicts existing findings. This contradiction in findings may be attributed to the use of only self-report tools for measuring self-management, as patients may report assessments of their own abilities which may not reflect their behaviours. Thus, it is possible that patients are behaving differently from what they report in terms of their medication taking.

Three studies reported that following dietary recommendations occurred at low levels. From the general HF literature, Riegel and colleagues (2009) have noted that dietary intake of sodium among individuals with HF likely remains high, and understanding of dietary and sodium related knowledge seems to be generally poor in the HF population. Furthermore, studies have demonstrated that excess sodium intake has been a precipitating factor for many hospital readmissions among the HF population (Riegel et al., 2009). Thus, the findings from these three studies on the overall low levels of reported performance of dietary recommendations reflected this existing knowledge. However, contrary to the findings in the general HF literature suggesting this poor performance, this review also had two studies reporting that following dietary recommendations was performed at high levels. This contradictory finding is also supported in the HF literature, with one study (Nieuwenhuis, van der Wal, & Jaarsma, 2011) reporting that reported rates of following dietary guidelines were 79% and in another study, was

also 79% (van der Wal et al., 2006). Thus, mixed findings were found in this review, as well as the broader HF literature in terms of performing dietary recommendations. Among the studies that reported some behaviours were performed well, while others were not, daily weighing was consistently reported to occur at low levels, which is consistent with the general HF literature reporting low levels of performance with regard to regular weighing (van der Wal et al., 2006).

 In summary, medication taking, performance of dietary recommendations, and exercise were the three behaviours of self-management most frequently examined in this systematic review. Medication taking and exercise were reported to occur at high levels in this review. Following dietary recommendations was reported to occur at both high and low levels. Daily weighing was reported at low levels in this review. Smoking and alcohol cessation were the least studied behaviours. Compared to what is known in the general HF literature, the findings from this review appeared to be contradictory. For instance, the high levels of reported medication taking in this review are in contrast to the high levels of readmission to hospital cited in the literature, with poor medication taking often cited as a reason for readmission. Thus, there seems to be some contradiction in what is reported by samples in this review, the general HF literature, and what is actually performed among individuals with HF. Reasons for these differences may be attributed to sample characteristics and tools used.

Depression

  It has been noted in the literature (Davidson et al., 2006) that the use of multiple tools measuring depression is a challenge for researchers. Within this review, nine tools were used to measure depression. The tools included across all studies encompassed tools that are frequently found in the literature (Davidson et al., 2006; Dimos et al., 2009; Rutledge et al., 2006). However, studies tended to use only one tool to measure depression. This is reasonable as the use

of too many tools to measure depression may result in survey fatigue among study participants, and the effect being measured may be impacted by the number of times subjects respond (Burns & Grove, 2009). Authors seemed aware of this as only one author used two tools to measure depression. Holzapfel and colleagues (2009) used the PHQ-9 and the SCID, which are commonly used together, when making a clinical diagnosis of depression.

Across all 13 studies, the presence of depressive symptoms was reported in a quarter to a half of the individuals, and levels of depression were minimal to moderate. It was anticipated that levels of depression among the samples would be high, since it has been suggested that depressive symptoms occur in as high as 77% of individuals with HF (Lea, 2009). However, other studies also found a wide range of prevalence of depression and depressive symptoms among HF study samples ranging from 9% to 60% (Rutledge et al., 2006) and 24% to 85% (Lane, Chong, & Lip, 2009), respectively. Thus, the findings from this review fall within this wide range. Some reasons for the variability of reported levels of depression may include the "depression assessment method, conservative versus liberal cutoff used to classify depression's presence, inpatient versus outpatient samples, HF severity, ethnicity, age, and gender" (Rutledge et al., 2006, p. 1534). All of these reasons may have impacted the findings on depression in this review as well. The reported levels of depression in this review tended to be minimal to moderate, and this is echoed in the existing literature that has indicated that depressive symptoms are reported by individuals more frequently than major depression (Lane, Chong & Lip, 2009).

Holzapfel and colleagues (2009) found that overall there were lower levels of depression in their study than what is reported in this population, and attributed this to the two step process they employed to measure depression. However, Riegel and colleagues (2007), who also used the PHQ-9, but alone, also found low levels of depression. This suggested that the use of the

PHQ-9 alone may be sufficient in detecting depression on its own, as it was designed for this purpose (Kroenke & Spitzer, 2002). However, this is one study. The literature indicates that the PHQ-9 functions as both a diagnostic and severity measure (Kroenke & Spitzer, 2002). The use of the SCID provides confirmation of the severity assessment from the PHQ-9 when a clinical diagnosis is needed (Kroenke & Spitzer, 2002). If detecting depression severity alone is of interest, the PHQ-9 alone may be sufficient. Other evidence supports Holzapfel and colleagues (2007) findings. Thombs and colleagues (2008) noted that screening tools tend to produce high false positive results and that clinical interview may be needed to diagnose depression more accurately. Providing treatment of depression based on false high positives could lead to dangerous and unnecessary treatment (Thombs et al., 2008).

In summary, there were many tools that were used to measure depression. Depressive symptoms were reported in a quarter to a half of the samples, and this fell within the range provided in the general HF literature. The level of depression in this review was minimal to moderate, and this was also echoed in the literature.

Anxiety

The investigation of anxiety was less represented in this review, with only one study focusing exclusively on anxiety and self-management, and four studies that examined anxiety with depression. This was an expected finding as researchers have noted the relative lack of focus on anxiety in self-management literature, compared to depression (Konstam et al., 2005). De Jong and colleagues (2011) did not justify their decision to examine only anxiety, despite ample evidence in the literature suggesting depression and anxiety occur concurrently in individuals with HF (Lea, 2009; Riegel et al., 2009). In the general population, anxiety is frequently reported with depression, with two out of three individuals reporting depression also reporting anxiety

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(Oltmanns et al., 2002). However, at the same time their decision to focus solely on anxiety has highlighted the need for more research on anxiety as a predictor of self-management, as much as depression.

Across all studies, a variety of tools were used to assess anxiety. Only one tool, the STAI was used more than once. Some tools focused exclusively on anxiety, while other tools measured anxiety as only one component within their tool, such as the MOSF-36, and the MAACL. The authors of these studies did not provide any indication as to why they selected these tools over others. However, one possibility is that doing so minimized the number of tools to be completed by their study participants, as authors who implemented these tools were also studying depression in their studies. In addition, it should be noted that tools measuring anxiety have not been created exclusively for the HF population. De Jong and colleagues (2011) note that while norm referenced ranges exist for the BSI, norm referenced data pertaining to the HF population do not exist. The large variety of tools that exist to measure anxiety clearly indicates the varied conceptualizations of anxiety that exist, as well as the varied target patient populations in which anxiety is measured (Riegel et al., 2009).

It has been noted in the literature that measurement of anxiety in cardiac populations tends to involve a self-report tool, as they have been found to be affordable and also the best approach for studying emotions, such as anxiety (De Jong & Hall, 2006). There are as many as 200 tools which measure anxiety (De Jong & Hall, 2006), however not all may be relevant to cardiac populations, as not all have undergone reliability and validity testing in cardiac populations. There is literature suggesting the appropriateness of the BSI and the STAI for use among individuals with cardiac disease (De Jong & Hall, 2006) as these tools have demonstrated reliability and validity in cardiac populations. Thus, selection of these tools by authors may be

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more appropriate. Furthermore, in all five studies, data collected on anxiety were provided directly from the participant. However, some variations in tool administration did exist. In one study, participants were supervised while filling out the tools (Schweitzer et al., 2007), and in two other studies, participants took the tools home to complete within a week (Evangelista et al., 2001; Luyster et al., 2009). This has significance as anxiety levels may be reduced at home compared to in hospital. Among the studies in this review that reported on this, two studies that reported higher anxiety scores (De Jong et al., 2011; Schweitzer et al., 2007) had observed the participants while they completed the tools, and one study that had lower levels of anxiety (Evangelista et al., 2001), had participants complete the tools at home.

As stated earlier, anxiety, in the lower end of the severity spectrum, occurs in approximately half of the general population (Konstam et al., 2005). In the HF population, anxiety has been estimated to occur in 9% to 63% of individuals living with HF (Evangelista et al., 2009). Furthermore, Konstam and colleagues (2005) noted that as many as 40% of individuals living with HF may have major anxiety. Thus, the rates and levels of anxiety reported across the three of the five studies appear to reflect the literature, as it was found among these studies that a third to a half of the samples reported high levels of anxiety. However, two of the studies examining anxiety were not in agreement with other findings in the literature, as they found overall low levels of anxiety in their samples. It is important to note that these two studies used tools to capture anxiety, which were not specific to anxiety alone. The MOSF-36 and the MAACL were designed to measure general concepts of mental health and dysphoria, respectively, and so may not have the sensitivity to accurately measure anxiety.

In summary, anxiety was less frequently studied than depression in this review. The levels of anxiety reported in this review were mixed. Three studies reported high levels of anxiety among

their samples which were supported with findings from the general HF literature. Two studies reported low levels of anxiety. However in these two studies, the tools used to measure anxiety also measured depression.

Self-Management and Depression

With regard to the relationship between self-management and depression, the findings were varied. However, several studies found that overall a relationship exists between these two variables. Cholowski and Cantwell (2007) reported that depression was directly correlated with carelessness with medication taking. This was explained by the authors as relating to the attention and motivation deficits among individuals with depressive disorders. It is also important to note that Cholowski and Cantwell (2007) created their tool for measuring medication taking, and no reliability or validity testing was discussed in relation to this tool. As such, this methodological approach limits the generalizability of their findings.

While Cholowski and Cantwell (2007) reported findings relating to unintentional poor performance of medication taking, Morgan and colleagues (2006) were interested in the perceived difficulty with taking medication, and found that individuals with depressive symptoms were also more likely to report difficulty taking their medication. Difficulty with taking medication may be attributed to a number of reasons, including cost, lack of motivation, poor attitudes towards medication, or complexity of medication regimes (Riegel et al., 2009), which may or may not be associated with depression. However, depression is commonly associated with worse cognitive ability, especially among the elderly (Riegel et al., 2009), which may be a possible explanation for increased difficulty with medications among those with depression.

Luyster and colleagues (2009) reported a statistically significant correlation between depression and following dietary guidelines. However, they also reported that depression only minimally contributed to the variance in following dietary guidelines. They found that age, marital status, and race also significantly contributed to the variance in this behaviour. Furthermore, of the individuals reporting difficulties with following dietary guidelines, the most commonly reported reasons were lack of motivation, environmental obstacles, and inability to control their diet (Luyster et al , 2009). Therefore, many factors may impact one's ability to follow dietary recommendations. This is echoed in the broader HF literature, with marital status, self-efficacy, and prior hospitalization being cited as other contributors to poor performance of dietary guidelines (van der Wal et al., 2005). Excessive sodium intake has been repeatedly identified in the literature as a precipitating factor for symptom exacerbation and hospitalization among individuals with HF (Riegel et al., 2009), and it is therefore important to identify the factors, beyond depression alone, that prevent one from following dietary guidelines.

Johanssson and colleagues (2011) were interested in consulting behaviour and delay, defined as the time between symptom onset and seeking medical assistance. However, they also examined and reported a correlation between overall self-management and depression. While this finding was statistically significant, the relationship was weak. This study involved the largest sample of all studies included in this review (958 patients), and characteristics of the sample were similar to those across all studies. The authors did not discuss the possible reasons for this weak correlation. The weak relationship may suggest as indicated in other findings from this review that other factors, beyond depression, impact self-management. The authors did not find a statistically significant relationship between depression and consulting behaviour, however, they did note that individuals who self-reported performing consulting behaviour at

higher levels did not necessarily have shortened delay times. This suggested that self-reported behaviour may not necessarily reflect actual behaviours. In summary, these three studies reported relationships that indicated worse depression correlated with worse self-management on some behaviours. This overall finding is supported by the existing literature (Lea, 2009; MacMahon & Lip, 2002).

Beyond correlations, performance of regression analyses suggested that the presence of other variables contributed to fluctuations in self-management. Other variables may exist which also contribute to the performance of self-management. Cameron and colleagues (2009) reported that depression only minimally contributed to the variance in self-management. In their model, they identified several of these variables, including age, co-morbidity, gender, and self-care confidence. Luyster and colleagues (2009) identified that age, marital status and race also contributed to the performance of self-management. Thus, these findings demonstrated that depression, which theoretically explained the increased likelihood of poor self-management performance, may in fact only be one of the many reasons individuals with HF perform self-management at low levels.

While van der Wal and colleagues (2007) did not examine the relationship between self-management and depression, their findings do offer valuable insight. Belief regarding the barriers to self-management was a moderator variable between depression and self-management behaviour performance. The authors found that worse depression was associated with more perceived barriers to self-management, which in turn were associated with worse performance of self-management. This finding highlights the impact of depression on an individual's beliefs and attitudes toward self-management, and the impact of beliefs on behaviour performance.

It was anticipated that the findings from this review would reveal the relationship between depression and individual behaviours of self-management. However, several challenges prevented this analysis. Firstly, only a small number of studies reported statistically significant findings. Secondly, among these studies depression was measured with a variety of tools and reported in different ways. Thirdly, self-management behaviours were often studied as one concept, and individual behaviours were not analyzed separately, or each behaviour was not studied frequently enough on its own to allow analysis or identification of patterns in findings. This finding illustrates the paucity of literature in this area, and the need for further research in order to understand in greater depth what role depression may play on particular self-management behaviours.

Several studies had findings that were unexpected. Holzapfel and colleagues (2009) suggested that the relationship between depression and self-management may not be linear. The authors found that individuals with minor depression rather than those with major depression or no depression reported significantly lower levels of self-management. Possible explanations for this may be that individuals with HF tend to interpret the feelings and thoughts associated with depression as being related to their medical illness. Therefore, individuals with major depression may interpret their HF as being worse and sense a greater threat from their illness, and consequently pay more attention to self-management activities (Holzapfel et al., 2009).

Riegel and colleagues (2009) also reported a non-linear relationship between self-management and depression. The authors found that individuals who reported higher levels of self-management had worse depression than those reporting moderate levels of self-management. Similar to the suggested explanation by Holzapfel and colleagues (2009), Riegel and colleagues suggest that a possible explanation for this is that individuals who are more

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symptomatic, have more co-morbidities, or generally feel a greater threat from their illness, may be driven by a greater urgency to perform self-management well (Riegel et al., 2009). Although this point seems to contradict the general understanding of depression and its impact on motivation (Oltmanns et al., 2002), it is important to note that this finding from Riegel and colleagues was not statistically significant and more evidence is needed beyond the study by Holzapfel and colleagues (2007) before any conclusions can be drawn on this non-linear relationship.

Schweitzer and colleagues (2007) examined seven behaviours of self-management, none of which were predicted by depression. To measure self-management, the authors used a study specific tool they created, as well as the SCHFI. However, the SCHFI was only used to assess the validity and reliability of the tool they created. They found a weak Pearson correlation coefficient comparing items from their own tool with the SCHFI. Despite this, they go on to use the responses collected from their tool for further statistical analysis. They identify this as a limitation of the generalizability of their study findings.

Other studies with findings that were not statistically significant included the study by Kato and colleagues (2009), and Muzzarelli and colleagues (2010). These studies had on average smaller sample sizes and authors cited this as a limitation of their studies. Authors of these studies did not provide a discussion of power, therefore it is possible that a relationship did exist, however, the studies were underpowered. Other reasons for not having statistically significant findings may have been due to the use of self-report tools alone, which may have led to over-reporting of self-management (Kato et al., 2009).

Overall, the findings in this review regarding the relationship between self-management and depression were varied. Studies that performed an examination of correlation found that overall

lower levels of self-management were weakly to moderately correlated with higher levels of depression. This finding was supported by other research. Studies that performed an examination of variance found that overall depression only minimally predicted self-management, and that other factors impacted self-management besides depression. This finding was also supported by other research. However, when compared to the existing literature, which is also varied, no concrete similarities or patterns were discovered between the specific behaviours of self-management and depression. This review identified that there are methodological concerns in this area of research, which may be preventing the detection of meaningful findings, such as the use of tools for measuring self-management that had no reliability or validity testing, and the lack of power analysis among studies. Furthermore, this review highlighted the need for consistency in the way findings are reported, as findings were presented as correlations, variances, and standardized beta scores. This variability in statistical reporting, and the variation of tools measuring both depression and self-management, made it difficult to summarize findings in a meaningful way.

Self-Management and Anxiety

Although limited in number, studies in this review reported some statistically significant relationships between self-management and anxiety. De Jong and colleagues (2011) reported a statistically significant correlation between medication taking and anxiety, however not between performance of dietary recommendations and anxiety. Luyster and colleagues (2009) found a statistically significant correlation between higher levels of anxiety and lower levels of performance of dietary recommendations. However, other findings from this review, as well as findings from the general HF literature, have reported that anxiety is not a significant predictor of dietary adherence (De Jong et al., 2011; DiMatteo et al., 2000; Schweitzer et al., 2007). Thus,

while the relationship may be statistically significant, anxiety alone does not contribute to low levels of self-management. Differences in findings may be due to the method of measurement. For instance, Luyster and colleagues (2009) used a self-report tool to measure diet, whereas De Jong and colleagues (2011) used urine sodium level. Both methods have their limitations and are different with one being an objective measure and one subjective. The collection of urine for testing in the study by De Jong and colleagues (2011) was performed by study participants. The process of instructing participants in this was not described and it is not known if human error may have occurred, and subsequently impacted findings. In contrast, Luyster and colleagues (2009) utilized a self-report tool. Participants were given the option of completing the tools at home or at the time of recruitment. Overall, the methods for measuring the performance of dietary recommendations were so different in both studies that a meaningful comparison of study results is difficult.

The study by Schweitzer and colleagues (2007) was the only study examining smoking and alcohol cessation. The authors reported that anxiety minimally predicted smoking and alcohol cessation. This finding was important as it highlighted the potential negative impact of anxiety on smoking and alcohol cessation, which are both serious health hazards to individuals living with HF. Furthermore, smoking and alcohol consumption are often coping mechanisms for individuals with anxiety (Novak et al., 2003), and therefore the presence of anxiety may perpetuate these behaviours. However, the effect was small, suggesting that there may be several other factors contributing to an individual's desire to continue smoking and consuming alcohol, besides anxiety. Such reasons may include pre-existing habits that make it difficult for the individual to quit. Schweitzer and colleagues also examined five other behaviours of self-management, however anxiety did not significantly predict those behaviours. Thus, from the

limited findings on self-management and anxiety, this review has brought attention to the potential role anxiety may have in the performance of medication taking, diet, and exercise among individuals living with HF, however, these findings were inconsistent.

Corvera-Tindel and colleagues (2004) examined self-management in terms of completion of an exercise regimen, and the role of anxiety, however they reported findings that were not statistically significant. Anxiety has been identified as a predictor of exercise performance among other populations, such as post myocardial infarction patient populations (Corvera-Tindel et al., 2004), therefore the finding in this study were surprising to the authors. The authors suggest that small sample size and homogeneity of the sample (all male) may have limited their ability to detect differences. Furthermore, levels of anxiety in this sample were low. As such, the difference between those who completed the exercise program, compared to those who did not may not have been attributed by anxiety in this particular sample. Findings may have been different in a sample with higher levels of anxiety and may have been more representative of the general HF population.

Evangelista and colleagues (2001) used the MOSF-36 to assess anxiety, which was conceptually combined with depression as 'mental health'. While the authors reported a statistically significant correlation between mental health and performance of dietary recommendations, and mental health and performance of exercise, it was not possible to determine the role of anxiety alone in these findings.

Among the studies examining anxiety and self-management, reporting significant results, the mean sample size was larger (85) than among the single study reporting non-significant results (39). Thus, it may be proposed that the sample size may have impacted the likelihood of these

studies obtaining statistically significant findings, as small sample sizes may have limited the researchers' abilities to detect these relationships.

Overall, the findings in this review regarding the relationship between anxiety and self-management were varied. While a correlation was found between higher levels of anxiety and lower levels of medication taking, the correlation between anxiety and other behaviours of self-management were mixed, and no concrete patterns or similarities were detected. This review set out to further elucidate this relationship, however the small number of studies examining anxiety, the variety of tools used, and sample characteristics made it difficult to provide a meaningful summary of findings.

CHAPTER 6

Limitations, Strengths, Implications, and Conclusion

The following chapter begins with a discussion of the limitations and strengths of this systematic review. This is followed by the implications of this study with regard to research, theoretical and practice implications, and ending with a conclusion.

Limitations and Strengths

There are two categories of limitations that may create restrictions in the generalizability of a study's findings: theoretical and methodological (Burns & Grove, 2009). This systematic review was theoretically challenged as the conceptualization of self-management throughout the literature was diverse. Across all studies, there was little distinction between terms used by authors to describe self-management. The term self-care was often used interchangeably with self-management, and this contributed to a theoretical limitation not only in this systematic review, but broadly in the HF literature. As such, for the purposes of the review, a conceptualization of self-management was adopted as it was the most inclusive of the phenomenon of interest.

Methodological limitations were also encountered and included a small number of studies included for review, both overall and specifically with regard to the number of articles examining anxiety alone (there was only one). A systematic review is considered strong if it contains studies that are methodologically similar, methodologically valid, and demonstrate consistent results (White & Schmidt, 2005). While studies did have methodological similarities (cross-sectional and non-experimental), and had some similar results, the findings were not overall consistent. While results were reported which were not statistically significant, a lack of

discussion of power analysis was a limitation, as it was not known if studies were underpowered, and therefore the possibility of type II errors was not discussed.

Due to the limited number of articles included in this review, as well as the variety of tools available for measuring the variables of interest, the criteria for inclusion in this review were left quite broad. While necessary, and ultimately providing a breadth of information, this broad inclusion criteria may be construed as a limitation as the articles presented data in such different ways. Other methodological limitations included the use of instruments in some studies which had not undergone reliability and validity testing. The use of such tools brings into question the credibility of the study findings as the data were collected from tools that had not undergone rigorous testing.

Different statistical tests were used and the manner of reporting statistical findings varied as well. Data acquired through various methods (self-report, physiological measures, electronic measures) and varied statistical tests and findings (percent variability, standardized beta scores, t-tests, chi square tests, correlation coefficients) made it difficult to meaningfully compare findings across all studies. Thus, findings have been presented descriptively.

A strength of the review was that the overall description of the samples across studies was representative of what has been found in the general HF literature, suggesting that perhaps the findings from these studies represented the population of interest well overall, and this improved the generalizability of findings.

Implications

    Research implications. Systematic reviews are often conducted to determine if there is a

need for further research (Moher et al., 2009). In this systematic review, several research

implications were revealed. Firstly, there is a need for more research regarding depression and

anxiety in HF. This review has identified that there is much variability in the rate of depression

and anxiety in the HF population. Further research should focus on identifying the causes of this

variability, so that the rates of depression and anxiety may be reported more consistently in the

literature. There is enough evidence indicating the elevated rates at which depression and anxiety

occur concurrently in HF, to suggest that more research is needed to understand the antecedents

and consequences of depression and anxiety in HF.

    In addition to cross-sectional studies which have dominated this area of research, longitudinal

studies are needed. Heart failure is a progressive illness and worsens over time. Without

longitudinal studies, it is difficult to know not only how individuals adjust over time in terms of

self-management, but also how depression and anxiety evolve over time in this population.

However, in conducting longitudinal studies with this population, researchers also need to be

mindful of attrition rates. Several factors such as hospitalization, decreased motivation, or death

are likely to occur in this study population, and may contribute to high rates of attrition in

longitudinal studies. Furthermore, only a small number of studies were found that examined the

relationship between self-management and depression and anxiety, as evidenced by the small

sample of 14 in this review. More research is needed to understand the nature of this relationship.

Since some of the findings from this review revealed that depression and anxiety may only

minimally predict self-management, researchers should further investigate the other modifiable

and non-modifiable risk factors that predict poor self-management, such as self-efficacy, marital status, and age.

It was suggested in two studies that the relationship between self-management and depression is non-linear. Specifically, the levels of self-management in individuals with minor depression may be lower than in individuals with major depression, or no depression. More studies are needed to explore this unexpected finding. In order to do this, researchers will need to measure depression with tools that distinguish between minor and major depression in order to detect these differences in self-management between groups. If this finding is supported with more research, the creation of self-management interventions for those with major depression may differ from those with minor depression or no depression.

This review revealed that there is a relative lack of work in this area in Canada. Canadian researchers should recognize this as a concern as the incidence and prevalence of HF in Canada continues to rise, and the pressures on the healthcare system are increasing. Furthermore, there is a need for testing of reliability and validity of tools measuring self-management, depression, and anxiety across cultures and in different languages. This may be an area of focus for research in Canada, as the population of individuals living with HF in Canada involves many cultures and languages (Howlett et al., 2010).

This review has identified that there needs to be more methodological and conceptual consistency among researchers in studying HF self-management. Methodologically, researchers should more uniformly report on refusal and dropout rates, and power, and standardize the manner in which individuals with HF are asked to complete self-report tools. These were inconsistencies noted in this review, and reporting on this information may reveal valuable findings in future research. Conceptually, there is a need for researchers to more clearly define

their understanding of self-management and to provide rationale for the selection of their tool for measuring self-management. To accomplish this, researchers may consider performing further conceptual analyses of self-management.

This review has identified a need to reassess current tools measuring HF self-management, as evidenced by the fact that three study authors felt the need to create their own tools to measure self-management. Tools for measuring HF self-management should capture all the behaviours of self-management, and undergo reliability and validity testing in HF populations. Of all the tools included in this review measuring self-management, the EHFSCB and the SCHFI captured the most behaviours of HF self-management, however the EHFSCB demonstrates the highest levels of psychometric testing. Researchers may consider revising the EHFSCB to include smoking and alcohol cessation, and annual influenza vaccination, and revising the SCHFI to include smoking and alcohol cessation. However if this is done, further psychometric testing should be performed on the revised tools.

This review found that medication taking was reported at high levels by individuals. However, the literature continues to report that individuals with HF are readmitted to hospitals with symptom exacerbations resulting from poor medication taking. Thus, there appears to be a discrepancy between what is reported by patients, and what is actually performed. Thus it may be beneficial in future to use multiple methods of measurement for self-management, including both self-report and objective measures, as self-report alone may not be a true representation of patient behaviours.

Depression and anxiety were examined either alone or in combination in this systematic review. The variety of tools measuring depression and anxiety, as well as the various statistical calculations across studies, made it difficult to standardize findings. Researchers conducting

similar work would benefit from collecting and analyzing data using similar methodology to allow for better comparisons across studies, including the selection and administration of tools. To accomplish this, more work is needed to identify tools that are the most appropriate for measuring the particular concept of interest. For instance, tools selected for measuring anxiety or depression in individuals with HF should account for the overlap in somatic symptoms, such as fatigue, pain, or heart palpitations. Since these symptoms are present in both HF and depression/anxiety, the assessment of depression and anxiety may not be accurate, if the reason for the presence of these symptoms is due to HF.

Furthermore, only one study examined self-management and anxiety alone. Further research would be helpful in this particular area to determine which behaviours of self-management are most impacted by anxiety, and which tools are best suited for measuring anxiety among individuals with HF. One study measured depression and anxiety together, and it was not possible to know if self-management was related to depression or anxiety. Thus, the decision to study depression and anxiety together or separately should be better supported. Researchers should consider addressing both depression and anxiety together in a study, as they tend to occur concurrently, however the measurement of each concept within the study should remain separate.

Finally, as discussed earlier in this review, the terms 'compliance' and 'adherence' represent a conceptualization of self-management. While these terms have been used frequently in the past, it is suggested that researchers adopt a different view of self-management, as these terms carry with them negative connotations (van der Wal et al., 2005), and may impact the attitudes healthcare providers have toward patients and their families. Researchers should consider conceptualizing self-management as occurring along a continuum, as this does not devalue patients' efforts as the terms 'compliance' and 'adherence' do.

Theoretical implications. The theoretical discussion regarding the relationship between self-management and depression and anxiety is poor throughout the literature, as evidenced by a lack of utilization of conceptual frameworks throughout the studies included in this review. Without a sound understanding of the concepts themselves, or the interrelationship among concepts, it is difficult to attach meaning to findings. For instance, self-management, as defined in this review, involved the performance of nine behaviours related to HF. Studies tended to examine either only one behaviour or overall self-management as defined by a tool, however no study examined all nine behaviours. The conceptualization of HF self-management was clearly described in this review, and may be used by other researchers to clarify their understanding of HF self-management.

Each of the behaviours is important to overall HF self-management. For instance, if a researcher conceptualized self-management as an individual taking medication as directed, an individual with HF reporting taking their medication consistently and correctly may be considered self-managing at high levels. However, if this individual continues to smoke and consume alcohol, they are not in fact self-managing at a high level related to these specific behavioural recommendations. One suggestion for improving the theoretical assumptions surrounding self-management would be for researchers to not only define self-management, but describe what behaviours are included in their definition of self-management. In addition, the interchanging of terminology like self-care with self-management, as discussed earlier in this thesis and by other researchers (Jones et al., 2011; Richard & Shea, 2011), deserves more attention, and some consensus on terminology should be reached.

Practice implications. The traditional management of HF is now challenged by an increased focus on self-management (Butler & Kalogeropoulos, 2008). Nearly half of all readmissions to

hospital for HF are preventable (Hoyt & Bowling, 2001). Individuals can prevent such occurrences by improving their ability to self-manage. The findings from this review indicated that medication, diet and exercise are the three most studied behaviours of HF self-management. Individuals with HF reported high levels of self-management in terms of medication taking, specifically. This may indicate the relative importance this component of self-management has in terms of practice. The performance of exercise and dietary recommendations also tended to be high, but results varied. Daily weighing occurred at low levels. Also, protective behaviours such as influenza vaccinations, smoking cessation and alcohol cessation were infrequently studied, suggesting perhaps these behaviours are viewed with low priority in practice as well. Therefore, healthcare providers should be made aware of the importance of all the behaviours of self-management, and ensure that patients receive the information they need to accomplish all the behaviours of self-management.

The selection of tools measuring self-management is important not only for research purposes, but also for clinical and practice-related purposes. Measuring self-management provides practitioners with important information about their patients' abilities to manage their HF. Tools should be selected for use in practice that are able to capture as cohesively as possible, all the behaviours of self-management. Tools measuring self-management are infrequently used in practice, however, the EHFSCB and the SCHFI may be useful for practitioners to use in practice to quickly identify areas of concern with regard to a patient's self-management (Cameron, Worrall-Carter, Driscoll, & Stewart, 2009).

Consideration should be placed on selecting tools to assess depression that are appropriate for the population in question. Individuals aged 65 and over represent the majority of the HF population, and it has been noted in the literature that diagnosing depression in the elderly is

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challenging as depression presents atypically in this demographic (Holroyd & Clayton, 2000). Interestingly, the GDS has been found to be the best validated measure of depression among older adults (Holroyd & Clayton, 2000), however, only one author out of 13 used this tool despite a mean age of 66 across all studies in this review. However, more work is needed to assess the appropriateness of the GDS, specifically in the HF population.

As mentioned before, the somatic symptoms of HF can mimic those of depression, therefore, it is important for those in practice to be aware of this, and to advocate for the thorough and appropriate assessment of depression among individuals living with HF. It is also important to measure the level of anxiety in individuals with HF. Literature has indicated that individuals with HF may have higher levels of anxiety than individuals with other cardiac conditions (De Jong et al., 2011). Despite knowing that anxiety is often intertwined with depression in HF patients, it is still infrequently identified by practitioners (Konstam et al., 2005). Bennett and colleagues (1997) note that many readmissions to hospital for HF are preceded by increased levels of anxiety, suggesting that there may be value in better assessing and monitoring the levels of anxiety in individuals living with HF.

There is also a need to standardize and streamline the tools measuring depression and anxiety in the HF population. Firstly, the recognition and treatment of depression and anxiety in HF populations needs substantially more attention, and increased proficiency is needed with its identification and treatment by healthcare providers. Secondly, the assessment of self-management by the interdisciplinary healthcare team needs to improve and become more consistent, specifically with the selection of measurement tools. The high rates of readmission among individuals living with HF to hospital, situate nurses in an advantageous position to improve their understanding of the relationship between self-management and depression and

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anxiety, and use this knowledge in their assessment of and interaction with patients. Findings on HF self-management need to be inclusive of psychological and motivational factors, and treatment of depression and anxiety should be considered for incorporation into the overall self-management plan more routinely. Although the results of this study indicate that depression and anxiety may only minimally contribute to low levels of self-management, this does not minimize the importance of addressing depression and anxiety among this population

Conclusion

Heart failure is rising in prevalence, as 50,000 new diagnoses are made each year (Heart and Stroke Foundation, 2010) in Canada. There exists a need to address the issues facing individuals living with HF, and assist them as best as possible, if they are expected to function independently with their illness. This systematic review examined self-management among individuals living with HF and in particular the role depression and anxiety play in the performance of self-management. A conceptual framework involving self-management (Jones et al., 2011; Lorig & Holman, 2003; Richard & Shea, 2011), and depression and anxiety guided this review and provided insight into the potential negative impact of depression and anxiety on HF self-management. Furthermore, this study was able to identify the areas requiring further development in theory and methodology, and make some suggestions for contributions to future research and practice. The experience of depression and anxiety among individuals with HF deserves more attention, and improvements in its recognition and treatment have the potential to greatly benefit this population.

Appendix A

Tools Measuring Self-Management

Tool	Description of Tool
European Heart Failure Self-Care Behaviour Scale (EHFSCB)	The European Heart Failure Self-Care Behaviour scale is a 12-item, self-administered questionnaire that addresses the behaviours of heart failure self-care (Jaarsma et al., 2003). Items were selected for inclusion based on expert ranking of importance among several behaviours. The final scale includes 12 items scored on a Likert scale from 1 to 5. Lower scores indicate higher levels of self-management (Jaarsma et al., 2003). Face validity, concurrent validity, and internal consistency of the tool were tested. Cronbach's alpha was found to be 0.81 (Jaarsma et al., 2003). It is a valid, reliable and practical tool to evaluate patients' self-care practices (Jaarsma et al., 2003). This scale has also been found to be valid and reliable when translated into Japanese. Internal consistency was satisfactory at 0.71, and test-retest reliability was found to be adequate, with a correlation coefficient of 0.69 (Kato et al., 2008).
Heart Failure Compliance Questionnaire (HFCQ)	This tool is a modified version of a compliance questionnaire originally designed to measure compliance behaviours in patients with myocardial infarction (Evangelista et al., 2001). Evangelista and colleagues (2001) developed the HFCQ to assess regimen issues related to individuals with HF. The HFCQ is a self-report tool that measures the compliance of patients to behaviours related to keeping medical appointments, taking medication, following dietary guidelines, exercising, and smoking and alcohol cessation (Evangelista et al., 2003). Responses are scored along a Likert scale, ranging from 1 to 5. Higher scores indicate higher levels of self-management (Evangelista et al., 2003). Content validity was established by a panel of experts. Internal consistency has also been tested resulting in a Cronbach's alpha of 0.68 (Evangelista et al., 2001). While this may be low, the authors note that the performance of one behaviour within the tool may not necessarily imply performance of

Tool	Description of Tool
	another behaviour (Evangelista et al., 2003).
Self-Care of Heart Failure Index (SCHFI)	The SCHFI is a 15-item self-report scale that is rated on a 4 point Likert scale and divided into 3 subscales (self-care maintenance, self-care management, and self-care confidence). The 15-items address self-care in individuals with HF. Reliability has been found to be adequate with an alpha of 0.76. Construct validity has been shown with satisfactory model fit on confirmatory factor analysis (Riegel et al., 2004). The tool captures fluid and weight monitoring, diet, exercise, annual flu vaccination, consulting behaviour, medication, and symptom management under the self-care maintenance and self-care management sections (Riegel et al., 2004).
CARDIA-questionnaire	In the study by Muzzarelli and colleagues (2010), three questions based on those in the CARDIA questionnaire were used to assess medication taking. The citation provided for the CARDIA questionnaire (Cutter et al., 1991) does not discuss the 3 medication related questions which were included in their study, however Muzzarelli and colleagues (2010) claim this tool has been validated, although no discussion of reliability or validity was included in the article they cited (Cutter et al., 1991).
24-hour Urine Sodium Levels	Currently, urine sodium level is the most objective predictor of dietary sodium intake (Bentley, 2006). A 24-hour sodium sample can account for 95% to 98% of one's daily sodium intake. However, there is variability within-persons and so multiple measurements improve accuracy. Validity and reliability of data are dependent on the quality of collection and analysis of the sample (Bentley, 2006).
Medication Event Monitoring System (MEMS)	The medication event monitoring system is a computerized device within a cap of a medication bottle that records when and how frequently a bottle is opened. Information is then downloaded to a computer for evaluation. This device has been used in a variety of medical populations (Diaz et al., 2001). Use of such devices has become a preferred method of monitoring medication taking (Farmer, 1999).
Pedometer	Pedometers have been found to be a valid measure of exercise adherence (Evangelista et al., 2005). Their ease of use and affordability have made them a widely used tool to assess exercise. Some limitations exist however, therefore it is recommended that journals be used concurrently with pedometers to allow more accurate documentation of exercise (Evangelista et al., 2005).

Tool	Description of Tool
Serum Digoxin Levels	Authors did not report on validity or reliability of use of serum digoxin levels.

Appendix B

Tools Measuring Depression

Tool	Description of Tool
Beck Depression Inventory (BDI)	A 21-item scale that explores how respondents have been feeling the past week. Each symptom is rated on a 4-point Likert scale from 0 to 3, and scores range from 0 to 63. Individuals with a BDI score of 10 or more are considered to have mild symptoms of depression, at the very least (Frasure-Smith et al., 1999) In non-psychiatric populations, the BDI has been shown to have internal consistency of 0.81 reported with a Cronbach's alpha, and test-retest reliability of 0.83 (Beck et al., 1988; Lane et al., 2002).
Patient Health Questionnaire (PHQ-9)	The PHQ-9 scores the 9 DSM-IV criteria for depression on a scale of 0 (not at all) to 3 (almost every day) to determine the severity of depression This tool has been validated, and internal reliability has been reported with a Cronbach's alpha of 0.89 (Kroenke et al., 2001). A score greater than or equal to 9 indicates a need to assess for depressive disorder (Kroenke et al., 2001).
Centre for Epidemiological Studies Depression Scale (CESD)	The CESD is a 20-item self-report scale designed to measure depressive symptoms among the general population. Internal consistency (Cronbach's alpha = 0.85) and test-retest reliability was found, and construct validity has been established (Radloff, 1977). A score of greater than or equal to 16 indicates the presence of depressive symptoms (Radloff, 1977).
Multiple Affect Adjective Checklist (MAACL) (Depression component of tool)	The MAACL was designed to measure depression, anxiety and hostility. The scale has been used frequently in nursing research. There are 132 adjectives, 89 are used to measure affect: 21 assess anxiety, 40 assess depression, and 28 assess hostility. The remaining 43 adjectives are not scored. Reliability has been found to be adequate and validity has been demonstrated (Jacobsen et al., 1996).
Medical Outcomes Study Short Form – 36 General Health Survey (MOSF-	The MOSF-36 is a general health survey. Physical health as well as mental health are captured on this scale. Mental health is further assessed. This is based on four subscales including a vitality subscale (4 items), a social function subscale (2 items), a role emotional subscale (3 items) and a mental health subscale (5 items) (Evangelista et al., 2001).

36) (Depression component of tool)	Total scores are on a scale of 0 (worst health) to 100 (best health). Internal consistency for the mental health subsections has been reported with a Cronbach's alpha of 0.95 and a test-retest reliability of 0.75 (Brazier et al., 1992). Construct validity has also been demonstrated (Brazier et al., 1992).
Medical Outcomes Study Depression Screen (MOSD)	An 8-item questionnaire to screen for depressive disorders. Usual cut off point is 0.06, and scores greater than this indicate major depression. This tool has been shown to have acceptable reliability testing (sensitivity and specificity), and has been validated in primary care settings (Mulrow et al., 1995).
Structured Clinical Interview for DSM-IV (Diagnostic and Statistical Manual of Mental Disorders)	The SCID is considered a gold standard in the diagnosis of clinical mental health disorders. Inter-rater reliability testing for this tool has been done extensively and has consistently ranged from adequate to excellent (Lobbestael et al., 2011).
Cardiac Depression Scale (CDS)	Has had psychometric testing (reliability and validity testing) and found to be an appropriate tool to assess depressed mood in cardiac populations. A 26-item tool, with 7 subscales assessing sleep, anhedonia, uncertainty, mood, cognition, hopelessness, and inactivity. A 7-point scale is used for responses (Hare, 1996).
Geriatric Depression scale (GDS)	The GDS is a 30-item inventory, with answers presented as yes or no (Mui, 1996). This is a lengthier test, taking 10 to 15 minutes to administer. Intended for adults over the age of 60. Test-retest reliability has been reported at 0.85 and internal consistency at 0.94. Has been validated and is able to distinguish between normal, mild to severely depressed. Symptoms reported: 10 or fewer are normal, 11 to 20 have mild depression, and 21 or more symptoms have moderate to severe depression (Mui, 1996).

Tools Measuring Anxiety

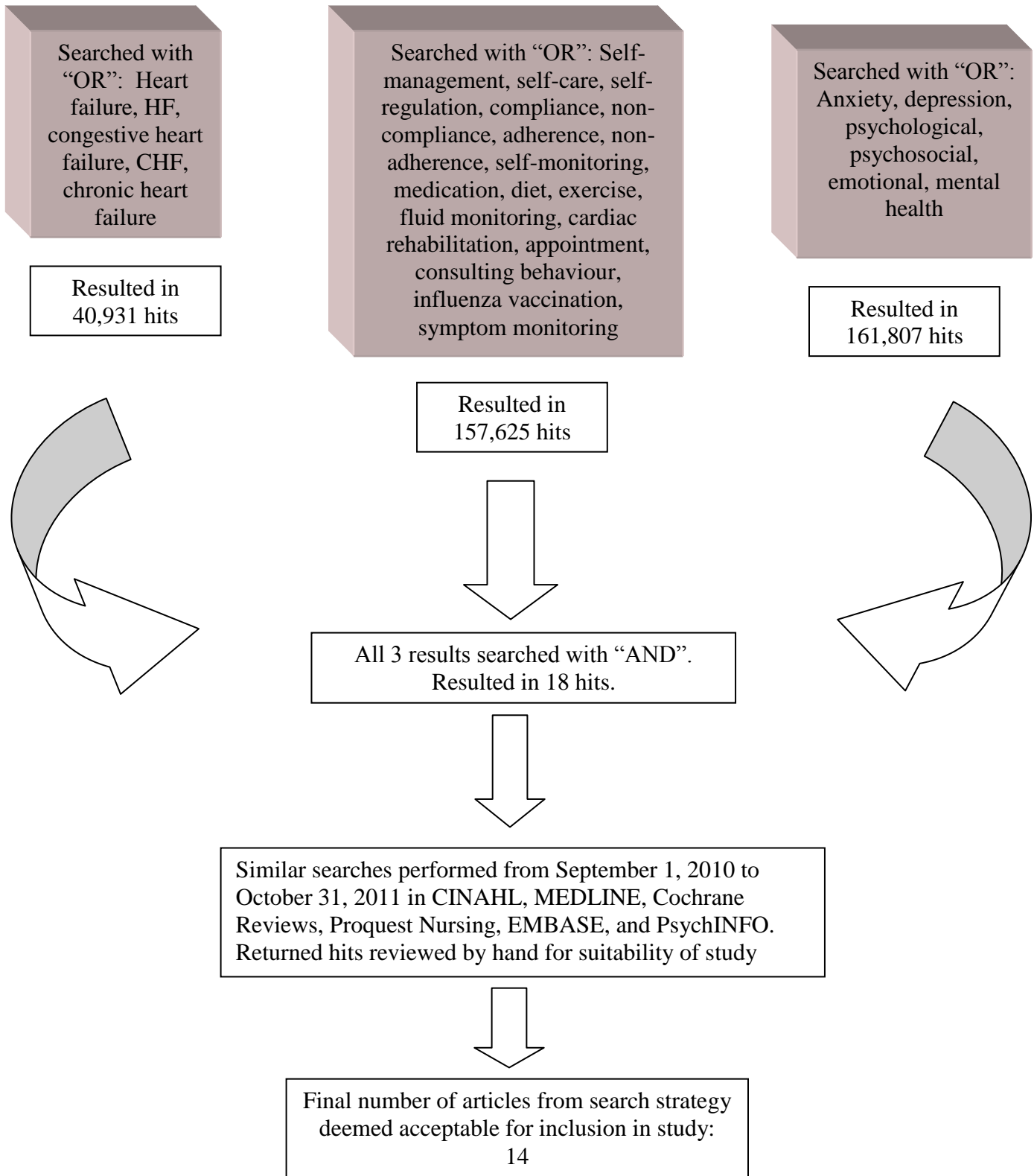| Tool	Description of Tool
State-Trait Anxiety Inventory	A 20-item scale that asks individuals to rate on a 4 point Likert scale how they generally feel, in relation to general symptoms of anxiety (Trait anxiety). Scores for each sub-scale range from 20 to 80. A score of 40 or more is interpreted as a risk of clinical anxiety. Takes about 10-20 minutes to complete. Cronbach's alpha for use of this tool in cardiac populations have ranged from 0.93 to 0.94 (De Jong & Hall, 2006).
Medical Outcomes Study Short Form – 36 General Health Survey (MOSF-36) (Anxiety component of tool)	The MOSF-36 is a general health survey. Physical health as well as mental health are captured on this scale. Mental health is further assessed as well-being, anxiety and depression. This is based on four subscales including a vitality subscale (4 items), a social function subscale (2 items), a role emotional subscale (3 items) and a mental health subscale (5 items) (Evangelista et al., 2001). Total scores are on a scale of 0 (worst health) to 100 (best health). Internal consistency for the mental health subsections has been reported with a Cronbach's alpha ranging from 0.73 to 0.96. Construct validity has also been demonstrated (Brazier et al., 1992).
Multiple Affect Adjective Checklist (MAACL) (Anxiety component of tool)	The MAACL was designed to measure depression, anxiety and hostility. The scale has been used frequently in nursing research. There are 132 adjectives, 89 are used to measure affect with; 21 assess anxiety, 40 assess depression, and 28 assess hostility. The remaining 43 adjectives are not scored. Reliability has been found to be adequate and extensive validity has been demonstrated (Jacobsen et al., 1996).
Brief Symptom Inventory (BSI) (Anxiety)	A 6-item anxiety subscale exists within the Brief Symptom Inventory. This subscale describes symptoms associated with anxiety, but not physiological symptoms (De Jong & Hall, 2006). A scale of 0-4 is used to rate their distress regarding these symptoms. Scores are averaged, and the final score is between 0 and 4. Higher scores represent higher level of anxiety.

Validity has been reported for this subscale, and Cronbach's alpha ranged from 0.85 to 0.90.

Appendix D

Search Strategy

Searched with "OR": Heart failure, HF, congestive heart failure, CHF, chronic heart failure

Searched with "OR": Self-management, self-care, self-regulation, compliance, non-compliance, adherence, non-adherence, self-monitoring, medication, diet, exercise, fluid monitoring, cardiac rehabilitation, appointment, consulting behaviour, influenza vaccination, symptom monitoring

Searched with "OR": Anxiety, depression, psychological, psychosocial, emotional, mental health

Resulted in 40,931 hits

Resulted in 157,625 hits

Resulted in 161,807 hits

All 3 results searched with "AND". Resulted in 18 hits.

Similar searches performed from September 1, 2010 to October 31, 2011 in CINAHL, MEDLINE, Cochrane Reviews, Proquest Nursing, EMBASE, and PsychINFO. Returned hits reviewed by hand for suitability of study

Final number of articles from search strategy deemed acceptable for inclusion in study: 14

Appendix E

Study Characteristics, Sample Characteristics, and Study Results

Studies Examining Self-Management and Depression				
Study (Author, Design, Tools, Purpose)	**Study and Sample Characteristics**	**Findings on Levels of Self-Management**	**Findings on Levels of Depression**	**Reported Results**
Cameron et al. (2009) Non-experimental – descriptive SCHFI CDS To test the hypothesis that cognitive function and depressive symptoms would predict	Australia Inpatient Sample = 50 Mean age = 73 (SD = 11) 76% male 50% Class III or IV HF 60% married 30% less than high school	SCHFI used, higher scores indicate better self-care. Mean self-care maintenance score was 67.8 (SD = 17.3) (range 25-100), and mean self-care management score was 50-0.4 (SD = 16.64). Overall self-care in this sample was poor. Scores ≥70 on each section was evident in only 52% of the sample in performing self-care maintenance, and 12% in self-care management.	53% (n=27) of the sample had a score on the CDS that indicated the presence of depressive symptoms.	Multiple regression analysis was used to identify predictors and to determine the variance in self-care maintenance and self-care management scores that was explained by cognitive function, depression, co-morbidity, gender, social situation, age and self-care confidence. The 7 variables explained 39% (F [7, 42] = 3.80; p = .003) of the variance in self-care maintenance scores with age making the largest contribution to self-care maintenance scores (β = .51, p = .001) and depression in this model producing a β = -.16, p = .28. The 7 variables explained 38% (F [7, 42] = 3.73; p = .003) of the variance in self-care management scores with higher self-care confidence as a predictor variable making the largest contribution to self-care management scores (β = .39, p <.01), and depression in this

heart failure self-care.				model producing a β = .32, p = .04. Only 2 variables contributed significantly to the variance in self-care maintenance: age (p < .01) and moderate to severe co-morbidity (p < .05). Four variables contributed significantly to the variance in self-care management: gender (p < .05), moderate to severe co-morbidity (p < .05), depression (p < .05), and self-care confidence (p < .01).
Cholowski & Cantwell (2007). Non experimental – exploratory correlational design Tool created by authors to measure medication taking Beck	Australia Outpatient cardiac rehabilitation centre. Sample = 51 Mean male age = 72.79 (SD = 7.64) Mean female age = 71.5 (SD = 9.28) 61% male	A self-report measure created by the study investigators used to measure medication taking. Assessed forgetfulness, carelessness, stopping meds if feeling better, and stopping meds if feeling worse, representing non-intentional and intentional forms of compliance. Coded 0,1,2 (non compliant to compliant). No info on any predetermined cut off scores. Total score from 0-8.	BDI completed by all participants. Mean score was 12.68, SD = 9.35, indicating mild mood disturbance and not clinical depression. The following was reported: No depression (n=28), mild mood disturbance (n=13), borderline clinical depression (n=7), moderate depression (n=2), severe depression (n=4).	Pairwise correlations examined the correlations between patho-physiological characteristics, psychosocial characteristics, and medication beliefs against self-reported medication compliance behaviours. Depression correlated with four compliance behaviours related to medication taking (forgetfulness, carelessness, and stopping medications when feeling better or worse) and total compliance. The only statistically significant result (p < .05) was for carelessness, r = -.31. The correlation between depression and total compliance score was -.15, but p > .05.

Depression Inventory To examine the relationship between psychosocial and pathophysiological measures in explaining medication compliance among patients with HF.		Mean score was 6.92, SD=1.07 Overall, the average self-reported self-care in terms of medication taking in this sample was high.		
Holzapfel et al. (2009) Non-experimental - descriptive EHFSCB PHQ-9	Germany 3 CHF outpatient departments Sample = 287 Mean Age = 63 (SD =	Mean scores of the 287 participants on the EHFSCB was 4.0 (SD=0.6) on a scale of 1 to 5, thus overall self-management was reported at high levels in this sample. Authors reversed the	PHQ-9 administered first, and 30.2% (n=87) scored ≥9 indicating a need for further assessment with the SCID SCID administered to the 30.2% who scored ≥9 on the PHQ-9. Of the sample of 287, 16.7% (n=48) had	ANCOVA (with age and gender as covariates) was conducted to compare reported self-care behaviour among patients with CHF with different degrees of depression severity (major depression, minor depression, and no depression). ANCOVA (age and gender as covariates) showed significant difference among the 3 depression groups (F|82,282| = 5.9, p = .003). Post hoc t tests showed that this difference was

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SCID (DSM-IV) To investigate self-care behaviour among patients with CHF with different degrees of depression.	11.8) 74.7% male 98.8% class II and III HF	scoring for the tool, so that in this study higher scores represent higher levels of self-care.	a depression diagnosis, specifically 10.4% (=30) with major depression, and 6.3% (n=18) with minor depression.	due to patients with minor depression. Patients with minor depression reported significantly less self-care than patients with major depression (t [46] = 2.2, p = .03)) or no depression (t [255] = 3.6, p ≤ .001). Patients with major depression did not significantly differ from the patients who were not depressed (t [267] = 1.2, p = .23). To identify other relevant predictors of self-care, bivariate correlation analyses were also performed. From the bivariate correlation analysis, those variables with a p ≤ .05 were used in a stepwise linear regression analysis. In addition to minor depression, age (p < .001), multiple morbidity (p = .01), LVEF (p = .001), and family status (p = .01) determined self-care. Linear regression analysis with stepwise selection procedure for self-care and minor depression produced a standardized β = -0.19, p = .001.
Johansson et al. (2011). Non-experimental – retrospective, descriptive	Sweden Inpatient Sample = 958 Mean age = 71 (SD = 11)	EHFSCB-9 used to measure a total SC score (0-45) and the section specific to consulting behaviour (0-20) Higher scores indicate less consulting behaviour, or	Of all the participants, the mean score of the CES-D was 15 (SD=13), which on a scale of 0-60 indicates lower levels of depression. 39% of participants	Patients with depressive symptoms had longer delays compared to those without depressive symptoms (120 vs 54 h, p = .001). Patients with depressive symptoms were 1.5 times more likely to delay ≥72 h. Consulting behaviour did not correlate with depressive symptoms, but was weakly correlated to delay (r = -.07, p = .03).

| EHFSCB-9

CESD

To determine whether depressive symptoms are associated with consulting behaviour | 63% male

5% Class II HF
95% Class III and IV

60% Common law | worse performance of self-care.

Overall, a mean EHFSCB-9 score of 34(5.5) was found, which on a range of 0-45 is at the higher end of the scale indicating worse self-care overall.

The mean consulting behaviour score was 8(3.3), which on a range of 0-20 indicates moderate levels of consulting behaviour. | (n=377) reported a CES-D ≥16 indicating depressive symptoms. | Categorical variables were presented as numbers and percentages and analyzed with chi-square test. Continuous variables were analyzed with Student's t test or Mann Whitney U-test.

A logistic regression analysis (backward stepwise) was used to assess a potential association between depressive symptoms and the delay between symptom onset and hospital admission.

Spearman's rank correlation was used to analyze the relationship between depressive symptoms and consulting behaviour and delay.

Total SC (the mean EHFSCB score) was weakly related to depressive symptoms (r = .08, p = .015), meaning patients with higher scores (worse self-care) were significantly more depressed, but this relationship was weak. However, those with better consulting behaviour (lower scores for that section) actually had longer delay times, though weakly correlated, r = -.07, p = .03. The relationship between consulting behaviour and depressive symptoms was not statistically significant.

When looking at depressive symptoms (CESD≥16) as a predictor of ≥72 hr delay, the |
|---|---|---|---|---|

				β was .37 (SE = .14), p = .008
Kato et al. (2009) Non experimental – cross sectional survey. EHFSCB CESD To evaluate adherence, identify associated factors, and clarify the impact of previous HF hospitalization on adherence in outpatients with HF.	Japan Outpatient Sample = 116 Mean age = 64.6 (ST = 15.3) 70.7% male 25.9% class I HF 74.1% Class II or III HF 73.3% married 58.6% high school or less 41.4% college or higher	EHFSCB was used to assess SM. A higher score indicates worse SM. Overall mean score for sample was 32.6 (SD = 9.1), thus, on a final scale of 12-60, self-care was reported overall at moderate levels. Across the 12 items on the tool, the highest percentage of the sample reporting "good adherence" was found for medication taking (98.3%) and the lowest percentage was for limiting fluid intake (27.6%).	25.9% (n=30) of participants reported presence of depressive symptoms, meaning CES-D ≥16.	Regardless of previous hospitalization, adherence to seek help if HF worsened was poor. Multivariate analysis showed that diabetes and being employed were independent predictors of poorer adherence to self-care behaviour (p = .03, p = .02, respectively), but the experience of previous HF hospitalization was not a predictor. Chi-square and Fisher's exact test were used for dichotomous variables. Student t test and Mann-Whitney U test were used for continuous variables. Univariate analysis was used to detect related factors. Spearman's rank correlation coefficient was used for continuous variables. Student t-test was used to evaluate differences between 2 groups, and ANOVA was used to evaluate differences among 3 groups. Spearman rank correlation for depression and previous hospitalization (yes or no) resulted in r = -.28, p = .85 for depression correlated with previous hospitalization, r = -.039, p = .76 for depression correlated with no previous hospitalization. Findings were not statistically significant, so the variable depression was not included in multiple regression analysis.

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	56.9% unemployed			This study did not have any findings between depression and the self-care scores.
Morgan et al. (2006). Non-experimental – cross sectional descriptive Tool created by authors to measure medication taking MOSD To evaluate the association between difficulty taking medications, depressive symptoms,	Canada and USA Multicentre outpatients (Canada and USA) Sample = 522 Difficulty with meds mean age = 58.1 (SD = 13.7) No difficulty with meds mean age = 61.4 (SD = 12.9) 77% male 68%	Self-management evaluated with a single question about medication taking. Based on responses, participants categorized into 2 groups. 12.2% (n=64) report difficulty taking medications. 87.8% (n=458) report no difficulty taking medications Thus, overall this sample reported taking medication well.	MOS-D was used to measure depression. A score ≥0.06 on the MOS-D indicates major depression. Overall, 29% (n=152) of the sample had depressive symptoms. Levels of depression not known.	Patients with difficulty taking medications (n = 64, 12.2%) had worse health status and more depressive symptoms (43.8% vs 27.1%, P = .006). Adjusting for demographic and clinical factors had little effect on the association between difficulty taking medications and health status. A chi square test was used to evaluate the association between difficulty taking medications and the presence of depressive symptoms. Of those who had difficulty taking medications, 43.8% had depressive symptoms, compared to 27.1% of those without difficulty with medications (p = .006). The characteristics of patients with difficulty taking medication were compared with characteristics of those patients without difficulty taking medications using t-tests for continuous variables and chi-square test for categorical variables.

and health status in a cohort of heart failure outpatients.	Caucasian

Mean class HF = 2.25 | | | |
| Muzzarelli, et al. (2010).

Non-experimental, prospective

Medication taking measured with questionnaire (CARDIA) and serum digoxin level.

GDS | Switzerland

Inpatient

Sample = 40

Mean age = 69 (SD = 12)

83% male

Mean Class HF = 2.4 | From CARDIA, 15% (n=6) reported taking less than 75% of their medication as prescribed. Meaning 85% reported taking medication well.

From serum digoxin concentration, 20% (n=8) had SDC levels <0.4 ng/ml, meaning 80% had SDC levels suggesting better medication taking.

As a combined approach, the tools together revealed overall 25% (n=10) of participants performed medication taking poorly. Thus, the majority (75%) performed medication taking well. | The mean score from the Geriatric Depression Scale was 3.8 (SD = 2.7) at baseline, which on a scale from 0-12, with higher scores indicating more depressed mood, indicates overall mild depressed mood in this sample. | Continuous data were presented as means and standard deviations. Categorical variables were presented as numbers and percentages.

Univariate analysis was done between the different variables and the adherence to the medical regimen, as assessed with the questionnaire and SDC. Tests included the Fisher's test for nominal variables, and the Mann-Whitney U test or the Wilcoxon test for ordinal variables. Continuous variables were tested using the student t test or the Mann-Whitney U test.

Those good in adherence had a higher mean score on the depression tool (GDS) 4.3 (SD = 2.8) than those poor in adherence 3.3 (SD = 2.4), p = .3, suggesting that those good with taking medication may be more depressed, but this finding was not statistically significant. |

Riegel et al. (2007).	USA	Participants were assessed to be poor in, good in or expert in self-care by qualitative methods, performed by one investigator.	There was no overall PHQ-9 average score presented for all 29 participants.	Using qualitative methodology, the sample was categorized as poor, good, or expert in self-care. Following this determination, descriptive statistics were used to depict the sample.
Mixed methods (qualitative and quantitative)	Outpatient Sample = 29		Mean scores for PHQ-9 presented across the three groupings, Poor, Good and Expert in SC.	Analysis of variance and chi-square analysis depending on level of measurement, were used to compare groups formed on the basis of the categorization of patients as poor, good or expert in self-care.
SCHFI	Poor in SC mean age = 59.4 (SD = 9.8)	Based on this method, of the (10.3%, n=3) were rated as expert in self-care, (53%, n=16) were rated as good in self-care, and (33%, n=10) were rated as poor in self-care.	Mean scores across the three groups ranged from 2.4 to 8.2, overall indicating mild depression in the sample. Depression was the highest among those poor in self-care.	Only 10.3% of the sample was expert in self-care. Patients poor in HF self-care had worse cognition, more sleepiness, higher depression, and poorer family functioning.
PHQ-9	Good in SC mean age = 63.9 (SD = 15.4)			
To describe and understand how expertise in HF self-care develops.	Expert in SC mean age = 69 (SD = 6.2)	Scores for SCHFI are presented as scores for self-care maintenance, self-care management and self-care confidence, across the three groups (poor, good, expert). SCHFI scores higher than 70 indicate good self-care.		There was no overall PHQ-9 average score presented for all 29 participants. Mean scores for PHQ-9 presented across the three groupings, Poor, Good and Expert in SC. Those poor in self-care, mean depression score was 8.2 (SD = 6.9), those good in self-care, mean depression score was 2.4 (SD = 2.4), and expert in self-care, mean depression score was 8.0 (SD = 1.0), $p > .05$ for these findings.
	62% male 62% Caucasian			
	28% Class II HF			Scores of 8 indicate mild depressive disorder, 2.4 indicates no need to treat depression. Depression was the highest among those poor in self-care.
	72% Class III or IV HF	Across all nine groupings, the scores on the SCHFI		

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		were all 70 or higher, indicating overall good self-reported self-care. The only low mean score was for self-care management, among those poor in self-care (62.0, SD = 12.9).		
	79% married or common law Mean years of education = 13.5 Mean months with HF diagnosis = 69 (SD = 41)			
Van der Wal et al. (2007) Descriptive cross-sectional. HFCQ CESD To gain insight into patient beliefs about	The Netherlands Inpatient Sample = 954 Mean age = 71 (SD = 11) 62% male 96% Class II and III HF	98.6% of participants - compliant with medication (i.e. reported "most of the time" or "always" on the HFCQ regarding meds). 77% of participants - compliant with sodium restricted diets. (i.e. reported "most of the time" or "always" on the HFCQ regarding sodium restriction).	40% (n=366) of sample had depressive symptoms (scored ≥16 on CESD).	Depression was associated with beliefs and not behaviour performance, therefore no tests were done between depression and behaviour performance directly. The most important barriers were diuresis during the night (57%), the taste of food (51%), and limited ability to go out (33%). A barrier related to failure to weigh daily was forgetfulness (26%). Patients with depressive symptoms and patients with a low level of HF knowledge experienced more barriers to compliance with the HF regimen. Self-reported compliance with medication was almost 99%, with diet was 77% and with daily weighing was 33%.

| compliance. To examine the association between demographic variables and depressive symptoms to beliefs. And Examine the association between compliance and beliefs | 60% married or common-law

Length of HF diagnosis from 1-48 months | 33% of participants - compliant with monitoring weight (i.e. weighed themselves daily to every three days). | | Mann Whitney and chi square tests were used to describe differences in total belief scores between subgroups of patients. Univariate logistic regression analysis was used to assess the association between compliance and patients' benefits and barriers to compliance. |

| **Study Examining Self-Management and Anxiety Only** ||||||

Study (Author, Design, Tools, Purpose)	**Study and Sample Characteristics**	**Findings on Levels of Self-Management**	**Findings on Levels of Anxiety**	**Reported Results**
De Jong et al. (2011).

Non-experimental, prospective

MEMS | USA

Outpatient

Sample = 147

Mean age = 61 (SD = 11) | From MEMS, 56% of sample took the right number of doses on ≥88% of days, which indicated medication adherence among over half the sample. | Anxiety subscale of the BSI was used. The mean anxiety score of the sample was 0.71 (SD = 0.74). Normative scores are 0.35-0.45 for healthy adults. 54.1% (n=79) participants reported high | In this study, authors were interested in medication and diet adherence as mediators between anxiety and event-free survival. Patients with high levels of anxiety had a shorter (hazard ratio 2.2, 95% confidence interval, 1.1-4.3; p = .03) period of event-free survival than patients with lower levels of anxiety. |

24 hour urine sodium BSI To examine the relationship between anxiety and event-free survival (death, ED visit, hospitalization)	70% male 88% Caucasian 76% Class II or III HF 61% married or common-law Mean years of education = 13	From urine sodium samples, 24% of sample had a computed sodium intake ≤3 g, so much of sample (76%) did not follow dietary guidelines.	levels of anxiety.	Multiple regression analysis was used to identify whether anxiety predicted dietary adherence and medication adherence. Anxiety did not predict dietary adherence, r = .04, p = .67 (not statistically significant). Anxiety did predict medication adherence, .18, p = .04 (statistically significant).
Studies Examining Self-Management and Depression and Anxiety				
Study (Author, Design, Tools, Purpose)	**Study and Sample Characteristics**	**Findings on Levels of Self-Management**	**Findings on Levels of Depression and Anxiety**	**Reported Results**
Corvera-Tindel, et al. (2004). Non	USA Outpatient and Inpatient	Non compliance was defined as completion of the 12 week program with only 60% or less of the prescribed walking	The MAACL measured anxiety (21 items) and depression (40 items). Higher scores indicate more dysphoria (more	Univariate analyses (chi square tests or t tests) and multivariate backward logistic regression were performed to identify clinical factors (BMI, co-morbidities, and HF duration), functional status, and emotional dysphoria

| experimental – prospective correlational design

Pedometer

MAACL

To assess clinical factors, functional status, and emotional predictors of noncompliance to a 12 week home walking exercise program. | Sample = 39

Mean age = 63.2 (SD = 10.1)

Mean class of HF = 2
Mean months with HF diagnosis = 37.5 (SD = 32.9) | completed, or dropping out

On the whole, this sample performed exercise well. Overall mean compliance with the program for this sample was 78% (SD = 36%). Mean compliance was 35% (SD = 30%) for non-compliant patients (n=13), and 99% (SD = 13%) for compliant patients (n=26). | depression and anxiety).

Initial univariate analysis was done (compliant vs. noncompliant). The mean depression scores on MAACL for compliant group was 11.2(5.6) and for the non-compliant group was 11.2(5.5), p=0.99. Meaning there was no difference in depression levels between those who completed the program and those who did not. However the findings were not statistically significant.

Initial univariate analysis was done (compliant vs. noncompliant). The mean anxiety scores on the MAACL for compliant group was 5.6(3.6), and the noncompliant group was 4.8(3.5), p=0.21. This | (anxiety, hostility, depression) influence on non-compliance to exercise training.

Initial univariate analysis was done (compliant vs. noncompliant). The mean depression scores on MAACL for compliant group was 11.2 (SD = 5.6) and for the non-compliant group was 11.2 (SD = 5.5), p = .99, suggesting there was no difference in depression levels between those who completed the program and those who did not. However the findings were not statistically significant. The mean anxiety scores on the MAACL for compliant group was 5.6 (SD = 3.6), and the noncompliant group was 4.8 (SD = 3.5), p = .21. This means there were higher levels of anxiety for those who were compliant than those who were not, however this finding was not statistically significant. |
|---|---|---|---|---|

			means there were higher levels of anxiety for those who were compliant than those who were not, however this finding was not statistically significant.	
Evangelista, Berg, & Dracup (2001). Non-experimental – descriptive correlational. HFCQ MOSF-36 To describe the sociodemographic, psychosocial, and social support variables that	USA Outpatient Sample = 82 Mean age = 54.14 (SD = 12.91) 62.2% male 68.3% Caucasian 67.1% married 88% high school or less 12 % college	Heart Failure Compliance questionnaire was used, participants were reported as "compliant" (i.e. performing self-management at higher level) if they scored 75% or more. Overall mean percentage compliance with behaviours was 84.86% (SD = 10.25). Exceptionally good behaviour performance was found in follow-up appointments, medication, smoking and alcohol cessation (>90%)	MOSF-36 used and examined both depression and anxiety ("mental health"), and well being. Scores from 0-100, with higher scores indicating better mental health. Mean score of the MOSF-36 was 55.6, SD=21.16, thus levels of mental health (depression and anxiety) were moderate. Unable to distinguish between depression or anxiety.	Depression and anxiety studied together as "mental health". Univariate analysis was conducted. Pearson product moment correlations were calculated and correlation between mental health and overall compliance was .317, $p < .001$. So, higher mental health related to higher level of compliance, moderate and positive relationship, and was statistically significant. Follow up visit and mental health correlated .248, $p < .05$, weakly and positively correlated and statistically significant. Diet and mental health correlated .262, $p < .05$, weakly and positively correlated and statistically significant. Exercise and mental health correlated .468, $p < .001$, so moderately and positively correlated, and statistically significant. Multivariate analysis also conducted to

predict compliance with the treatment regimens in patients with HF.	or more 65.3% retired or unemployed	Diet and Exercise were both <75% indicating worse performance of these behaviours.		examine compliance with follow-up appointments, medication diet, exercise, and smoking. With step-wise multivariate linear regression, diet and exercise both predicted by mental health, but not follow up visit. Overall compliance was predicted by mental health (adjusted $R^2 = .120$, $F = 8.360$, $p = .005$). Mental health did not predict medication taking or smoking. Mental health predicted diet (adjusted $R^2 = .057$, $F = 5.805$, $p = .018$). Mental health predicted exercise (adjusted $R^2 = .209$, $F = 22.135$, $p = .000$)
Luyster, Hughes, & Gunstad (2009). Non-experimental – descriptive HFCQ BDI STAI	USA Outpatient Sample = 88 Mean age = 70 (SD = 10.7) 77% male 82%	Authors only analyzed the subsection of the HFCQ which looked at dietary adherence. Scores were out of 100, with higher scores indicating higher adherence to diet. The majority (62.5%) of study participants reported following dietary recommendations "most of the time" and 16%	Depression: 24% of sample had clinically significant levels of depressive symptoms (i.e. they scored ≥10 on BDI) Depression mean score was 7.6 (SD=7). Scores of BDI range from 0 to 63. Anxiety: 36% of the sample had	The relationship between age and dietary adherence was examined by Pearson correlation. Multiple regression analyses were conducted to examine the relationship between the psychosocial variables and adherence to diet. Most patients reported following dietary recommendations in the past week most of the time (63%) whereas only 16% of patients reported following dietary recommendations all of the time. Greater depression and anxiety symptoms were associated with lower dietary adherence.

To examine the impact of psychosocial factors (depression, anxiety and social support) on adherence to dietary guidelines among HF patients.	Caucasian 98% Class I or II HF 66% married 60% high school or less 40 % college or more 81% retired or unemployed	reported "all of the time". A little over half of the participants (52%, n=45) reported no difficulty with adhering to dietary recommendations. Thus, overall the sample reported following dietary guidelines.	clinically significant symptoms of anxiety (i.e. they scored ≥40 of the STAI) Anxiety mean score 35.6 (SD = 10). Scores of STAI range from 20 to 80.	The psychosocial variables accounted for 22% of the variability in dietary adherence, after controlling for covariates (F = 6.58, p < .000). Depressive and anxiety symptoms significantly predicted self-report dietary adherence, higher levels of depression and anxiety was related to worse adherence. Bivariate correlation between variables depression and diet adherence r = -.51, p < .01, but once controlled for age, marital status and race, regression coefficient was β = -0.30, SE = .34, p < .05. Bivariate correlation between variables anxiety and diet adherence -.48, p < .01, but once controlled for age, marital status and race, regression coefficient was β= -.27, SE = 0.24, p < .05.
Schweitzer et al. (2007). Non-experimental	Australia Inpatient and outpatient.	A study specific tool was developed to measure 7 behaviours – daily weighing, sodium intake (diet), fluid monitoring,	Mean BDI score was 9.61, SD=7.65 (minimal depression). 66.7% reported minimal	Depression did not predict adherence. Anxiety explained minimal variability regarding smoking and alcohol cessation. Self-efficacy strongly predicted behaviour performance.

HFCQ SCHFI Study specific tool STAI BDI To test the hypothesis that depression, anxiety and self-efficacy are independent predictors of adherence to medical and lifestyle recommendations among patients with HF.	Sample = 102 Mean age = 63.57 (SD = 14.23) 70.6% male 84.3% Class II or III HF 66.7% married 90.2% high school or less 78.4% retired	medication taking, exercise, avoiding alcohol, avoiding smoking SCHFI measured 6 items of self-care maintenance section, rated on 4 point scale. Used to compare adherence to behaviours measured by the study specific tool HFCQ was used for descriptive purposes. 91.2% reported adherence with medication regimen. 87.3% reported observing smoking cessation recommendations. 47.9% reported adhering to fluid intake recommendations. 34.4% reported daily	depression (BDI<10), 21.6% reported mild depression (scores 10-16), 6.9% reported moderate depression (17-29) and 5.9% reported severe depression (>29). Scores >10 indicate "being depressed" and this was reported by a third of participants (33%). Mean STAI score was 35.47, SD = 10.35. (Scores range from 20-80) 31.4% of participants reported significant anxiety (STAI>40)	Daily weighing – "Gender, age and functional status significantly explained 14% (adjusted R^2 = .11) of the variance in daily weighing (F [4, 97] = 3.96, p <.05)" (Schweitzer et al., 2007, p. 80). "The 3 psychological variables accounted for significant proportion (13.6%) of the variability in daily weighing after controlling for effects of gender, age and functional status" (Schweitzer et al., 2007, p.80). However, depression and anxiety did not predict daily weighing behaviour. (For BDI: β = .04, SE = .04, p > .05), for STAI: β = .07, SE = .03, p > .05) Diet (sodium restriction) – Gender, age and functional status did contribute to variability in diet adherence. The depression (t = -.19, p > .05) and anxiety (t = -.93, p > .05) failed to predict diet adherence. (For BDI: β = -.02, SE = .06, p > .05, For STAI: β = 1 .12, SE = .05, p > .05). Fluid intake –Neither the covariates (gender, age, functional status) (F [4, 97] = 1.30, p > .05) nor the linear combination of the entire group of variables (F [7, 94] = 1.72, p > .05) predicted the observed variation in fluid restriction adherence. Depression and anxiety did not predict fluid intake. (For BDI: β = .01, SE = .04, p > .05, For STAI: β = -.02, SE = .03, p > .05)

		weighing. 33.3% reported limiting alcohol 9.8% reported following dietary guidelines. 47.1% reported difficulty with following exercise recommendations		Medication taking – Gender, age, and functional status did not predict medication variability ($F_{[4, 97]} = 0.26$, $p > .05$), and linear combination of the entire group of variables did not predict either ($F_{[7, 94]} = 0.40$, $p > .05$). Depression and anxiety did not predict medication adherence. (For BDI: $\beta = -.03$, $SE = .01$, $p > .05$, For STAI: $\beta = -.12$, $SE = .01$, $p > .05$). Exercise – Gender, age and functional status did not account for variability in exercise ($F_{[4, 97]} = 2.30$, $p > .05$). Age uniquely accounted for 5.9% of the variability ($t = 2.51$, $p < .05$). After controlling for covariate effects, depression and anxiety explained 13.1% of the variability in exercise ($F_{[3, 94]} = 5.26$, $p < .05$), but did not predict exercise. (For BDI: $\beta = .00$, $SE = .04$, $p > .05$, For STAI: $\beta = .02$, $SE = .03$, $p > .05$) Smoking restriction – Gender, age and functional status did not explain variability in smoking avoidance ($F_{[4, 97]} = 1.58$, $p > .05$). This group of variables accounted for 22% (adjusted $R^2 = 16.2\%$) of variability ($F_{[7, 94]} = 3.78$, $p < .05$). Including depression and anxiety increased prediction by 15.9% ($F_{[3, 94]} = 6.37$, $p < .05$). Depression did not predict smoking avoidance (BDI: $\beta = .21$, $SE = .02$, $p > .05$). Anxiety accounted for 3.3% of

				variability in smoking avoidance (t = -2.01, p < .05). For STAI: β =.26, SE = .01, p < .05). Alcohol restriction – Gender, age and functional status did not explain variability in alcohol avoidance (F [4, 97] = 1.18, p > .05). This group of variables accounted for 36% (adjusted R^2 = .314) of variability (F [7, 94] = 7.60, p < .05). The inclusion of depression and anxiety increased prediction by 31.5% (F [3, 94] = 15.45, p < .05). Depression did not predict alcohol avoidance (BDI: β = -.10, SE = .02, p > .05). Anxiety accounted for 3.4% of variability in avoiding alcohol (t = 2.24, p < .05). For STAI: β =.27, SE = .02, p < .05). Thus, minimally predicted. STAI scores explained minimal variability regarding smoking and alcohol adherence.

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