CHAPTER 2

Literature Review

This chapter presents and reviews relevant literature to the present study. The relevant literature was reviewed from 2001 to 2016 using the CINAHL, MEDLINE, Science Direct, ProQuest, and Google Scholar databases. The presentation is divided into five parts. The first part is an overview of CHD in children. The second part is related to care behaviors among mothers of toddlers with CHD. The third part reviews factors affecting care behaviors among mothers of toddlers with CHD. The fourth part reviews interventions for enhancing care behaviors among mothers of toddlers with CHD. The last part discusses the theoretical framework of the study.

2.1 An overview of CHD in children

CHD is the structural abnormalities of the heart and major blood vessels present at birth (O'Brien & Baker, 2009; Singh, Chee, & Gahlaut, 2014). It is the most frequently diagnosed chronic problem for infants and contributes substantially to mortality during childhood, particularly at the early ages (Meberg Lindberg, & Thaulow, 2005). The exact etiology of more than 90% of CHD cases is unknown (Lott, 2003). Etiology appears to be related to genetic, maternal, maternal environment factors, and family history. These include: 1) genetic factors such as Down's syndrome and Trisomy 18; 2) maternal factors include mothers with health problems such as maternal insulin-dependent diabetes, contacting rubella and other viral infections during pregnancy, taking medications, and drug abuse; 3) maternal environmental factors such as drinking water contaminated by teratogenic, organic solvents, pesticides and air pollution; and 4) a family history of CHD in a parent or sibling increases the risk of a cardiac anomaly in children (O'Brien & Baker, 2009; Sayasathid et al., 2012).

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2.1.1 Classification of CHD

The classification of CHD can be divided into four patterns based on hemodynamic characteristics including: 1) increased pulmonary blood flow, namely VSD, ASD, PDA, and atrioventricular canal defect (AVCD); 2) decreased pulmonary blood flow, namely tetralogy of fallot (TOF) and tricuspid atresia (TA); 3) obstruction of blood flow, namely coarctation of aorta (COA), aortic stenosis (AS), and pulmonic stenosis (PS); and 4) mixed blood flow, in which saturated and desaturated blood mix within the heart or great arteries, namely transposition of the great arteries (TGA), total anomalous pulmonary venous connection (TAPVC), truncus arteriosus, and hypoplastic left heart syndrome (HLHS) (O'Brien & Baker, 2009; Pillitteri, 2014; Wong, Hockenberry, Wilson, Perry, & Lowdermilk, 2006).

The defect of increased pulmonary blood flow is the physiologic effect of the most common cardiac abnormalities (Suddaby, 2001) as well as the most common structural abnormalities presented for assessment and management among infants and young children (Fitzgerald & Sherwood, 2007). The cardiac defect that intracardiac communications along the septum or an abnormal connection between the aorta and pulmonary artery permit blood flow from the higher pressure in the left side of the heart to the lower pressure in the right side of the heart (left-to-right shunting) results in increased pulmonary blood flow and congestive heart failure (CHF) (O'Brien & Baker, 2009). VSD, ASD, and PDA are typical defects in this group. Types of increased pulmonary blood flow are described as follows:

1) VSD. VSD is the most common congenital cardiac defect with increased pulmonary blood flow. This defect is an abnormal opening in the septum between the left and right ventricles; it occurs in about 4 to 5 of every 1,000 live births (Van der Linde et al., 2011). Incidence of VSD accounts for about 20% to 25% of all CHD (Lott, 2007). VSD can be classified according to location, namely perimembranous defect (opening at the membranous part of the interventricular septum), muscular defect (opening at the muscular part of the interventricular septum), subpulmonic defect (opening near the pulmonary valve or above the crista supraventricularis), and inlet defect (opening behind the membranous septum and next to the septal papillary muscle) (Sukapan, 2013). This defect permits oxygenated blood flow from the higher pressure left ventricle flow into the lower pressure in the right ventricle, which may vary in size from a small pinhole to the complete absence of the ventricular

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septum (James, Ashwill, & Droske, 2002; O'Brien & Baker, 2009). Blood shunts from left to right across the septum (an acyanotic disorder) impairing the efficiency of the heart due to blood that should be forced into the aorta and flow out to the body from the contraction of the left ventricle shunts back into the pulmonary circulation. This condition results in an increased pressure in the pulmonary artery and an increased pressure in the right ventricle causing the muscle to hypertrophy (Pillitteri, 2014). Approximately 20% to 60% of VSD will close spontaneously during the first year of life in children having a small or moderate anomaly (O'Brien & Baker, 2009). Asymptomatic children with moderate VSD usually receive surgical correction between the ages of 2 and 4 years old (Lott, 2007). The indications for surgical closure include the following: 1) after 1 year of age, a significant left-to-right shunt with a pulmonary-to-systemic blood flow ratio (Qp/Qs ratio) of at least 2:1; 2) children who have a large VSD develop CHF and failure to thrive do not respond to medical therapy; 3) older infants with a large VSD and evidence of elevated pulmonary vascular resistance; and 4) development of aortic valve insufficiency or endocarditis (Park, 2014).

2) ASD. ASD is an abnormal opening in the septum between the left and right atria which allow oxygenated blood from the higher pressure in the left atrium to flow into the lower pressure in the right atrium (an acyanotic disorder). This condition causes an increased blood flow into the right side of the heart, right ventricular hypertrophy, and an increased pulmonary artery blood flow, the same as with a VSD (O'Brien & Baker, 2009; Pillitteri, 2014). ASD can be classified according to location, namely ostium primum defect (opening at the lower end of the septum), ostium secundum defect (opening near the center of the septum), and sinus venosus defect (opening near the junction of the superior vena cava and the right atrium) (O'Brien & Baker, 2009; Park, 2014). Incidence of ASD accounts for about 5% to 10% of all CHD (Lott, 2007). Spontaneous closure occurs more than 80% of the time in patients with defects between 3 and 8 mm before 1.6 years of age. An ASD with a diameter larger than 8 mm rarely closes spontaneously (Park, 2014). The surgery to repair this defect, though, is usually delayed until 2 to 4 years of age due to the possibility of spontaneous closure (Lott, 2007; Park, 2014). The indications for surgical closure include the following: 1) a shunt with a Qp/Qs ratio greater than 1.5:1 or significant enlargement of the right side of the heart; 2) patients who develop CHF who do not respond to medical management; and 3) patients with a large ASD or additional complicating factors or anatomy

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(Crawford, DiMarco, & Paulus, 2010; Park, 2014). In these cases, a surgical approach may remain the best course of intervention

3) PDA. PDA is failure of the fetal ductus arteriosus to close completely within the first weeks after birth. As a result, the persistent patent ductus permits oxygenated blood flow from the higher pressure in the aorta to the pulmonary artery (left-to-right shunting) to the lungs. The shunted blood returns to the left atrium of the heart, passes to the left ventricle of the heart, flows out to the aorta, and shunts back to the pulmonary artery. This condition results in increased pressure in the pulmonary circulation, which causes an increased workload on the left side of the heart, increased pulmonary vascular resistance, and increased right ventricle pressure and hypertrophy (O'Brien & Baker, 2009; Pillitteri, 2014). Incidence of PDA accounts for about 5% to 10% of all CHD (Lott, 2007). Surgical ligation of PDA is performed on children between the ages of 1 and 2 years old (Lott, 2007). The indications for surgical closure include patients with hemodynamically significant PDA with CHF, failure to thrive, pulmonary overcirculation, or enlargement of the left atrium and left ventricle (Park, 2014).

Increased pulmonary blood flow are the most common type of defects worldwide (Van der Linde et al., 2011), including in Thailand (Ratanachuek-Pongdara, 2011; Sayasathid et al., 2012). Thus, CHD with increased pulmonary blood flow is the focus of this study.

2.1.2 The severity of CHD

The severity of CHD in children can be classified as mild, moderate, and severe (Dale et al., 2012; Hoffman & Kaplan, 2002) as follows:

1) Mild CHD. Children with mild CHD show no significant symptoms. They have lesions that are left untreated and are resolved spontaneously, but they need continuous follow-up after the neonatal period and/or medical controls. CHD types of increased pulmonary blood flow include small VSD, small PDA, and small or spontaneously closed ASD.

2) Moderate CHD. Children with moderate CHD show symptoms during childhood and require specialized cardiologic care. Signs and symptoms of CHF include tachypnea, diaphoretic, fatigues easily, and underweight for age (Potts & Mandleco, 2002).

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They require follow-up appointments with a pediatric cardiologist throughout their childhood and will most likely be treated at least once for cardiac catheterization or surgery. Interventions are simple such as closing of cardiac defects by catheter technique or surgery. CHD types of increased pulmonary blood flow include VSD, PDA, and ASD.

3) Severe CHD. Children with severe CHD exhibit obvious symptomatic and sometimes severe illness when they are a newborn or infant. Signs and symptoms of CHF include tachycardia, tachypnea, crackles in chest, dyspnea, cough, feeding difficulty (Hussain, Hussain, Krishin, & Abbasi, 2010), lethargy, lack of spontaneous movement, decreased arterial pulses, and central cyanosis (Suddaby, 2001). They require repeated cardiac surgery, catheter intervention or both. CHD types of increased pulmonary blood flow include large VSD and large PDA.

In this study, the severity of CHD in toddlers with CHD who need the cardiac surgery focused on moderate and severe CHD with VSD, ASD, or PDA.

2.1.3 Physiological effects of CHD with increased pulmonary blood flow

Cardiac defects with increased pulmonary blood flow, namely VSD, ASD, and PDA, will deliver shunting of oxygenated blood from the higher pressure in the left side flow into the lower pressure in the right side that lead to increased pulmonary blood flow and cause CHF (O'Brien & Baker, 2009; Suddaby, 2001). The increased blood volume in the right side of the heart increases the oxygenated and deoxygenated blood moving to the lungs which overcome the capacity of the lungs to move oxygenated blood to the left side of the heart (Suddaby, 2001). Excessive pulmonary blood flow can reduce lung compliance, make gas exchange more difficult, and increase the risk of pulmonary infections. Consequently, clinical manifestation increases the work of breathing such as the intercostal and subcostal retractions, rapid and shallow respiratory pattern, nasal flaring and grunting, and slow weight gain.

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Moreover, the oxygenated blood is recirculated through the lungs and pulmonary vascular congestion and returned to the left side of the heart, which may increase the right ventricular and articular pressure and may finally result in increased pulmonary vascular resistance. Pulmonary vascular resistance and increased pressure in the right ventricle or atrium causes the hypertrophy of muscle. If the right atrium and ventricle are unable to adapt to the increased workload, the result would be the enlargement of the right

ventricle and right atrium, which causes cardiac failure. Symptoms of CHF include retention of fluid and sodium in order to increase blood volume to compensate for the decreased blood flow in the peripheral circulation. These symptoms include tachycardia, tachypnea, sweating, decreased urinary output, weak peripheral pulses and neck vein distention. Furthermore, oxygenated blood moving from the lungs to the left side of the heart is being recycled back to the lungs, causing decreased oxygenated blood to provide cellular nutrition, along with tachypnea, which causes increases in energy expenditure and results in feeding difficulties (Suddaby, 2001). Infants and children with CHD may be prone to malnutrition and growth failure due to inadequate intake, increased energy requirements, and/or inefficient absorption (Roman, 2011).

CHD permitting the blood to go through the lungs and then shunt from the left heart and back to the right heart are generally acyanotic. However, children with acyanotic defects may develop cyanosis due to unrepaired septal defects; the increased pulmonary blood flow over many years results in pulmonary vascular changes. This condition contributes to a turnabout of the cardiac shunting, becoming right-to-left shunting because of a progressive increase in pulmonary vascular resistance, which is called the Eisenmenger complex (James et al., 2002; Wong et al., 2006).

2.1.4 Clinical presentations of CHD

The clinical presentations of CHD with increased pulmonary blood flow depend on the severity of the defect, treatment, and also prognosis of the defect. The most common clinical presentations of CHD with increased pulmonary blood flow include tachycardia, dyspnea, diaphoresis, edema, and poor weight gain as follows:

1) Tachycardia. Tachycardia is one of the earliest signs of CHF as a direct result of sympathetic stimulation that the heart attempts to beat faster to move blood forward more effectively (O'Brien & Baker, 2007; Pillitteri, 2014).

2) Dyspnea. Dyspnea will often be present in CHD with left-to-right shunts associated with CHF or respiratory tract infection (Lott, 2007; O'Brien & Baker, 2009). Dyspnea is caused by a decrease in the distensibility of the lungs (O'Brien & Baker, 2007). The manifestations of dyspnea include tachypnea, tachycardia, and increased work of breathing demonstrated by intercostal and subcostal retractions, flaring of alae nasi, and

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grunting. Tachypnea can lead to hypoxemia because oxygen does not reach the alveoli for gas exchange in adequate amounts for fast breathing rates (O'Brien & Baker, 2009).

3) Diaphoresis (perspiration or sweating). Diaphoresis is caused by impaired myocardial function in CHD with left-to-right shunts associated with CHF. It is often seen, particularly on the head during effort (O'Brien & Baker, 2009).

4) Edema. Edema develops as the sodium and water retention causes systemic vascular pressure to increase. Weight gain is the earliest sign of edema. However, this additional accumulated fluid can lead to the swelling of soft tissue such as loose periorbital tissues, so it can be seen as periorbital edema (O'Brien & Baker, 2009). Lower extremity edema tends to occur as a late sign of CHF in children (Pillitteri, 2014).

5) Poor weight gain. Infants with CHD are the age group at the highest risk for malnutrition and may have slow weight gain because of increased metabolic demands such as poor cardiac function, increased heart and respiratory rates as well as decreased energy intake contributing to growth failure. Children with acyanotic CHD have more poor weight gain, whereas children with cyanotic CHD have growth impairment in both height and weight (Wright & Rocchini, 2002).

2.1.5 Management of CHD

Management of CHD includes medical management, cardiac catheterization, and surgical management (Ball & Bindler, 2003; Lott, 2007; O'Brien & Baker, 2009; Wong et al., 2006) as follows:

1) Medical management. Medical management for children with increased pulmonary blood flow is as follows:

1.1) Prevention or treatment of CHF. Children with increased pulmonary blood flow and with obstruction to blood flow demonstrate signs and symptoms of CHF. Monitoring for signs of CHF is very important. The purposes of treatment of CHF are to enhance cardiac function such as administration of digitalis glycoside (digoxin) or the angiotensin-converting enzyme inhibitors (captopril, enalapril); to remove accumulated sodium and fluid such as restriction of fluid and sodium and administration of diuretic (furosemide, spironolactone); to decrease cardiac demands such as limiting physical activity;

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to maintain body temperature; to reduce work of breathing; to prevent and treat infections; and to improve tissue oxygenation such as oxygen administration (O'Brien & Baker, 2009).

1.2) Prophylaxis against infective endocarditis (IE). Treatment of IE requires long-term parenteral drug therapy by using high doses of proper antibiotics intravenously for two to eight weeks, such as penicillin G or amoxicillin for four weeks (Ferro & Fonseca, 2014; O'Brien & Baker, 2009). Preventive treatment of IE is the use of prophylactic antibiotics one hour before certain procedures such as dental procedures and also maintenance of good oral health care in order to decrease the opportunity of bacteremia from oral infections (O'Brien & Baker, 2009).

1.3) Other medical management. Other medical management is also important including improving nutritional status such as increasing caloric density, with the need for nasogastric feeding; decreasing exposure to respiratory infections; and cardiac follow-up (O'Brien & Baker, 2009; Wong et al., 2006).

2) Cardiac catheterization. Cardiac catheterization is now more often performed as a therapeutic procedure. Surgery to close the congenital heart disorder is usually done electively by cardiac catheterization. Recently, interventional cardiac catheterization is used to correct an abnormality of many acyanotic heart defects, such as the use of balloon angioplasty procedure to dilate the stenosed valve and the use of occlusion procedure to close the disorder, namely device closure (Pillitteri, 2014). For example, Children with VSD that do not close spontaneously can be closed by the placement of a septal occluder device during cardiac catheterization to prevent chronic pulmonary artery hypertension from developing or infective endocarditis due to the recirculating blood and stagnant blood flow in the pulmonary artery. The procedure is associated with few complications, considered safe, and is highly effective in children with CHD (O'Brien & Baker, 2009).

3) Surgical management. The timing of the surgery depends on the severity of the circulatory and pulmonary compromise. Surgical management in CHD can be divided into two types: palliative surgery and corrective surgery (Bowden, Dickey, & Greenberg, 1998; O'Brien & Baker, 2009).

3.1) Palliative surgery. Palliative surgery is performed as a surgical bridge such as a Blalock-Taussig (B-T) shunt, Glenn shunt, and pulmonary artery banding. The aim of this type of surgery is to improve the child's condition for a temporary period.

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Palliative surgery permits the child's condition to stabilize and to provide time for the child to grow until a more definite surgical correction is viable.

3.2) Corrective surgery. Corrective surgery is performed to correct the defect in both anatomy and physiology in some defects. The presence of a significant left-to-right shunt is an indication for surgical correction (Lott, 2007). For example, a large PDA can be surgically closed by ductal ligation or by surgery performed using only three small thoracotomy incisions on the chest and do not require extra-corporeal circulation (Pillitteri, 2014). The aim is to complete surgical intervention early in life. Some cardiac lesions require multi-staged surgical repair. The cardiac surgery in children with VSD, ASD, or PDA is performed based on the severity of the defects, growth and development of the child, having illness, and family needs (O'Brien & Baker, 2009).

2.1.6 The impact of CHD on toddlers with CHD and their mothers

CHD is a chronic illness that can affect both toddlers with CHD and their mothers. CHD with increased pulmonary blood flow during the preoperative period is clinically the most unstable and critically risky for several complications related to this type of defect; thus it is the more difficult to care for these toddlers. Caring for a toddler born with CHD can increase the demands and stress experiences for his/her mother. The impact of CHD on toddlers with CHD and their mothers are as follows:

1) The impact of CHD on toddlers with CHD. CHD can have physical, developmental, psychological, and behavioral effects on toddlers with CHD as follows:

1.1) Physical effects. The physical effects on toddlers with CHD may be presented as several complications from the defect prior to surgery as described in the following:

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1.1.1) Congestive heart failure (CHF). CHF refers to the inability of the heart to pump an adequate amount of blood to the circulatory system at normal filling pressures to meet the metabolic demands of the body (Wong et al., 2006). The most often CHF occurrence is secondary to structural defects, including CHD leading to large left-to-right shunts that causes an increased volume and pressure overload inside the heart, which decreases the left ventricular cardiac output to a level that is insufficient to meet the body's

metabolic demands and also an increase in the right ventricular cardiac output that causes work overload of the right ventricular myocardium (James et al., 2002; Laohaprasitiporn, 2006; Wong et al., 2006). The clinical manifestations include tachypnea; tachycardia; increased effort of breathing; cyanosis; pallor; fatigue more easily; periorbital and facial edema; decreased urine output; neck vein distention; and increased sweating. Additionally, most infants and children with CHD have difficulty being fed and slow weight gain (James et al., 2002; O'Brien & Baker, 2009; Suddaby, 2001). A study of frequency and clinical presentation of CHF in 49 patients with CHF and VSD age 1 month to 12 years old in Pakistan reported that the majority of these patients presented CHF in infancy and the common signs and symptoms at presentation were murmur, tachypnea, tachycardia, hepatomegaly, crackles in chest, dyspnea, cough, and feeding difficulty (Hussain et al., 2010).

There were several studies of CHF in infants and children with un-operated CHD. Of the 84 children age under 15 years old diagnosed with CHD and admitted to a tertiary care hospital in Nepal, 46 patients (54.8%) had CHF (Shah et al., 2008). In a study of 50 infants age 12 months or under diagnosed with CHD, 28 patients (56%) had signs of CHF (Harshangi et al., 2013). Furthermore, CHF is the main cause of death in infants and children with CHD. One study reported that CHF is the major cause of death, with a mortality rate of 20% in those patients (Shah et al., 2008) and CHF also shared 66.6% of cause of death in infants with CHD (Harshangi et al., 2013).

1.1.2) Respiratory infection (RI). RI in infants and children with CHD is a crucial cause of significant morbidity and mortality, which include required hospitalization and intensive care with prolong mechanical ventilation (Chiu et al., 2016; Healy, Hanna, & Zinman, 2012; Shah et al., 2008). According to the study by Medrano and Garcia-Guereta (2010), the main causes of hospitalization among children with CHD who are less than 2 years old in Spain were bronchiolitis (51.4%), upper respiratory tract infections (21%), and pneumonia (19.9%), respectively. Upper and lower respiratory infection can cause prolonged hospitalization in children, delay of cardiac surgery, and a tendency for postoperative complications such as pulmonary hypertension, bacterial infections, atelectasis, and a longer stay in the pediatric intensive care unit (Healy et al., 2012; Malviya et al., 2003; Zachariah & Simoes, 2008).

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CHD in children is a contributing factor that places them at a higher risk for RI such as the cardiac defects associated with left-to-right shunting increase pulmonary blood flow into the lungs causing pulmonary edema; children under 3 years old represent a group that have a higher risk for RI, especially respiratory syncytial virus (RSV) infection, and are more likely to develop severe lower respiratory tract infection (James & Ashwill, 2007; Jung, 2011; Kim & Choi, 2011). A study of thirty patients with CHD hospitalized with RSV infection at a tertiary care hospital in Canada found that the mean admission age was 15.1 months, 90% were acyanotic CHD, additionally most of them had bronchiolitis (73.3%) and some had pneumonia (26.7%) (Butt et al., 2014). CHD pediatric patients with RSV lower respiratory tract infection required more intensive care unit admissions and assisted mechanical ventilation (Andres et al., 2012; Butt et al., 2014; Chiu et al., 2016; Healy et al., 2012).

Furthermore, the presence of a lower respiratory tract infection, particularly recurrent pneumonia can be a life threatening disease in children with underlying diseases, especially CHD (Celebi, Hacimustafaoglu, & Albayrak, 2010; Ozdemir, Sari, Bakirtas, Zorlu, & Ertan, 2010). In the previously mentioned study of the 84 children diagnosed with CHD in Nepal, 44 patients (52.4%) had lower respiratory tract infection that was a major cause of death (Shah et al., 2008). Likewise, several studies in Thailand reported that a respiratory tract infection, including the common cold and pneumonia, was the most common complications in a hospitalized child with CHD (Chaisom et al., 2010; Panturut et al., 2011; Songthip et al., 2015; Srichantaranit et al., 2010).

1.1.3) Infective endocarditis (IE). IE is an infection of the valves and inner lining of the heart, which can potentially damage the heart valves (O'Brien & Baker, 2009). It is most often a sequel of bacteremia in the children with CHD (O'Brien & Baker, 2009). Children with CHD often have pressure gradients between the structures of cardiac that cause turbulence which may result in damage of the endocardium, that is, the microorganisms that enter the bloodstream and grow on the endocardium can quickly destroy the surrounding tissue and valve structures (James et al., 2002; O'Brien & Baker, 2009). The clinical manifestations are fever; anorexia, nausea, fatigue and malaise, chest pain, heart failure, and a new or changing heart murmur (James et al., 2002).

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In a population-based cohort study of children with CHD that followed them from birth to 18 years old by Rushani et al. (2013), the cumulative incidence of IE among children with CHD was 6.1 first case per thousand children and children less than 3 years old were at a higher risk of IE. The incidence of IE was as high as 10% to 13% in children with unrepaired TOF and VSD (James et al., 2002). A study of patients diagnosed with IE found that these patients had the most common underlying disease that were left-to-right shunts, especially uncorrected VSD, ASD, and arterial ducts (Siddiqui et al., 2007). Similarly, the most frequently unrepaired CHD associated with IE is VSD (Penny & Vick, 2011). In a study by Shah et al. (2008), eight children (9.5%) were diagnosed with CHD and associated with IE, it was the cause of death in these patients.

1.1.4) Malnutrition. Children with CHD have a high caloric requirement due to a high basal metabolic rate and low reserves leading to malnutrition (Wheat, 2002). Mechanisms for malnutrition in un-operated children with CHD are multifactorial including the presence of anemia, low arterial oxygen saturation, pulmonary hypertension, poor nutritional absorption from the digestive tract in chronic CHF, and a poor dietary history or inadequate nutrition due to feeding difficulties (Hassan et al., 2015). This is especially for children with increased pulmonary blood flow who have feeding difficulties due to tachypnea, tachycardia, and poor cellular nutrition from decreased peripheral blood flow (Suddaby, 2001). Most of the children with acyanotic CHD, especially VSD, were toddlers that had a small head, stunting, and were underweight (Ussein & Othman, 2013). The prevalence of malnutrition among children with CHD, particularly in acyanotic CHD with pulmonary hypertension was 92% (Arodiwe et al., 2015).

In a study of 196 pediatric patients with CHD 24 months old or younger, 29.6% of these patients had acute malnutrition, which was more common in acyanotic patients without CHF or pulmonary hypertension including ASD, VSD, and PDA; 21.9% of patients had chronic malnutrition, especially acyanotic patients with pulmonary hypertension (Baaker, Abdul-Abass, & Kamel, 2008). In a study of a hundred patients age 2 - 72 months old with symptomatic CHD at an out-patient department in Egypt, 71.4% of these patients had severe malnutrition, which was more common in un-operated acyanotic patients (Hassan et al., 2015). Additionally, the highest prevalence rate of acute malnutrition in hospitalized children was also found in children with CHD and left-to-right shunts (Joosten & Hulst, 2008). Likewise, a study of nutritional status in Thailand reported that malnutrition

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was found in 40% of pediatric patients with CHD before surgery (Ratanachu-ek & Pongdara, 2011).

In addition, malnutrition is also an important risk factor for the occurrence of morbidity among infants and children with CHD, especially in developing countries, because of limited resources resulting in late surgical correction, hence causing a vicious circle of respiratory tract infections and CHF (Krishna, 2005; Vaidyanathan et al., 2008). For example, the study findings of Vaidyanathan et al. (2002) indicated that the preoperative nutritional status among infants with large VSD in India was poor, along with the infants having pneumonia. Early surgical repairs can reduce CHF, improve nutritional status as well as survival rates for patients with CHD (Hagau & Culcitchi, 2010; Mahdi, Hashim, & Ali, 2009; Ratanachu-ek & Pongdara, 2011; Vaidyanathan et al., 2008).

1.2) Developmental effects. Infants and children with CHD are at risk of developmental delays prior to surgery (Majnemer et al., 2009; Van der Rijken et al., 2010). Developmental delays were common in children with both acyanotic and cyanotic CHD; these deficits continued when the children entered school (Majnemer et al., 2009).

The developmental status of infants and young children with CHD is related to physical and psychosocial factors. Infants and young children with CHD associated with CHF may have diminished gross motor attainment due to a lack of energy until they undergo cardiac surgery repair (Smith, 2001). The fine motor, social, and cognitive aspects of development seem less impaired than the gross motor aspect (O'Brien & Baker, 2007). Additionally, anxiety and worries about their child's illness often cause parents to be overprotective, which can lead to developmental regression or stagnation for their child (Bjarnason-Wehrens, Schmitz, & Dordel, 2008). In Japan, Hirose, Ichida, and Oshima (2007) studied the developmental status of 75 infants with CHD, and found that 14 (18.7%) had delayed development, particularly in the gross motor development and a weight gain of less than ten grams per day. Such weight gain and recognition of mothers for their infants' development were associated with developmental delay. A study of developmental status in 42 preschool children with CHD in Taiwan reported that these children had more suspicious interpretations than preschool children without CHD, particularly in the development of gross motor and language (Chen, Li, & Wang, 2004). Moreover, one study demonstrated that one-third of CHD children aged 6-65 months with hemodynamic significance who required

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surgery repair had significant delayed development in fine motor and gross motor sections as well as in social skills than those with no hemodynamic significance (Weinberg, Kern, Weiss, & Ross, 2001).

1.3) Psychological and behavioral effects. CHD is a chronic disease that psychologically affects children with CHD similar to children with other chronic illnesses, especially when they grow older and may have psychological or behavioral problem (Green, 2004). In a longitudinal case-cohort study of 408 children with CHD in Norway conducted by Landolt et al. (2014), it was found that the CHD group had higher levels of fussiness at age 6 months and child internalizing behavior problems such as anxiety, depression, and withdrawal from age 18 to 36 months than in the normal population cohort. In addition, there was a cross-sectional study of long-term outcomes in 420 children 17 years old and younger in the US, with data from the National Health Interview Survey from 1997 to 2011, which was conducted by Razzaghi, Oster, and Reefhuis (2015). That study revealed that those children with CHD appear to be at a high risk of neurodevelopmental outcomes such as being diagnosed with autism spectrum disorder or intellectual disability, increased healthcare utilization, and also a greater of number of school days or daycare were missed.

2.1.7 The impact of CHD on mothers of toddlers with CHD

Caring for toddlers with CHD can have physical, psychosocial, and social effects on their mothers as described in the following:

1) Physical effects. The physical effects on parents who care for a child with CHD include lack of sleep due to worries about monitoring signs and symptoms of the child with CHD throughout the night (Kamm, 2006). As in Thailand, a study of the impact on Thai families in caring for children with CHD age 3-17 months old prior to cardiac surgery demonstrated that mothers who were the primary caregiver in families reported lack of rest and sleep because they were exhausted in caring for their difficult children (Srichantaranit & Chontawan, 2011).

2) Psychological effects. Several previous studies have indicated that having a child with CHD and caring for them has a profound negative effect on the mental health of parents, which is most evident among mothers (Carey, Nicholson, & Fox, 2002; Dale et al., 2012; Landolt et al., 2014; Lawoko & Soares, 2006; Wei et al., 2015). In most families,

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mothers endure much of the burden and the responsibility as the primary caregivers in caring for children with illnesses (Gantt, 2002). In systematic reviews and meta-analyses of 94 articles regarding the impact of having a child with CHD on families by Wei et al. (2015), 18 of the 24 articles related to the parent's psychological health. It was revealed that parents of children with CHD had significantly higher levels of stress, anxiety, and depression than parents of children without CHD. Similarly, one study reported that many parents of children with CHD have psychosocial problems such as depression, anxiety, hopelessness, and somatization, which persisted over a year, especially for mothers who had more severe psychosocial problems than fathers (Lawoko & Soares, 2006). Furthermore, increased child's internalizing behavior problems can contribute to risk for mother's mental health problems, including distress. In Thailand, two studies about the impact on mothers of children with CHD under 3 years old prior to surgery also reported similar findings as studies conducted in other countries. One study reported that those mothers had stress in providing care for their children (Chaisom et al., 2010), and another study reported that mothers living with stress worried about a fatal diagnosis, heart surgery, monitoring their child's symptoms, and financial constraints (Srichantaranit & Chontawan, 2011).

In addition, parents of children with CHD (PCCHD) have a poor quality of life and well-being when caring for a child with CHD. Quality of life of PCCHD was significantly poorer than parents of children with minor illnesses and with other diseases and also parents of healthy children (Arafa, Zaher, El-Dowaty, & Moneeb, 2008). In addition, one prospective case-cohort study by Dale et al. (2012) indicated that mothers of children with severe CHD showed significantly lower well-being than mothers of children without CHD at 6 months and 36 months postpartum and also reported that well-being in mothers of children with mild and moderate CHD did not deviate significantly from those without CHD. According to Dale's study, the finding suggested a pattern in which all stressors concerning the severity ill child lead to the significant deterioration of well-being in mothers.

3) Social effects. A mother who stays at home spends more time providing excess care to her sick child with CHD than the father. This may diminish social activity, and cause social isolation (Lawoko & Soares, 2003). In Thailand, a study related to caring practices for children with CHD prior to surgery reported that the responsibilities of the

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mother resulted in very few opportunities to take an outing, or to relax or to take part in the usual social activities (Srichantaranit & Chontawan, 2011).

2.2 Care behaviors

The care behaviors described in this study refers to care behaviors of mothers for toddlers with CHD based on the Self-Care Deficit Nursing Theory of Orem (Orem, 2001). Self-Care Deficit Nursing Theory is used to describe the range of care behaviors, care behaviors among mothers of toddlers with CHD, and factors affecting care behaviors among mothers of toddlers with CHD.

2.2.1 Self-Care Deficit Nursing Theory

Orem's Self-Care Deficit Nursing Theory (2001) views a person as an active agent capable of performing self-care and dependent care actions. The premise of this theory proposes that "human agency, the power to act deliberately, is exercised in the form of care of self and others in identifying needs for and in making needs inputs" (Orem, 2001, p. 140). Orem also stated that a behavior that is to be considered self-care, must be a behavior engaged in for the purpose of meeting a self-care requisite. Based on this definition, the research design of this study must incorporate the purpose for the specific behavior. Self-care is the behavior of persons who possess free will and engage in deliberate action. This theory provides an understanding of the personal perspectives and experiences that can contribute to the practical science of nursing.

Self-Care Deficit Nursing Theory explains the association between the action capabilities of persons and their care demands for self-care or the care demands of children or adults who are their dependents (Orem, 2001). Three concepts are central to Orem's theory (2001: self-care/dependent care, basic conditioning factors, and self-care/dependent care agency. In previous research studies, these three concepts of Orem's theory have also been shown to be significantly related to the understanding of maternal dependent care behaviors of children with CHD and children with other chronic illnesses; moreover, the theory has been used to explain care behaviors and factors affecting care behaviors (Chaisom et al., 2010; Songthip et al., 2015; Tungpaibool, 2008). Self/dependent care behavior is influenced

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by basic conditioning factors and self-care agency (Orem, 2001). These concepts are described below.

1) Self-care and dependent care. Self-care is defined as "the practice of activities that individuals initiate and perform on their own behalf in maintaining life, health, and well-being" (Orem, 2001, p. 43). This theory of self-care posits that self-care is a human regulatory function whereby persons must make deliberate actions for themselves or for their dependents. Importantly, the presupposition of self-care presents that "all things being equal, mature and ring persons through learning develop and exercise intellectual and practical skills and are able to sustain motivation essential for continuing daily care of themselves and their dependents with some degree of effectiveness" (Orem, 2001, p. 143). Orem noted that generally adults perform care for themselves, but infants and young children need complete care or assistance with self-care activities from others due to their early developmental stage. The provider of infant or child care is referred to as the dependent care agent. Self/dependent care agents perform self-care activities in order to meet universal, developmental, and health deviation self-care requisites that are essential to have validity in the regulation of human functioning, development, and well-being on a daily basis. Dependent care agents perform effective care behaviors of which they are capable of performing; this is known as dependent care agency.

2) Self-care agency and dependent care agency. Self-care agency and dependent care agency are human powers and capabilities necessary for persons to provide continuing care for themselves or for persons dependent on them (Orem, 2001). Self-care agency is developed through the spontaneous process of learning, which is helped by intellectual curiosity, instruction and supervision from other persons, and his/her experience in performing self-care measures. The ability of the self-care agent to learn varies based on life experience, health status, culture, factors influencing knowledge attainment, and the use of resources. The structure of the concept of self-care agency and dependent care agency is formalized into three parts:

2.1) Capabilities and dispositions foundational for self-care agency are skills, traits, and personal characteristics influencing the person's ability to engage in action; they include the following: 1) conditioning factors and states (e.g., genetics); 2) selected basic capabilities (e.g., perception); 3) knowing and doing capabilities (e.g., learned skills);

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4) dispositions affecting goals sought (e.g., self-awareness); and 5) significant orientative capabilities and dispositions (e.g., orientations to health) (Orem, 2001).

2.2) Power components are capabilities specific to health-related self-care actions that empower engagement in self-care operations. There are ten power components: 1) ability to maintain attention and exercise requisite vigilance; 2) controlled use of available physical energy; 3) ability to control the position of the body; 4) ability to reason; 5) motivation; 6) ability to make decisions about care of self; 7) ability to acquire technical knowledge about self-care; 8) ability to order discrete self-care actions; 9) a repertoire of cognitive, perceptual, manipulative, communication, and interpersonal skills; and 10) ability to consistently perform self-care operations (Orem, 2001).

2.3) Capabilities for self-care operations include the following: 1) estimative operations-knowing self-care requisites and having the means of meeting them; 2) transitional operations-making judgments and decisions about self-care; and 3) productive operations-performing actions and meeting self-care requisites (Orem, 2001). In this study, estimative operations and transitional operations were chosen due to the factors that affected care behaviors among mothers of children with CHD in prior studies related to the capabilities for dependent care operations including the following: 1) self-efficacy is linked to the transitional capability of dependent care operations, and 2) knowledge is linked to the estimative capability of dependent care operations.

In infants and children, Orem also noted that dependent care agency is the complex, acquired ability of mature persons to know and meet the health deviation self-care requisites of infants and children. Also, it is necessary to adjust to universal and developmental self-care requisites in continuing dependent care systems and parenting activities (Orem, 2001). Development of dependent care agency focuses on mastery of production operations of self-care such as meeting requisites for maintenance of sufficient intake of food, water, and air. The means for developing dependent care agency varies by life experience, knowledge, and developed skills that can be adjusted to the care situation for dependents.

Dependent care agents who engage in dependent care are assumed to have dependent care agency to meet the requirements of their dependents while variations in

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dependent care agency and dependent care behaviors are conditioned by basic conditioning factors.

3) Basic conditioning factors. Basic conditioning factors are factors internal or external to individuals that affect their ability to engage in self-care or affect the kind and amount of self-care requirement (Orem, 2001). They include ten factors: age, gender, developmental state, health state, sociocultural orientation, health care system factors, family system factors, pattern of living, environmental factors, and resource availability and adequacy (Orem, 2001). In this study, five factors—age, gender, health state, sociocultural orientation, and resource availability and adequacy—were chosen due to the results from previous studies that found that these factors affected care behaviors among mothers of children with CHD (Asumpinzub, 1997; Chaisom et al., 2010).

2.2.2 Care behaviors among mothers of toddlers with CHD

According to Orem's theory (2001), children in the early stages of development require assistance with self-care activities from responsible adults. Toddlers with CHD who have an alteration of the hemodynamic pattern and are developmentally unable to assume self-care activities, must receive self-care assistance. This assistance is usually provided by their mothers. The mothers of toddlers with CHD act as the dependent care agent in performing care actions to meet universal, developmental, and health deviation self-care requisites of their toddler with CHD in maintaining life, health, and well-being. These care actions of mothers are known as care behaviors.

Mothers are responsible for the toddlers' care needs, which include maintaining their toddler's health, as well as the prevention and management of complications from the cardiac defect. Mothers must provide care according to the child's care needs, particularly prior to cardiac surgery. These needs include ensuring adequate growth and nutrition, development, immunization, prevention of illness and infection, infective endocarditis prophylaxis, activities, proper sleep, timely dental care, taking prescribed medications, monitoring CHF, and attending follow-up visits as scheduled (Sawangsri, 2001; Smith, 2001; Srichantaranit et al., 2010; Woodward, 2011; Wright & Rocchini, 2002). These needs are consistent with the therapeutic self-care demands that correspond to the three aspects of self-care requisites in Orem's theory. There are three types of self-care requisites: universal,

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developmental, and health deviation. These requisites are formalized expressions of the kinds of action to be performed by or for individuals. Care behaviors of mothers are actions that they perform in relation to these universal, developmental, and health deviation self-care requisites of toddlers with CHD. These concepts are described in further detail below.

1) Universal self-care requisites. Universal self-care requisites are care requirements associated with life processes, maintenance of the integrity of structure and functions, and general well-being at various states of the life cycle of all persons (Orem, 2001). These requisites are essential for the provision of care among toddlers with CHD to promote positive health and well-being. The details regarding universal self-care requisites for toddlers with CHD are as follows:

1.1) Maintaining sufficient food, water, and air. Infants and children with CHD require adequate and good nutrition for growth and development, but providing them with adequate nutrition is especially difficult due to their high caloric requirements and their inability to be fed effectively because of fatigue and tachypnea. This often results in poor nutrition (O'Brien & Baker, 2009). Poor nutrition, particularly prior to surgery, can lead to the frequent occurrence of infections, especially acute respiratory infection (Krishna, 2005; Pillitteri, 1999). CHD is frequently related to malnutrition and growth retardation. About 40% of children with CHD in Thailand were found to be malnourished before surgery (most were acyanotic CHD) (Ratanachu-ek & Pongdara, 2011). Children with CHD often exhibit malnutrition in the form of being underweight and have problems with weight gain (da Silva, Oliveira-Lopes, & de Araujo, 2007; Ratanachu-ek & Pongdara, 2011, Vaidyanathan, Radhakrishnan, Sarala, Sundaram, & Kumar, 2009; Wright & Rocchini, 2002). Therefore, monitoring the nutrition status of toddlers with CHD and providing appropriate nutrition management are essential for ensuring the child's optimal growth, development, and health status.

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CHD with increased pulmonary blood flow has been found to be more highly associated with growth disturbances in body weight than height. The normal nutrient and caloric intake appropriate for other children their age may not be adequate for toddlers with CHD due to their high caloric needs and low reserves. Provision of adequate intake of nutrients and calories is crucial for optimal growth in toddlers with CHD, so mothers need to critically monitor their child's nutritional status. For Thai toddlers, the recommended

energy level is 1,000 kcal per day to meet the requirements of muscle tissue growth and high activity level (Nutrition Division, 2014). It is recommended that Thai toddlers should have three meals a day, and according to the food guide; daily food intake should include 3 servings of grains (3 ladles), 1.5 servings of cooked meat (3 tablespoons), 5 servings of fat (3 teaspoons), 1 serving of milk (240 milliliters), 4 servings of fruit (1 serving = a medium orange or a banana, or 8-10 pieces of smaller fruit), and vegetables should be served as needed (Nutrition Division, 2014). Toddlers with CHD, require a caloric intake of 150% the normal values for their age in order to support normal growth (Nichols et al., 1995). Mothers should therefore increase the volume of food to meet the child's needs and provide high caloric and nutritionally dense food. In particular, toddlers with increased pulmonary blood flow are at risk of CHF, so mothers should control CHF by restricting the amount of highly salted foods such as salted fish in order to reduce the congestion of water and sodium (Musiksukont, 2010).

In general, the daily requirement of water for the toddlers is 1,000 milliliters, but toddlers with CHD can drink as much water as needed if they do not have any symptoms of dyspnea or excessive weight gain. Toddlers with CHF should be restricted to less than 1,000 milliliters of water or milk per day or as ordered by a physician to reduce fluid retention (Musiksukont, 2010; Nutrition Division, 2014). Additionally, in toddlers with CHD who have CHF, rapid excessive weight gain (more than 200 grams per day) may indicate fluid retention rather than improved nutrition status (James et al., 2002).

In order to promote adequate intake of fresh air, mothers need to place their toddlers with CHD in a good environment and protect them from environmental dust or smoke so that they have adequate oxygenation. Also, toddlers should not be brought to crowded places such as superstores or the market because they are at risk for respiratory infection. This is important since their bodies are working harder due to their heart condition.

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1.2) Provision of care associated with elimination processes. Normally, toilet training is one of the major hallmarks of toddlerhood (Wilson, 2009). Toilet training readiness is assessed by the following: 1) physical readiness, most children are ready for training around the ages of 18 to 24 months; 2) mental readiness, the toddlers must be able to recognize the release or retaining for of feces and urine, communicate this sensation, and have the cognitive skills to imitate appropriate behavior and follow directions; 3) psychological

readiness, the toddlers must express a willingness to please the mother by waiting to go to the toilet and be able to sit on the toilet for 5 – 10 minutes; and 4) parental readiness, mothers must be able to recognize the level of readiness of their child. Mothers should help toilet train their children by using a relaxed approach with positive reinforcement (Potts & Mandleco, 2002; Wilson, 2009).

In toddlers with increased pulmonary blood flow who are at risk of CHF, mothers should observe the amount of urine output and take note of abnormal stools such as constipation which worsens CHD. Mothers should provide a well-balanced diet that includes high fiber foods and fruits to help keep stools soft and to promote a regular elimination pattern (Wilson, 2009).

1.3) Maintaining a balance between activity and rest. During the toddler stage, one major task for toddlers is to learn to be independent. For example, they learn to walk, run, and go down stairs alone. Toddlers with CHD should be encouraged to maintain an active lifestyle to the best of their capacity and their condition. Mothers should consider the type of activity that the child can do and restrict their activity when appropriate (Smith, 2001). Heart rate and respiration should be carefully monitored to assess the degree of cardiac demand imposed by each activity it is essential to adjust the level of activity accordingly (O'Brien & Baker, 2009). For toddlers, their normal heart rate is 80 – 120 beats per minute as well as a normal respiratory rate of 20 – 40 breaths per minute.

To promote rest, mothers should encourage their children to sleep for about 12 to 14 hours per day and should provide one nap in the afternoon for about 2 to 3 hours (James et al., 2002; Wilson, 2009). In addition, mothers should decrease or manage the conditions that will increase metabolic requirements such as a fever or heat, as well as excessive energy expenditure such as crying for prolonged periods.

1.4) Maintaining a balance between solitude and social interaction. During the toddler years, differentiation of self from significant others is a major task and includes separation from the mother and individuation in the environment. Toddlers should learn to tolerate and achieve short periods of separation from their mothers, which is crucial for social development. Moreover, this separation also allows mothers time to restore their energy and patience. Interaction with other persons becomes increasingly important for

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children in this group. It is age appropriate for toddlers to engage in parallel play by playing alongside other children and/or doing the same things with the same toy but not directly engaging with other children (Allender, 2002; Wilson, 2009). Mothers should provide opportunities for their children to play or interact with family members and other persons.

1.5) Prevention of hazards to life, functioning, and well-being. At their developmental stage, toddlers lack problem-solving skills and experience with many situations, coupled with their low level of physical co-ordination, can lead to high-risk or dangerous situations. Toddlers with CHD are at high risk for infections such as RI and IE. Hence, mothers should protect toddlers with CHD from close contact with other persons with infections (Smith, 2001; Woodward, 2011; Wright & Rocchini, 2002). Toddlers with CHD need the provision of care for prevention of hazards. These preventions included immunizations, endocarditis prophylaxis, and routine dental care (Wright & Rocchini, 2002). To prevent infection, mothers should limit their child's exposure to pathogens by avoiding crowded events, washing the hands of their child frequently, practicing good hygiene, and taking their child to receive routine immunizations. Additionally, mothers should increase dental hygiene and should inform the dentist about their child's heart problem, so that the dentist can consider prescribing antibiotics to the child before cleanings or dental procedures in order to reduce the IE risk factors (Smith, 2001; Woodward, 2011, Wright & Rocchini, 2002).

1.6) Promotion of normalcy. Mothers should take actions to promote the integrity of the child's structure and function. For example, mothers should prevent the heart from working too hard by administering the right dosages of medications and ensuring adequate sleep for their child (Srichantaranit et al., 2010). Also, mothers need to monitor their child's health continuously. For example, they should take their child for dental examinations every 6 to 12 months. In addition, mothers should identify and attend to deviations from normal conditions of toddlers with CHD. For example, mother should recognize deviations from the child's normal appearance such as breathing patterns (Giffin, 2002).

2) Developmental self-care requisites. Developmental self-care requisites are related to the processes of human growth and development, as well as developmental events and occurrences in each individual at various stages of the life cycle, such as the intrauterine stage, the neonatal stage, infancy, childhood, adulthood, and pregnancy (Orem, 2001).

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Conditions and resources that promote the natural development of individuals vary within families, communities and societies. At the stages of infancy and childhood, developmental self-care requisites can be met only by dependent care agents, such as parents, or others persons. These requisites consist of the provision of conditions that promote development, engagement in self-development, and inferences with development (prevention of or overcoming effects of human conditions and life situations that can adversely affect human development) (Orem, 2001).

The development of children with CHD is affected by multiple factors that can change because of the pathology of disease, impact from treatment, other illnesses, hospitalization, and nutritional problems (Weinberg et al., 2001; Woodward, 2011). Children with CHD can have developmental delays including motor, language, and psychosocial delays (Majnemer et al., 2009; Smith, 2001; Van der Rijken et al., 2010; Weinberg et al., 2001). Thus, toddlers with CHD need developmental care from their mothers to ensure development that is appropriate for their age group (Wright & Rocchini, 2002). To promote optimal developmental tasks of toddlers with CHD, mothers need to understand the normal development of this age group, provision of conditions that promote development, engagement in the development of their child, and promote development for overcoming effects of the child's conditions such as poor health or the lack of an ability that can adversely affect development.

2.1) Promoting motor development. The major gross motor development in toddlers is locomotion, such as walking up and down stairs at 2 years old. Fine motor skill development includes increasingly skillful manual dexterity such as grasping very small objects at 1 year old, ability to build towers at 2 years old, and ability to draw circles on paper at 3 years old (Wilson, 2009). Thus, mothers need to encourage their children to do normal activities as much as they can to encourage development and to minimize developmental delays.

2.2) Promoting psychosocial development. According to Erikson, the primary psychosocial developmental stage during the toddler years is gaining a sense of autonomy while overcoming a sense of doubt and shame. The toddlers start to find that their behaviors are their own (Wilson, 2009). However, in this stage toddlers are faced with the conflict of attempting autonomy and sacrificing dependence on other persons which can

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produce a sense of doubt about their capability to control their behaviors (Wilson, 2009). Thus, mothers should monitor the skills and balance of control of their child with CHD by a careful balance of holding on and letting go. In social modalities, mothers should encourage the use of hands, mouth, eyes and sphincters when toilet training has begun through play activities such as opening and closing drawers and taking objects out of boxes (Wilson, 2009).

2.3) Promoting cognitive development. According to Piaget, cognitive development during the toddler years is at the sensorimotor and preoperational phase, during which cognitive processes develop rapidly but reasoning skills are still primitive and need to be understood to effectively deal with the typical behaviors of toddlers (Wilson, 2009). To promote this development, mothers of toddlers with CHD should read books to their children and choose books with bright and colorful images. Mothers should also take them to different activities and places to provide them with new experiences such as walks around the garden at their house and point out the different plants or insects. Additionally, mothers should promote appropriate imitation such as imitating household activities.

2.4) Promoting language development. Toddlers increasingly use language symbolically and are concerned with questions related to why and how. Their increasing level of comprehension is the most striking characteristic of language development in this age group. For instance, their capability of speech comprehension is much higher than the number of words the toddler can speak (Wilson, 2009). Thus, mothers should talk to toddlers slowly and clearly as well as respond and encourage them to repeat words.

3) Health deviation self-care requisites. Health deviation self-care requisites exist when persons are injured or ill, persons have specific types of pathology such as defects, and persons who receive a medical diagnosis and treatment (Orem, 2001). Toddlers with CHD can have a health deviation due to characteristics of the heart defect and may need medical and surgical management. It is important for mothers to strictly follow these requisites as described below:

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3.1) Mothers should seek and secure proper medical assistance from health professional teams such as cardiologists and pediatric nurses.

3.2) Mothers should be aware of and attend to the effects and results of the condition of the pathology. RI, IE, and CHF are preventable major complications from the pathology of the defect. Mothers should observe the signs and symptoms of these complications and know how to relieve the symptoms. For example, toddlers with dyspnea

should be placed in an inclined posture at a 30- to 45-degree angle (Semi-Fowler's position) to promote maximum chest expansion. Furthermore, mothers should play an important role in the oral and dental health of their children with CHD in order to decrease the risk of IE. Mothers have to brush their child's teeth at least twice a day and take their child for regular dental visits (Ghajari et al., 2014).

3.3) Mothers should provide medically-prescribed diagnostic, therapeutic, and rehabilitative measures including administrating medications correctly and properly, feeding appropriate food to their child, and regularly visiting their child's doctors even if there are no abnormal symptoms due to the heart condition of their child.

3.4) Mothers should be aware of and attend to the discomforting or deleterious effects of medication. They must look for potential side-effects and interactions with other medicine or foods in order to provide immediate assistance in case of an emergency.

3.5) Mothers should modify their self-concept that their toddler with CHD is in a special state of health and in need of specific forms of health care. Mothers need to understand the chronic illness and treatment of their toddlers with CHD as well as adapt to the special and continuous care needed prior to cardiac surgery. Toddlers with CHD need help in all daily activities such as feeding, elimination, promoting development, taking medications, receiving immunization, and doing follow-up. Having a child with CHD can increase the care demand of mothers and produce stress in mothers and their families, particularly mothers who spend most of their caregiving time attending to their child's physical needs (Svavardottir & McCubbin, 1996). Maternal adaptation in caring for their toddlers with CHD is important in maintaining a maternal role, and consequently keeping their child healthy and ready for surgery.

3.6) Mothers should learn to live with the effects of pathology and medical diagnostic and treatment measures of toddlers with CHD. Mothers should integrate daily activities of providing care for their toddlers with CHD into their normal daily life.

2.3 Factors affecting care behaviors among mothers of toddlers with CHD

Several factors have been found to be associated with care behaviors among mothers of young children with CHD prior to cardiac surgery (Asumpinzub, 1997; Chaisom et al., 2010). One descriptive correlational study (Asumpinzub, 1997) and one predictive study (Chaisom

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et al., 2010) revealed that factors affecting care behaviors among mothers of children with CHD included maternal age, educational level, family income, perceived self-efficacy, perceived susceptibility, perceived severity, perceived benefits, perceived barriers, health motivation, parenting stress, knowledge, and social support. In addition, there are two descriptive correlational studies that provided factors relating care behaviors among parents of children age 1 - 6 years old with acyanotic CHD prior to surgery including knowledge and self-efficacy (Soiphet, 2014) and factors relating caregiving among caregivers of children age 1 - 6 years old with acyanotic CHD and cyanotic CHD prior to surgery including knowledge and health perception (Phromreungrit el al., 2015). Previous studies showed various factors which were positively associated with care behaviors of the mothers. These factors are related to the basic conditioning factors and dependent care agency in Orem's theory (Orem, 2001). These factors are as follows:

2.3.1 Age

Age can reflect past experience and maturity of mothers. Mature persons can adjust well to caring for patients, so dependent care agency increases with age, but later decreases at old age (Orem, 1991). Asumpinzub's study (1997) showed a positive relationship between maternal age and maternal caring behaviors for children age 3 - 6 years old with CHD ($r = .1741$, $p < .05$).

2.3.2 Educational level

Educational level affects a person's sociocultural orientation to health and health care, which may be necessary for increasing cognitive appraisal skills as well as problem-solving skills in order to care for self or other persons (Orem, 1991). Asumpinzub (1997) showed a positive significant correlation between the educational level of mothers and maternal caring behaviors for children aged 3 - 6 years with CHD ($r = .2454$, $p = .01$). In addition, Mornmoung (2001) also found a positive significant correlation between maternal education and maternal adaptation in caring for infants with CHD with a p value of .001.

2.3.3 Family income

Family income can affect how an individual's care needs are met (Orem, 2001). Asumpinzub (1997) found a positive significant correlation between family income and

maternal caring behaviors for children aged 3 - 6 years old with CHD ($r = .2831$, $p < .01$). Chaisom et al. (2010) also found a positive significant correlation between family income and maternal caring behaviors for toddlers with CHD ($r = .21$, $p < .05$).

2.3.4 Parenting stress

Parenting stress can interfere with or constitute an obstacle for meeting self/dependent care requisites (Orem, 2001). It was found that parenting stress was negatively correlated with dependent care behaviors of mothers of toddlers with CHD ($r = -.21$, $p < .05$) (Chaisom et al., 2010).

2.3.5 Social support

Social support can affect the selection of ways or the ability to perform self/dependent-care to meet self-care requisites and is therefore associated with self-care behaviors (Orem, 2001). Social support has been found to be positively correlated with dependent care behaviors of mothers of toddlers with CHD ($r = .33$, $p < .01$) (Chaisom et al., 2010). Several studies found social support to be an important factor in improving maternal care behaviors for children with CHD and children with other chronic illnesses (Dulyakasem, 1993; Kamproh, 2001; Thamapan, 2010).

2.3.6 Self-efficacy

Self-efficacy is consistent with the transitional capability of self/dependent care in that transitional operations is a cognitive process which involves the judgment of one's ability to perform self/dependent-care activities (Orem, 2001). Self-efficacy has been shown to be positively correlated with care behaviors of parents to prevent RI in children aged 1 – 6 years old with acyanotic CHD ($r = .658$, $p < .001$) (Soiphet, 2014). Chaisom et al. (2010) found that self-efficacy was the predictor accounting for 43.80% of the variance in the mothers' dependent care behaviors for toddlers with CHD. That study demonstrated integration of the self-efficacy concept with self-care agency in the Self-Care Deficit Nursing Theory. Several studies in clinical trials found that self-efficacy was also a central factor for determining mothers' dependent care behaviors for children with CHD and children with other chronic illnesses (Chottivitayatarakorn, 2000; Dejyothin & Kirdpole, 2015; Thamapan, 2010; Wattana, 2007).

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2.3.7 Knowledge

Knowledge is an inherent part of self/dependent care agency. Individuals need to have knowledge of themselves and of environmental conditions in order to make decisions about the actions they will or will not perform. If a person does not possess the required knowledge, skill and/or motivation; then a person has a self-care deficit and will be unable to perform the action. Additionally, knowledge is also required for knowing and understanding how to interpret information about taking care of self or dependents, in particular for health deviation self-care requisites (Orem, 2001). Chaisom et al. (2010) found that knowledge was not associated with dependent care behaviors among mothers of toddlers with CHD. However, Phromreungrit el al. (2015) found a positive correlation between knowledge and caregiving among caregivers of children with CHD ($r = .51$, $p < .01$). Soiphet (2014) found a positive correlation between knowledge and care behaviors among parents of children with CHD ($r = .367$, $p < .001$). In addition, several studies in clinical trials found knowledge to be an important factor in improving maternal care behaviors for children with CHD and children with other chronic illnesses (Kruanate, 2008; Songthip et al., 2015; Theannamngian, 2003).

2.3.8 Perception

Perception is a part of selected basic capabilities of self-care agency for engagement in self/dependent care and other forms of activity (Orem, 2001). This variable is important in determining or changing people's care behaviors because their behavior is dependent upon their perception of their disease. Phromreungrit el al. (2015) found a positive significant correlation between health perception and caregiving for children aged 1 - 6 years old with CHD ($r = .51$, $p < .01$). Similarly, Asumpinzub's study (1997) showed a positive relationship between perception of disease and maternal caring behaviors for children aged 3 - 6 years old with CHD ($r = .5431$, $p < .001$). Perception of disease includes perceived susceptibility to complications of CHD, perceived severity of disease, perceived barriers of action, perceived benefits of action, and health motivation (Becker, 1974). These concepts are described in detail below.

1) Perceived susceptibility to complications of CHD. Perceived susceptibility is defined as the belief of the likelihood of catching a disease or condition (Champion & Skinner, 2008). This factor can lead to outcome behaviors. Asumpinzub (1997) found a

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positive significant correlation between perceived susceptibility and maternal caring behaviors for children aged 3 - 6 years old with CHD ($r = .5848$, $p < .001$).

2) Perceived severity of disease. Perceived severity refers to the belief of how serious a condition is (Champion & Skinner, 2008). Asumpinzub (1997) found a positive significant correlation between perceived severity and maternal caring behaviors for children aged 3 - 6 years old with CHD ($r = .3431$, $p < .001$).

3) Perceived benefits to action. Perceived benefits refer to the belief in the efficacy of the advised action to reduce risk or seriousness of impact (Champion & Skinner, 2008). According to Pender, Murdaugh, and Parsons (2006), perceived benefits motivates behavior both directly and indirectly and affects care by determination of commitment about action planning for engaging in the care behaviors. Asumpinzub (1997) found a positive significant correlation between perceived benefits and maternal caring behaviors for children aged 3 - 6 years old with CHD ($r = .4241$, $p < .001$).

4) Perceived barriers to action. Perceived barriers refer to the beliefs in the tangible and psychological costs of the advised action (Champion & Skinner, 2008). According to Pender et al. (2006), perceived barriers affect behavior directly through serving as blocks to action and indirectly by reducing commitment about action planning. Asumpinzub (1997) found a positive significant correlation between perceived barriers and maternal caring behaviors for children aged 3 - 6 years old with CHD ($r = .3704$, $p < .001$).

5) Health motivation. Health motivation is the value of reduction of perceived susceptibility to and severity of illness or its sequelae (Rosenstock, Strecher, & Becker, 1988). Asumpinzub (1997) found a positive significant correlation between health motivation and maternal caring behaviors for children aged 3 - 6 years old with CHD ($r = .2390$, $p < .001$).

In conclusion, care behaviors of mothers of children with CHD is dependent on various influencing factors. Previous studies showed the various factors, which are positively associated with care behaviors of the mothers. These aforementioned factors can be classified as non-modifiable and modifiable factors. Non-modifiable factors included maternal age, educational level, and family income. Modifiable factors included perceived self-efficacy, perceived susceptibility, perceived severity, perceived benefits, perceived barriers, health motivation, parenting stress, knowledge, and social support. The most important modifiable factor that influences care behaviors of the mothers of children with CHD prior to surgery, is self-efficacy, which can be improved and predict correct maternal care behaviors. However,

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the correlational study of Chaisom et al. (2010) found other factors related to Orem's Self-Care Deficit Nursing Theory (Orem, 2001), including parenting stress, perceived social support, and CHD knowledge. These factors were found to be important to care behaviors among mothers of toddlers with CHD. Although these factors are not directly mentioned in Orem's theory, they relate to Orem's concept of basic conditioning factors and self/dependent care agency. Maternal age, educational level, family income, social support, and parenting stress are under basic conditioning factors, while self-efficacy, knowledge, perceived susceptibility, perceived severity, perceived benefit, perceived barrier, and health motivation are under dependent care agency.

2.4 Factors related to Orem's Self-Care Deficit Nursing Theory

According to the concepts of Orem's Self-Care Deficit Nursing Theory (2001), care behavior is affected by dependent care agency and basic conditioning factors. Self-efficacy and perception of disease (perceived susceptibility to complications of CHD, perceived severity of disease, perceived benefits of action, perceived barriers of action, and health motivation) are under dependent care agency. Maternal age, educational level, family income, social support, and parenting stress are under basic conditioning factors. Even though maternal age, educational level, and family income are non-modifiable factors, these factors can be used to take part in controlling the inferential variables of the research design such as defining inclusion criteria, randomization, and statistical control. The other factors which relate to Orem's theory can be modified. Therefore, an intervention based on the concepts of Orem's theory (2001) by modifying or supporting self-efficacy, parenting stress, social support or knowledge may enhance care behaviors among mothers of toddlers with CHD. According to Orem's theory (2001), self-efficacy and knowledge are parts of dependent care agency that influence care behaviors of mothers for toddlers with CHD. Furthermore, parenting stress and social support are the internal and external factors that affect care behaviors of mothers for toddlers with CHD or affect their capacity to engage in care behaviors. In this study, these factors are needed to improve maternal care behaviors as described in the following:

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2.4.1 Self-efficacy

Self-efficacy is linked to the transitional capability of dependent care operations in dependent care agency of Orem's theory (2001). Persons can develop the capabilities of making judgments about performing care activities by thought about what can and should be done to engage in dependent care operations. According to Bandura (1997), self-efficacy is one's judgment of how effectively individuals can organize and execute a designated type of performance. Thus, self-efficacy can be linked to the transitional capability of dependent care operations which involves the judgment of one's ability for dependent care. It is important in developing an individual's decision-making ability to engage in a specific behavior when they believe in their capabilities. Beliefs determine how people feel, think, motivate themselves, and behave (Bandura, 1994). A low sense of self-efficacy is associated with stress, depression, anxiety, and hopelessness; a strong sense of efficacy facilitates cognitive processes and performance. Self-efficacy can influence people's choice of activities and can increase or obstruct motivation (Bandura, 1995; Zulkosky, 2009). Self-efficacy is a powerful psychosocial factor capable of predicting the enactment of health-related behaviors (Bandura, 1986). It is significant to influence certain behaviors to achieve positive outcomes (Zulkosky, 2009).

Self-efficacy is constructed from four major sources of information (Bandura, 1997):

1) Enactive mastery experience. This source serves as an indicator of capability and enables the person to succeed through personal experience. Performance mastery has the strongest influence on self-efficacy belief when the person has developed and refined their skills through practice. Human capability is developed by breaking down complex skills into easy subskills and orderly arranging them (Bandura, 1997; McAlister, Perry, & Parcel, 2008).

2) Vicarious experience. This source affects efficacy through transmission of competencies through the comparison of the attainments of others. People actively seek proficient models that are similar to their behavior and expressed ways of thinking, competent models transmit knowledge and teach observers effective skills and strategies for managing environmental demands (Bandura, 1997). Observing how others like themselves are able to

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perform a task can increase the observers' belief that they too have the capability to master comparable activities in specific behaviors (Bandura, 1997; McAlister et al., 2008).

3) Verbal persuasion. Verbal persuasion serves as a further means of strengthening people's beliefs that they are able to accomplish what they seek, that strong encouragement can boost their self-confidence enough to induce their first efforts for behavior change. Verbal persuasion from others can increase self-efficacy, for example, evaluative feedback from another person-especially during the early stages of skill practice, and telling people that their progress shows they have ability for the activity (Bandura, 1997; McAlister et al., 2008).

4) Physiological and affective states. Physiological and affective states permit persons to judge their capabilities, strengths, and vulnerabilities to dysfunction. Persons should be well-rested and relaxed before attempting a new behavior to enhance physical status and reduce stress levels (Bandura, 1997; McAlister et al., 2008).

Chaisom et al. (2010) found that self-efficacy was the predictor accounting for 43.80% of the variance in the mothers' dependent care behaviors for toddlers with CHD. Self-efficacy was also a central factor in an effective model for the mothers' dependent care behaviors for children with CHD and children with chronic illness (Chottivitayatarakorn, 2000; Dejyothin & Kirdpole, 2015; Thamapan, 2010; Wattana, 2007). Research findings identified four sources of self-efficacy: enactive mastery experience, vicarious experience, verbal persuasion, and physiological and affective states. These four sources enhanced self-efficacy, which improved maternal caring behaviors. Thus, the significance of these results is especially important in documenting the correlation between maternal perceived self-efficacy and maternal care behaviors for their children, particularly in mothers of toddlers with CHD.

Additionally, Chaisom et al. (2010) found a relationship between self-efficacy, knowledge, parenting stress, and social support. Self-efficacy had a highly significant positive relationship with care behaviors for toddlers with CHD, a low positive relationship with knowledge ($r = .21$, $p < .05$), a moderately positive relationship with social support ($r = .44$, $p < .01$), and a moderately negative relationship with parenting stress ($r = -.40$, $p < .01$). These findings indicate that maternal self-efficacy was associated with several factors. If mothers of toddlers with CHD have more self-efficacy, they will have more knowledge, more social

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support, or lower parenting stress. Likewise, if mothers of toddlers with CHD have more knowledge, more social support, or lower parenting stress, they will have more self-efficacy.

2.4.2 Social support

Social support is under the basic conditioning factors of Orem's theory (2001) as a resource in the availability and adequacy of resources that primarily affect the selection of ways to meet dependent-care requisites. House (1981) defines social support as interpersonal transaction relating to emotional concern (love and empathy), instrumental aid (goods or services), information (about the environment), or appraisal (information about self-evaluation). Social support can modify the deleterious effect of stress on health in three major ways: 1) enhancing health and well-being directly due to support which meets important human needs for security, social contact, and affection; 2) reducing levels of stress directly, thereby indirectly improving health; and 3) buffering the impact of stress to help a person live a more healthy life. According to House (1981), social support can be categorized into four different types of supportive acts or behaviors. These are described in further detail below:

1) Emotional support. Emotional support is the most important supportive behavior, which involves providing caring, empathy, love, and trust (House, 1981).

2) Instrumental support. Instrumental support involves instrumental behaviors that directly help the person in need. For instance, a person may help other people do their work, help them take care of themselves, or give help them pay their bills (House, 1981). This supportive act is to provide tangible material help or service that directly meets a person's need (Heaney & Israel, 2008).

3) Informational support. Informational support means providing information to the person, which can be used in coping with personal and environmental problems (House, 1981). This supportive act is to provide suggestions, advice, and information that can be used to solve problems (Heaney & Israel, 2008).

4) Appraisal support. Appraisal support involves transmissions of information that are relevant to self-evaluation. Other persons are sources of information that individuals can use when evaluating themselves (House, 1981). This supportive act is done to provide information for self-evaluation. Examples include positive feedback and affirmation (Heaney & Israel, 2008).

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Chaisom et al. (2010) indicated that mothers of toddlers with CHD who have more social support engage in more positive dependent care behaviors and also have lower levels of parenting stress. Mothers can cope with stress and adjust themselves better when they receive emotional support and thus can provide more optimal caregiving behaviors (Findler, 2000). The social support theory by House seems to cover all aspects of support for mothers. Clinical trial research based on House's concept of social support (1981) documented that having basic needs met (physical, emotional, and social needs) was crucial for mothers who have children with CHD and children with chronic illness, and those that received such support showed more appropriate maternal care behaviors (Dulyakasem, 1993; Kamproh, 2001; Thamapan, 2010). Thus, social support is a significant factor related to caring behaviors of the mothers.

2.4.3 Knowledge

Knowledge is linked to the estimative capability of dependent care operations in dependent care agency of Orem's theory (2001) that engages in the operations by understanding, making judgments and making decisions about the actions they will do and those they will avoid and can lead to produce effective care. Before people can affirm the proper thing to do, they must gain knowledge of the courses of action open to them in order to know and meet the self-care requisites of their dependents (Orem, 2001). It is a necessary basis for dependent care that facilitates performance of dependent care. According to Orem's theory (2001), individuals need to have knowledge of themselves and knowledge of environmental conditions in order to make a decision about the actions they will or will not perform. Orem also states that knowledge is required for the health deviation self-care requisite. Thus, knowledge is a significant factor in improving maternal care behaviors.

Knowledge refers to the capacity to act (Sveiby, 1997). The knowledge of people highly affects the comfort, effectiveness, safety, and satisfaction with which the goals of an individual are formulated and attained (Hunt, 2003). Knowledge is acquired through experience, learning, and practice, which can affect behavior and performance of the person in consequence of training and education. As a result, the person has the power to achieve the performance (Hunt, 2003). Performance improvement of individuals should focus on the process of adult learning as being central to their theory and practice. Adult learning is defined

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as the process of adults gaining knowledge and expertise (Knowles, Holton, & Swanson, 2005). Knowles et al. (2005) classify the core principles of adult learning as follows:

1) The need to know. Adults need to know why they need to learn something before they engage in learning. Before learning, they need more information about how the learning will be conducted, what learning will occur, and why learning is important. For adult education, the first task of the facilitator of learning is to assist the learners to become more aware of the need to know. Tools for raising the level of awareness of the need to know are simulated or real experiences. These tools may include diagnostic performance assessments, personnel appraisal systems, and exposure to a role model.

2) The learners' self-concept. Adults have the self-concept of being responsible for making their own decisions in their lives; thus, they can develop a deep psychological need to be seen and treated by other persons as being competent of self-direction. There are two conceptions of self-directed learning: 1) self-teaching, whereby learners are capable of controlling the mechanics and techniques of teaching themselves, and 2) personal autonomy, whereby learners are capable of controlling the goal of learning and possession of learning.

3) The role of the learners' experience. Adults come into the educational activities with either a greater volume or a different quality of experiences from adolescents. Thus, adult education places more emphasis on individualization of teaching and learning strategies, experiential techniques (e.g., simulation exercises and problem-solving activities), and peer-helping activities.

4) Readiness to learn. Adults generally come ready to learn when their life situation creates a need to know so that they can cope with their real-life situation effectively. Most learning experiences are situational and the behaviors of the learners vary with the learning situations. The ways of inducing the learner for readiness to learn include counseling, superior performance, simulation exercises, and other techniques.

5) Orientation to learning. Adults' orientation to learning is life-centered. They perceive that learning will help them perform the activities or manage the problems that they face in life situations. In addition, adults learn new skills and knowledge, attitudes, and values most efficiently when they are applied to real-life situations.

6) Motivation. Adults are responsive to some external motivators such as a salary increase or a new job, but the most powerful motivators are internal pressures such as

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well-being, quality of life, and satisfaction. Adults are motivated through learning which can help them solve problems in their lives.

Knowledge is a significant factor in providing care for children with CHD (Phromreungrit et al., 2015; Soiphet, 2014). Current literature documents that parents of children with CHD should be educated on the disease and the provision of care, and guided by a specialist (Ghajari et al., 2014; Liu, Yu, Zhou, Yang, Lu, & Zhao, 2014; Ndile & Kohi, 2011; Raica, Tanasescu, Galice, & Pop, 2011). Moreover, Ndile and Kohi (2011) stated that better maternal knowledge and improved care for their children with CHD could prevent complications such as IE and enhance their children's well-being.

2.4.4 Parenting stress

Parenting stress is classified under the basic conditioning factors of Orem's theory (2001) as a health state factor of the person which can bring about conditions that interfere with or constitute obstacles to meeting dependent-care requisites. Parenting stress is the tension parents feel in achieving their parenting functions as a result of dysfunctional parental behaviors or behavioral characteristics of the child (Abidin, 1995). Uzark and Jones (2003) revealed that parents of children with cardiac disease reported excessive parenting stress, especially with children who are difficult to care. Abidin (1995) postulates that the stressors of parental experiences are relevant to the role of being a parent and will influence parenting behaviors. It is an important factor in providing care for children with CHD. In fact, parenting stress is negatively correlated with dependent care behaviors of mothers of toddlers with CHD ($r = -.21$, $p < .05$) (Chaisom et al., 2010), and indicated that if parenting stress decreased, maternal care behaviors increased. In addition, parenting stress is a modifiable variable and one responsive to interventions to reduce stress levels and improve parenting and coping skills (Sumpter, 2009). In addition, parenting stress can be affected by social support; mothers of children with CHD who have more social support have lower parenting stress (Chaisom et al., 2010; Lee, Yoo, & Yoo, 2007) and better coping (Tak & McCubbin, 2002).

Parenting stress and coping is the topic most frequently examined by previous researchers related to the consequences of mothering children with CHD (Lawoko & Soares, 2002; McCusker et al., 2009, Tak & McCubbin, 2002). According to the transactional model of stress and coping (Glanz & Schwartz, 2008), stressful experiences are construed as person-

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environment transactions and the effect of an external stressor or demand is mediated by an individual's appraisal of the stressor. When an individual is confronted with a stressor, the individual evaluates potential threats and his or her capacity to change the situation and to handle negative emotional reactions. In the transactional model of stress and coping, coping efforts mediate a person's appraisal of the stressor through problem management and emotional regulation. It has been shown that the coping process gave mothers greater confidence in their ability to care for their children with CHD (Campell, Kirpatrick, Berry, & Lamberti, 1995), and led to better feeding and the promotion of developmental practice of mothers (McCusker et al., 2009), as well as better maternal adjustment in providing care for children with chronic illnesses (McCusker et al., 2009; Thompson, Gustafson, Hamlett, & Spock, 1992). Coping strategies include the following: 1) problem management (problem-focused coping), which includes changing the stressful situation through active coping, problem-solving, and information seeking; and 2) emotional regulation (emotional-focused coping), which includes changing the way one thinks or feels about a stressful situation such as seeking social support and venting feelings, avoidance, and denial. Based on the transactional model, when emotional-focused coping strategies are employed in a combination with problem-focused coping strategies, individuals will be the most effective at adapting to stressors. This combination will improve their health behaviors (Glanz & Schwartz, 2008).

2.5 Tools for assessing care behaviors among mothers of toddlers with CHD

In reviewing literature on maternal care behaviors assessment prior to surgery period, the following tools were found:

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2.5.1 The Maternal Caring Behaviors Questionnaire

This instrument developed by Asumpinzub (1997) consisted of 46 items for mothers who have children aged 3 – 6 years old with CHD. It was based on a review of relevant documents and Orem's Nursing Theory (Orem, 1991). The scale covered three main components of three types of self-care requisites for toddlers with CHD: 1) universal self-care requisites, 2) developmental self-care requisites, and 3) health deviation self-care requisites. Answers were given using four-point Likert scales (from 0 = no practice done to 3 = always experience practice). Interpretation of scores ranged from 46 to 138. The content validity was

determined by a panel of five experts. The internal consistency reliability was tested in 30 mothers who have children with CHD similar to the sample; the Cronbach's alpha coefficient was .80, which was acceptable.

The Maternal Caring Behaviors Questionnaire for mothers who have children younger than one year old with newly diagnosed CHD was modified from the questionnaire of Asumpinzub (1997) by Chottivitayatarakorn (2001). The researcher revised the original items by classification of care behavior as three dimensions: 1) feeding and taking medication; 2) infection prevention; and 3) observing the signs of congestive heart failure and ways to relieve the symptoms. Also, the researcher adjusted some items for clarification and appropriateness for maternal caring behaviors in the present situation. This questionnaire consisted of 22 items and was scored from 1 to 4 (from 1 = never experience practice to 4 = always experience practice). Interpretation of scores ranged from 22 to 88. The content validity was determined by a panel of five experts. The internal consistency reliability was tested in 30 mothers who had children with CHD; the Cronbach's alpha coefficient was .80, which was acceptable.

2.5.2 The Questionnaire of Primary Caregiver Behavior in Caring

This questionnaire consisted of 19 items developed by Theannamngian (2003) for primary caregivers who had children aged 2 – 6 years old with cyanotic heart disease at risk of cyanotic spells. It was based on a review of relevant documents and Orem's Nursing Theory. It is about the behavior of the primary caregivers that have a specific aim to respond to their needs relevant to the self-care practice for caring of their children with cyanotic heart disease at risk of cyanotic spells. They include universal self-care requisites, developmental self-care requisites, and health deviation self-care requisites. The measurement was scored based on three levels: slightly appropriate behavior, appropriate behavior, and very appropriate behavior. These statements were scored from 1 to 3, respectively. Interpretation of scores ranged from 19 to 57. The content validity was determined by a panel of five experts. These experts ascertained whether the instrument was appropriate in terms of content for use. Also, a pilot study was undertaken among ten primary caregivers who were similar to the sample to check the appropriateness of the questionnaire. The internal consistency reliability was tested in ten primary caregivers; the Cronbach's alpha coefficient was .88, which was acceptable.

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2.5.3 The Dependent Care Behaviors in Mothers of Toddlers with CHD Scale

This questionnaire consisting of 38 items developed by Chaisom et al. (2010) was based on The Self-Care Deficit Nursing Theory (Orem, 2001) and literature review. The scale covered three main components of three types of self-care requisites for toddlers with acyanotic CHD prior to cardiac surgery: 1) universal self-care requisites, 2) developmental self-care requisites, and 3) health deviation self-care requisites. Answers were given using four-point Likert scales (from 0 = never experience the reported behavior to 3 = always perform the reported behavior). The possible final scores ranged from 1 to 3 and were classified into three levels of low (1.00 – 1.67), moderate (> 1.67 – 2.34), and high (> 2.34 – 3.00) by dividing the scores equally into three ranges; high scores indicated better dependent care behaviors. The content validity was determined by a panel of five experts; the content validity index (CVI) of the entire scale was .95. The internal consistency reliability was tested in ten mothers of the toddlers with CHD; the Cronbach's alpha coefficient was .74, which was acceptable.

2.5.4 The Questionnaire Regarding Behaviors of Mothers Caring for Children Acyanotic Congenital Heart Disease

This questionnaire consisting of 36 items developed by Songthip et al. (2015) for mothers of 0 – 2 year-old children with acyanotic CHD pending corrective surgery was based on a review of relevant documents. The researcher classified maternal care behaviors as four dimensions: 1) taking medication, 2) feeding, 3) preventing respiratory infections, and 4) observing the signs of congestive heart failure and ways to relieve the symptoms. The answers were given using three-point rating scales (from 1 = never perform the reported behavior to 3 = always perform the reported behavior). Interpretation of scores ranged from 36 to 108; higher scores indicated better dependent care behaviors. The content validity was determined by a panel of five experts; the content validity index (CVI) of the entire scale was .96, which was acceptable. The reliability was not reported in this study.

2.5.5 The Parental Care Behaviors to Prevent Respiratory Infection in Children with Congenital Heart Disease Questionnaire

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This questionnaire consisting of 33 items developed by Soiphet (2014) for parents of children aged 1 – 6 years old with un-operated acyanotic CHD was based on a review of relevant documents. The researcher classified care behaviors as four dimensions: 1) proper nutrition, 2) immunization, 3) preventing of contraction with persons who had respiratory infection, and 4) taking medication for preventing CHF. These statements were scored as 1 to 4, respectively. Interpretation of scores ranged from 33 to 132. The scores were classified into three levels—low (33 – 65), moderate (66 – 98), and high (99 – 132)—by dividing the scores equally into three ranges. The content validity was determined by a panel of five experts; the content validity index (CVI) of the entire scale was .93, which was acceptable. The internal consistency reliability was tested among ten mothers who had children with CHD similar to the sample; the Cronbach's alpha coefficient was .89, which was acceptable.

2.5.6 The Caregiving among of Caregivers of Children with CHD Questionnaire

This questionnaire consisting of 33 items developed by Phromreungrit et al. (2015) for caregivers who provide care for children aged 1 – 6 years old with un-operated acyanotic CHD and cyanotic CHD was based on a review of relevant documents. The researcher classified caregiving as seven dimensions: 1) growing and feeding; 2) development; 3) immunization; 4) dental health care and preventing infective endocarditis; 5) prevention of illness and respiratory infections; 6) physical activity; and 7) taking medication. These statements were scored as 1 to 5 respectively. Interpretation of scores ranged from 33 to 165. The scores were classified into three levels—low (33 – 77), moderate (78 – 121), and high (122 – 165)—by dividing the scores equally into three ranges. The content validity was determined by a panel of 5 experts; the content validity index (CVI) of the entire scale was .96, which was acceptable. The internal consistency reliability was tested among ten mothers who had children with CHD similar to the sample; the Cronbach's alpha coefficient was .96, which was acceptable.

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In conclusion, these existing tools indicated that the assessment of maternal care behaviors was consistent with the care behaviors of mothers for children with CHD. Many researchers have developed measuring instruments for this care behaviors concept among mothers of various age groups of children. Children with CHD in each age group have different care needs (Wright & Rocchini, 2002). The type of CHD can also affect the children's care needs (O'Brien & Baker, 2009). For example, some children with cyanotic

CHD (such as TOF) need special attention to care for managing fluid and preventing the occurrence of cyanotic spells, while some children with acyanotic CHD (such as large VSD) need an emphasis on monitoring the symptoms of CHF. Thus, the Dependent Care Behaviors in Mothers of Toddlers with CHD Scale by Chaisom et al. (2010) was selected as the measuring tool for care behaviors among mothers of toddlers with acyanotic CHD in this study for three reasons. First of all, this scale is based on the self-report that the mother evaluates herself about care behaviors which covered three main components of three types of self-care requisites based on Orem's theory (Orem, 2001) including universal self-care requisites, developmental self-care requisites, and health deviation self-care requisites of toddlers with CHD. The second reason is that this scale assessed care behaviors among mothers of CHD toddlers with increased pulmonary blood flow and assessed those mothers in the northern region of Thailand. Lastly, this scale reported both CVI and reliability, which were acceptable. Although this scale is considered to be appropriate for assessment of care behaviors among mothers in this study, the structure of items needed to be adjusted in order to make it more appropriate for mothers of toddlers with CHD in providing care during preoperative period as well as the evidence of psychometric properties of this scale adequately.

2.6 Intervention for enhancing care behaviors among mothers of children with CHD

This literature review was conducted to identify the effective intervention programs designed to strengthen the mothers' care behaviors for children with CHD. The existing intervention for enhancing care behaviors of mothers for children with CHD prior to surgery can be classified by activities as follows:

2.6.1 Health Education Program

The health education program for mothers of children with CHD was found in five previous studies. A study by Chottivitayatarakorn (2000) examined effects of a self-efficacy program on mothers caring for children with CHD. This study was quasi-experimental research with a one-group pretest-posttest design. The purposive sampling consisted of thirty mothers of children who were 0 – 1 year old with CHD. The self-efficacy program that was developed consisted of suggestion, demonstration, practice, group discussion, self-monitoring, a prompt, and a reminder letter. The program was during a 12-

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week period with three sessions. The first 20- to 30-minute session held during the first week was about providing CHD knowledge, demonstration and return-demonstration, and providing the handbook. The second session held during the second week was about sending the reminder letter to will-power mothers in providing care for their children. The third 30-minute session held during the sixth week was about mastery experience and participant modeling through discussions with 2 – 3 mothers per group. The post-test was assessed six weeks after the program. After completing the program, the mean score of maternal caring behavior increased statistically and significantly ($p < .001$).

The study by Kamproh (2001) examined the effectiveness of a health education program upon maternal behaviors in caring for children with VSDs at Queen Sirikit Institute of Child Health. This study was quasi-experimental research, with pre-test post-test control group design, using the Protective Motivation Theory and Social Support as the conceptual basis for organizing health education activation. One hundred mothers of children below the age of one year old with VSD diagnosed as moderate to severe were organized by the researcher into two groups, with fifty mothers in each group. The program comprised a lecture with a slide show, group discussion, positive role modeling, demonstration, practice, a telephone call, and a postcard mailing for stimulation. Group activities were conducted once a week at 4-week intervals for approximately 5 – 6 mothers in the experimental group. There were three sessions of 1 – 1.5 hours each. The program included reminding the mothers to take good care of their children and keep appointments through mailing postcards twice. The post-test was assessed immediately at the eighth week after the program. The mean score of maternal caring behavior in the experimental group was statistically and significantly higher after accomplishing the program than before attending the program and the comparison group ($p < .001$).

A study by Dejyothin and Kirdpole (2015) examined the effects of a self-efficacy enhancement program on the self-efficacy beliefs and caring behaviors of caregivers to control heart failure in children with congenital heart disease. This study was quasi-experimental research, with pre-test post-test control group design, using the Self-Efficacy Theory as the conceptual basis for organizing health education activation. Thirty caregivers of children aged 6 years old and under with acyanotic CHD were organized by the researcher into two groups, with 15 caregivers in each group. The program was a 4-week

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period with three sessions. The first 60-minute session held in the first week was about enactive mastery experience, vicarious experience, verbal persuasion, and physiological and affective states through discussions with 2 – 3 mothers per group, demonstration and return-demonstration with guidance from the researcher, and providing a handbook. The second and third sessions held in the second and third weeks, once a week, were about supporting care and reviewing the knowledge via telephone. The post-test was assessed at the fourth week of the program. The mean score on caregivers caring behaviors in the experimental group was statistically and significantly higher than the control group ($p < .001$).

There were two studies that examined the effects of supportive-educative nursing system program on care behaviors of mothers of children with CHD; the program activities were designed based on a supportive-educative nursing system of Orem's Nursing Theory including teaching, guiding, supporting, and managing environmental conditions (Songthip et al., 2015; Theannamngian, 2003). The study by Theannamngian (2003) examined the effects of a supportive-educative nursing system on primary caregiver's behavior in caring for children with cyanotic heart disease at risk of cyanotic spells and the occurrence of cyanotic spells. This study was pre-experimental research, with single-group pre-test/post-test design. The sample comprised thirty primary caregivers (80% of them were mothers) of children aged 2 – 6 years old with cyanotic heart disease at risk of cyanotic spells and who have never undergone any cardiac surgery. The program activities consisted of six steps: 1) educating about cyanotic spells by using video tape and pamphlets at the eighth week; 2) recording the occurrence of cyanotic spells; 3) following the assessment form at the first week to the eighth week; 4) inquiring via telephone about any question of caring at the ninth week; 5) motivating via postcards about caring at the tenth and the fourteenth weeks; and 6) group activities for discussion about practice of caregiver at the twelfth week. Primary caregivers had a higher mean score after completing the sixteenth week health-education program than before attending the program (Mean = 37.20, SD = 5.18) and the occurrence of cyanotic spells of the child decreased (Mean = 8.63, SD = 10.52).

Additionally, the study by Songthip et al (2015) examined the effects of a supportive-educative nursing system program on knowledge and behaviors of mothers of children with acyanotic CHD aged 0 – 2 years old. This study was quasi-experimental research, with two-group pretest-posttest design. Fifty mothers of 0 – 2 year-old children with

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acyanotic CHD were organized by the researcher into two groups, with 25 mothers in each group. The program was conducted over a 4-week period with three sessions. The first 45-minute session held in the first week was about educating in regards to care for children with acyanotic CHD through computers, managing environmental conditions using group discussion with 3 – 5 mothers per group about sharing their care experiences, demonstration and return-demonstration with guidance from the researcher, and providing a handbook. The second and third sessions held in the second and third weeks, once a week, were about supporting via telephone about deep listening on their child care problems. The post-test was assessed at the fourth week of the program. The mean score of maternal care behaviors in the experimental group was statistically and significantly higher than the control group ($p < .001$).

2.6.2 Psychoeducation Program

In the UK, McCusker et al. (2009) studied a controlled trial of early interventions to promote maternal adjustment and development in infants born with severe CHD. The mothers of infants with CHD who required surgical or catheter interventions were allocated to the intervention or the control group, a group in blocks of ten based on order of admission to the unit, with 35 subjects in each group. The Congenital Heart Disease Intervention Programme (CHIP) was guided by a transactional stress and coping model (Thompson et al., 1992) to understand child outcomes in chronic illness, focused on bolstering maternal adjustment and coping skills. CHIP interventions included six sessions of 1 – 2 hours each. In the first session, the researcher provided an opportunity for the participant to express emotional ventilation and construction of meaning. The second session focused on psychoeducation with active coping skills using problem-solving therapy to reduce worry and distress and promote infant development. The third session related exposure to the medical involvement, recovery unit, and health professionals who were involved in treating the infant. Between the second and the third sessions, the mothers saw a video narrative of experienced parents about how they coped with the problems. The fourth and the fifth sessions emphasized the psychoeducation and coaching on competencies and strategies to optimize feeding success and improve infant development. In the sixth session, all interventions described in the program were reviewed. At the six-month follow-up, there was a statistically significant increase in the feeding practices and on the mental development scale.

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In conclusion, the existing interventions for improving care behaviors of the mothers for children with CHD and child health outcomes prior to surgery were mostly found in Thai studies (Chottivitayatarakorn, 2000; Dejyothin & Kirdpole, 2015; Kamproh, 2001; Songthip et al., 2015; Theannamngian, 2003), but only one study in Western literature was found (McCusker et al., 2009). Most interventions were developed for mothers caring for children diagnosed CHD aged under 3 years old who were their dependents. Each intervention was developed based on different health behavior theories such as Self-Efficacy Theory (Chottivitayatarakorn, 2000; Dejyothin & Kirdpole, 2015), a supportive-educative nursing system of Orem's Nursing Theory (Songthip et al., 2015; Theannamngian, 2003), Protective Motivation Theory and Social Support (Kamproh, 2001), and a transactional stress and coping model (McCusker et al., 2009). The successful strategies of these existing interventions were knowledge provision (Chottivitayatarakorn, 2000; Kamproh, 2001; McCusker et al., 2009; Songthip et al., 2015; Theannamngian, 2003); enhancement of self-efficacy (Chottivitayatarakorn, 2000; Dejyothin & Kirdpole, 2015); development of coping skills (McCusker et al., 2009); modification of perception including susceptibility, severity, benefit, barrier, health motivation, and self-efficacy (Kamproh, 2001); and social support (Kamproh, 2001). Furthermore, combined education with letter reminders, postcards reminders, telephone counseling and self-monitoring were also used successfully. The results of these studies indicated that the significantly increased maternal care behaviors as well as improved child health outcomes included decreased incidence of respiratory infection (Kamproh, 2001) and cyanotic spell occurrence (Theannamngian, 2003). These interventions of previous studies can achieve an improvement of maternal care behaviors at four weeks to twelve weeks within 3 – 5 sessions. In this study, the six-week period of the program was chosen due to two reasons: 1) the previous studies showed the effectiveness of the program on maternal care behaviors within this period, and 2) the surgery is typically scheduled approximately seven weeks after physicians' recommendations at the study setting.

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However, the effects of the aforementioned programs on care behaviors of mothers resulting from one or two factors that are incorporated into the program did not cover all of the aforementioned key factors including self-efficacy, knowledge, parenting stress and social support that would be needed to be adjusted within the program to help mothers perform better dependent care, and some components of each factor used also needed to be modified. In addition, these previous studies seem to have some limitations. The main

limitation was methodological weakness—using quasi-experimental designs, which did not randomize the sample into control and experimental groups (Chottivitayatarakorn, 2000; Dejyothin & Kirdpole, 2015; Kamproh, 2001; Songthip et al., 2015); using pre-experimental research, which did not randomize the assignment of the sample (Theannamngian, 2003); lack of a controlled trial using blinding (McCusker et al., 2009); and lack of a comparison group (Chottivitayatarakorn, 2000; Kamproh, 2001; Theannamngian, 2003). Hence, the generalizability of these studies was limited.

Moreover, the existing program has other drawbacks such as the short duration of the intervention (3 sessions) (Chottivitayatarakorn, 2000; Dejyothin & Kirdpole, 2015; Songthip et al., 2015), education with simple teaching aids such as flip chart or slides (Chottivitayatarakorn, 2000; Dejyothin & Kirdpole, 2015; Kamproh, 2001), and no follow-up on maternal care behaviors after the program's completion (Kamproh, 2001). In addition, all interventions reported in the Thai studies related to enhancing maternal caring behaviors have focused upon the health education program to help the mothers increase CHD knowledge, increase confidence in providing care for their children, and receive support from health care providers. These studies did not pay attention to reducing stress in providing care by incorporating the concept of parenting stress into programs. Thai mothers of children with CHD revealed that they have stress in providing care for their children similar to parenting stress in Western countries, which can affect maternal caring behaviors (Chaisom et al., 2010; Srichantaranit & Chontawan, 2010). In a study by McCusker et al. (2009), a program that focused on education combined with developing active coping skills using problem-solving therapy reduced maternal stress as well as improved maternal care practices about feeding and promoting development for their infants with CHD.

These drawbacks of the existing interventions for improving care behaviors of mothers show that a further study is needed. Rigorous evidence supporting effects of intervention for enhancing dependent care behaviors of the mothers of toddlers with CHD as well as incorporating the concept of parenting stress into the program are needed.

2.7 Intervention on care behaviors of mothers based on Orem's Theory

The literature related to enhancing care behaviors program for mothers of CHD children with application of Orem's Self-Care Deficit Nursing Theory was found in two

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studies. Songthip et al. (2015) and Theannamngian (2003) developed health education programs with the application of a supportive-educative nursing system of Orem's Nursing Theory. A supportive-educative nursing system was applied to promote self-care capability, self-care practices, and improve health status. Valid helping techniques in this system include combinations of support, guidance, provision of a development environment, and teaching in order to meet a patient's requirements to perform self-care by helping with individuals' decision making, behavior control, and acquired knowledge and skills (Orem, 2001). Other studies of maternal care behaviors that used Orem's theory as a theoretical framework to guide effective intervention also demonstrated application of a supportive-educative nursing system for promoting dependent care behavior of mothers such as children with asthma (Kaewlao, 2008), premature infants (Taya, Wittayasooporn, & Luecha, 2005), and RI (Lerdngammongkokul, Wichienchroen, & Nookong, 2011). This nursing system provides helping methods for the mothers to increase their ability or agency, in particular for enhancing knowledge and skills; then the ability acquired could help them to perform actions to meet the therapeutic self-care demand of children with chronic illnesses.

Although this nursing system is appropriate for improving maternal care behaviors and child health outcomes in several prior studies, it does not cover the factors that affect care behaviors among mothers of toddlers with CHD, such as the factors under the basic conditioning factors (parenting stress and social support) and other factors under dependent care agency (self-efficacy) to help them in providing care. In addition, studies by Songthip et al (2015) and Theannamngian (2003) focused on an increase in dependent care agency, particularly knowledge of CHD as well as informational and emotional support, which did not develop skills in providing care in order to help mothers enhance other dependent care agency such as self-efficacy, which is needed to help the mothers in judging their capacity to perform care behaviors. In research literature, care behaviors of mothers for toddlers with CHD depend on several factors. Modifiable factors related to Orem's theory include self-efficacy, parenting stress, knowledge, and social support. Based on the research literature, factors from the basic conditioning factors and self/dependent care agency based on Orem' theory to guide framework for intervention were not found. Additionally, they were not found in prior research that incorporates or integrates these factors into a program for enhancing care behaviors among mothers of toddlers with CHD by using this theory as the

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theoretical framework. Thus, the application of theoretical concepts in this theory for enhancing care behaviors among mothers of toddlers with CHD is needed.

In this study, the researcher developed a new intervention program based on the Orem's theory. The new intervention program included the following: 1) basic conditioning factors, which include parenting stress and social support, and 2) dependent care agency, which includes knowledge and self-efficacy. Mothers who engage in dependent care are assumed to have dependent care agency in order to meet requirements of toddlers with CHD while variations in dependent care agency and care behaviors of mothers are conditioned by basic conditioning factors. This program could be conducted to increase knowledge, enhance self-efficacy, decrease parenting stress, and enhance social support; hence, care behaviors of mothers can be improved and the incidence of illnesses of toddlers with CHD may be decreased.

2.8 Theoretical Framework

The Self-Care Deficit Nursing Theory (Orem, 2001) was used as a framework to guide this study. According to Orem's theory (2001), mothers act as dependent care agents who perform care actions for toddlers with CHD including universal, developmental, and health deviation self-care requisites, which are known as care behaviors. Based on Orem's perspective, care behaviors among mothers of toddlers with CHD are affected by not only dependent care agency including knowledge and self-efficacy but also basic conditioning factors including parenting stress and social support. Knowledge is linked to the estimative capability of dependent care operations in dependent care agency that engages in the operations by understanding, making judgments, and making decisions about the actions they will take and those they will avoid. Self-efficacy is linked to the transitional capability of dependent care operations in dependent care agency that engages in the operations by making judgments of one's ability to perform dependent care activities. Parenting stress is under basic conditioning factors as a health state factor of the persons which can bring about conditions that interfere with or constitute obstacles to meeting dependent-care requisites. Social support is under basic conditioning factors as a resource in the availability and adequacy of resources that affect primarily the selection of ways to meet dependent-care requisites. Thus, an appropriate intervention for promoting maternal care behaviors for toddlers with CHD in this

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study can be designed to maintain its effects on the desired outcome by integrating these factors into program.

Intervention in this study was developed to enhance care behaviors of mothers for toddlers with CHD and decrease the incidence of illnesses among toddlers with CHD during the preoperative period. The intervention consisted of four components. The first component focused on providing knowledge to help the mother understand, judge, and make decisions about performing actions to meet the child's care demands. It was achieved using the principles of adult learning including the need to know, the learners' self-concept, the role of the learners' experiences, readiness to learn, orientation to learning, and motivation. The second component, enhancing self-efficacy, helped the mother judge her capacity to perform care behaviors. It was achieved by developing four main sources of self-efficacy: 1) enactive mastery experience, using return-demonstration for care behaviors; 2) vicarious experience, using video presentation; 3) verbal persuasion, providing strong verbal encouragement; and 4) physiological and affective states, using relaxation technique training. The third component, decreasing parenting stress, is necessary because parenting stress affects the health state of mothers, which can constitute barriers to the care behaviors of the mother. It was achieved by coping skill training using problem-solving strategies with scenario discussion as well as emotional ventilation and narrative therapy techniques with coping model through video. The fourth component, enhancing social support, is also necessary to change the care behaviors of mothers. This resource can affect the selection of means to meet self-care requisites. It was achieved by providing emotional, informational, instrumental, and appraisal supports including the following: 1) providing emotional support through postcards, 2) providing informational support through telephone support and other types of communication, 3) providing instrumental support (such as a thermometer), and 4) providing appraisal support through positive feedback. The mothers of toddlers with CHD who participated in this program were able to enhance knowledge, enhance self-efficacy, decrease parenting stress, and enhance social support, which helped them improve their care behaviors for their toddlers with CHD and decrease the incidence of illnesses of toddlers with CHD as shown in the diagram (Figure 2.1).

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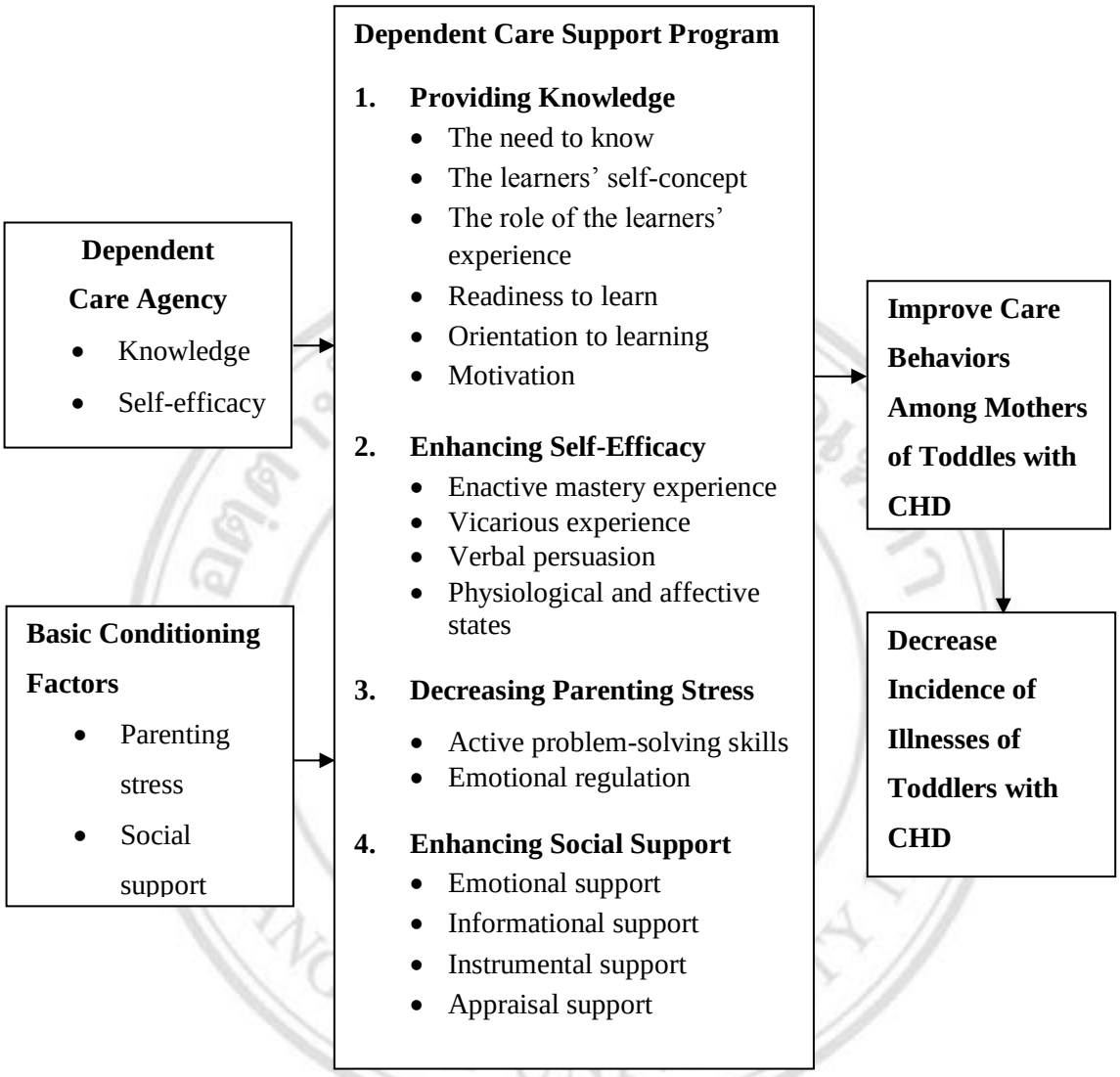


Figure 2.1 Theoretical Framework of This Study

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