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Surgical and Interventional Treatments of Congenital Heart Diseases in Da Nang Hospital, Vietnam

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Title: **Surgical and Interventional Treatments of Congenital Heart Diseases in Da Nang Hospital, Vietnam**

ABSTRACT

Background

We conducted this study to explore the trend and the percentage of congenital heart disease (CHD) visited Da Nang hospital from 2010 to 2015. Another objective was to develop criteria that help to classify atrial septal defect (ASD) patients as patients suitable for surgical or transcatheter closure procedures. In addition, we compared the effectiveness and safety of surgical and transcatheter methods for ASD patients.

Methods

The data involved the information of all CHD patients treated in Da Nang hospital from January 2010 to December 2015. The selection involved all the patient cases treated with surgical and transcatheter closure procedures. All cases without clear data on transcatheter or surgical intervention were excluded. A total of 1220 cases were eligible for the study. All the data collected was based on paper medical records.

Results

A total of 1220 CHD patients were recruited in the study, of which 58.9% were women, and 41.1% were men. Most of CHD patients belonged to the age group of 0-9 (70.2%). A total of 266 ASD patients were included in the study, of which 186 women (69.9%) and 80 men (30.1%). The distribution of male and female proportions was relatively similar between years. After adjusting for sufficient rim among ASD patients, the cut-off point of the length of the defect for an operation would be 34.1 mm, while the width of the defect would be 33.3 mm. Both surgical and transcatheter closure procedures were safe for ASD patients. The total price for a case of ASD operation was significantly higher than that for a case of transcatheter closure.

Conclusion

We suggest that Vietnam should continue investing more in early diagnosis and treatment for CHD patients. Hospital in Vietnam should update the technology and find transcatheter closure devices with reasonable prices so that more ASD patients would afford to use.

Keywords: *Congenital heart disease, Atrial septal defect, Percentage of CHD, Intervention, Effectiveness, Safety, Da Nang, Vietnam*

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Abbreviations

AoC	Aortic coarctation
AoS	Aortic stenosis
AR	Aortic regurgitation
AS	Aortic stenosis
ASD	Atrial septal defect
ASD I	Ostium primum atrial septal defect
ASD II	Ostium secundum atrial septal defect
ASO	Atrial septal occlude
AV block	Atrioventricular block
AV valve	Atrioventricular valve
AVC	Atrioventricular canal
AVSD	Atrioventricular septal defect
CHD	Congenital heart disease
Coarc Ao	Coarctation of the aorta
CT	Computed tomography
DORV	Double outlet right ventricle
IVC	Inferior vena cava
MR	Mitral regurgitation
MRA	Magnetic resonance angiography
MRI	Magnetic resonance imaging
PA	Pulmonary atresia
PAH	Pulmonary artery hypertension
PAPVR	Partial anomalous pulmonary venous return
PDA	Patent ductus arteriosus
PID	Pelvic inflammatory disease
PS	Pulmonary stenosis
SV	Single ventricle
SVC	Superior vena cava
TA	Tricuspid atresia
TAPVR	Total anomalous pulmonary venous return
TEE	Transesophageal echocardiography
TGA	Transposition of great arteries
TOF	Tetralogy of Fallot
VSD	Ventricular septal defect

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1. Introduction

1.1. What is Congenital Heart Disease?

Congenital heart disease (CHD) is also known as a congenital heart defect. CHD is defined as an abnormal structure of the heart or the heart's function that happens before birth (1). In the 2018 edition of ICD-10-CM, its diagnosis code is Q24.9 and is part of the group congenital malformation of heart, unspecified. Although there are variations between population-based studies, CHD occurs in 0.8% to 1.0% of live births (2) and 10% of aborted fetuses (3). The prevalence varies by geographic region, Asia has reportedly the highest prevalence of CHD estimated at 9.3 per 1000 live births (4), followed by Europe and the lowest prevalence in North America (1).

It is estimated that CHD is the most prevalent subtype of birth defects, which is the leading cause of mortality from birth defects (3). The clinical spectrum of CHD ranges from simple defects to life-threatening malformations, which must be identified and treated right after birth. Moderate to severe CHD have an estimated incidence of 6 per 1000 live births. According to Hopkins MK et al., the incidence of severe CHD requiring expert cardiology care is from 2.5 to 3 per 1000 live births (1). The prevalence of CHD varies by ethnic or racial group. It was reported that British Asian and African children had a higher incidence of all CHD and for severe and complex CHD types than non-Asians (5). The reasons for these ethnic variations remain unclear.

In developed countries, most of CHD patients are diagnosed and treated during their infancy. The total survival for this population has improved dramatically in developed countries with survival rates of more than 85% (1, 2, 6). With the advances in surgical and medical treatments, most of the children with CHD were treated, so we could observe an increased prevalence of adults with repaired CHD (2, 7). Furthermore, the risk of mortality in adults with CHD is higher than that in the general population, so the causes of death among adults with CHD are more likely to be CHD-related (8).

Although the precise pathogenesis of CHD is not fully understood yet, most cases are believed to have a genetic basis (3, 4, 6). Oyen et al. found that people who live in a family with a history of CHD have a 2- to 4-fold increased risk of CHD as compared to those without a family history of CHD (9). It has been hypothesized that CHD may be associated with susceptibility genes or epigenetic factors, which might produce different phenotypes (pleiotropy) within a family (3). Specific genetic abnormalities are more likely to associate with CHD, such as chromosomal disorders, microdeletions and mutations (6, 10). Recently, some new genetic techniques could identify a wide range of genetic mutations in CHD patients. These affect cardiac gene transcription and molecules that modify chromatin and regulate proliferation-differentiation decisions (3). It was found that CHD occurred in about 30% among patients with anomalies of other organ systems (4, 10). Among patients with neurodevelopmental disability and congenital anomalies, exome mutations are more common (3).

Diagnosis of CHD is based on the clinical syndrome, physical exam, laboratory, electrocardiogram (ECG) and radiologic evaluation. Symptoms and signs are associated with the underlying heart defect. Patients with CHD often suffer from fatigue, tiredness, poor feeding, rapid heartbeat and shortness of breath. They can also get chest pain, and they face the symptom of cyanosis and clubbed fingernails (6). In addition, laboratory testing may be used to aid the detection of other pathology or associated medical disorders with CHD. There are several options for radiologic evaluation, such as cardiac ultrasonography, chest x-rays, cardiac computed tomography (CT), cardiac magnetic resonance imaging (MRI) for morphology and function, and angiography.

Broadly congenital heart disease is classified as cyanotic and acyanotic. Cyanotic congenital heart diseases are manifold, including Tetralogy of Fallot (TOF), Truncus Arteriosus (TA), Transposition of Great Arteries (TGA), Total Anomalous Pulmonary Venous Return (TAPVR), and Tricuspid Valve Anomalies. However, common acyanotic CHD include Atrial Septal Defect (ASD), Ventricular Septal Defect (VSD), and Patent Ductus Arteriosus (PDA) (4). CHD can also be divided based on site of heart defect (ventricles, atria, septa, veins and great arteries), the presence or not of a cardiac shunt, and clinical consequences of structural defects in pulmonary blood flow (11, 12). Among CHD, VSD is the most common subtype (34%), followed by ASD (13%), PDA (10%), pulmonic stenosis (8%), TOF (5%), aortic coarctation (AoC, 5%), transposition of the great artery (TGA, 5%), and aortic stenosis (AoS, 4%) (1, 4).

Although VSD is the most prevalent of CHD worldwide, in adulthood, there are higher rates of new diagnoses of ASD due to it often remains asymptomatic during infancy and childhood (1, 2). Furthermore, the incidence of ASD is increasing with better and more affordable imaging methods, such as echocardiography (13). ASD is usually associated with a high frequency of pulmonary arterial hypertension with advancing age, which may be due to delays in detection or treatment (14).

1.2. What is ASD?

Atrial septal defect is one type of CHD in which the blood flow non-physiologically between the two atria of the heart. In ASD, the defect allows shunting of blood between the pulmonary and the systemic circulation. It is one of the most common types of CHD (11, 15-17). ASD is divided into five different anatomical subgroups: ostium primum ASD (ASD I), ostium secundum ASD (ASD II), superior sinus venosus ASD, inferior sinus venosus ASD, and coronary sinus ASD (1, 16). Patent foramen ovale (PFO) is also a communication between two atria that present in approximately one-third of the normal persons but can be considered a variant of normal. (16). ASD is also classified into simple defects from 4 to 26 mm in diameter or complex defects greater than 26 mm in diameter. In addition, ASD can be classified by the size of the septal defect and the deficiency rims (15).

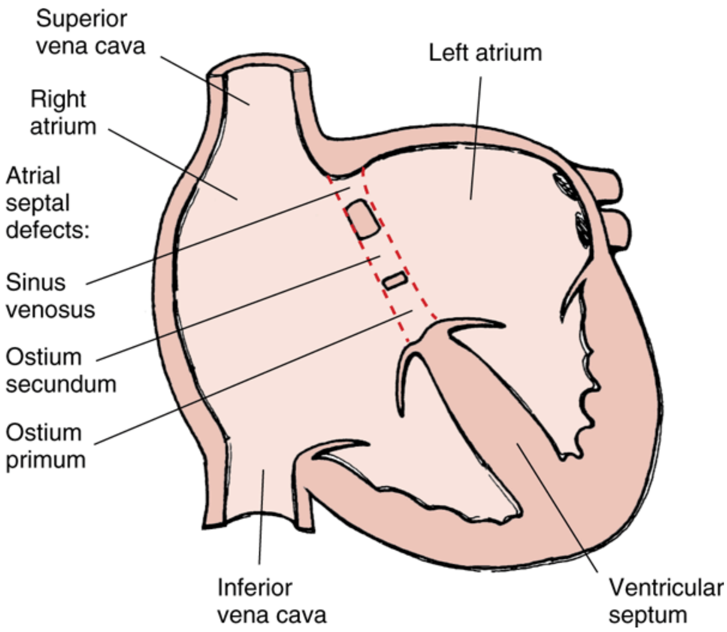


Figure 1: Three types of ASD

ASD II is the most frequent among all types of ASD with the proportion around 60–75%. It has a female predominance (female to male ratio of 2:1), and is frequently detected in childhood (4, 17, 18). The defect creates a hole between the left and right atrial chambers, which make communication at the position of the fossa ovalis (18). ASD II may be due to a single or several defects in the area of the fossa ovalis. In most ASD II patients, these defects are well-formed. The size of the defect can vary from several millimeters to 1-4 cm. The large size of defects can be associated with the complete absence of septum primum (13). ASD II patients often remain asymptomatic during their childhood, and most of them will survive until the time of adulthood (1, 2, 18). In adulthood, untreated ASD II is associated with exercise intolerance, right ventricular diastolic and systolic failure, supraventricular arrhythmias, premature death, atrial arrhythmias, and pulmonary arterial hypertension (18). Only ASD II patient with the central defect can be treated by percutaneous closure (15).

The ostium primum ASD is a defect in the atrial septum that relates to tricuspid and mitral valves, which accounts for about 15%–20% of ASD cases. The defect makes blood flow between the atrioventricular valves and the anterior-inferior margin of the fossa ovalis (1, 2). ASD I can be considered as one type of atrioventricular canal defect (AVC), which also called atrioventricular septal defect (AVSD) (13). AVC is a defect of the atrioventricular septum of the heart. There are two types of AVC, which are complete AVC and partial AVC. ASD I is located inferiorly near the crux of heart, in the inferior part of the atrial septum. It is found that ASD I is more likely to associate with the abnormalities of the atrioventricular valve (AV) (2, 17).

The sinus venosus ASD is located either inferiorly near inferior vena cava (IVC) entry or superiorly near superior vena cava (SVC) entry, and results from abnormal in-folding of the atrial wall adjacent to the vena cava (1, 11, 17). It is estimated that about 4–11% of ASD is sinus venosus defect. The most common location of sinus venosus is between the right upper pulmonary vein and the SVC (13). It is found that large defects often relate to anomalous pulmonary venous connections (1).

About less than 1% of CHD cases is coronary sinus septal defect. This abnormal atrial communication results from a defect of the wall along the coronary sinus and the left atrium. In coronary sinus septal defect, there is a shunt from the left atrium that goes through the defect to the coronary sinus orifice (1, 2, 13, 15, 17). Another type of ASD is a congenital common atrium; it is a rare ASD. The congenital common atrium happens when all of three septums are absent (septum secundum, septum primum, and atrioventricular canal septum). This defect is usually seen in CHD patients with multi-malformation like heterotaxy syndrome (isomerism) (13).

1.3. Situation of ASD in the world

ASD is the second most common type of CHD (0.07–0.2 %) in children (19), with an estimated incidence of 56 per 100 000 live births. The estimated prevalence of ASD is 1.6 per 1000 live births (13, 18). With improved detection by modern echocardiography of clinically silent defects, it is estimated that the incidence of ASD is about 100 per 100 000 live births (13). In developing countries, ASD is the most common form of CHD, and it is under detected during childhood. In adults, the ASD accounts for 7% to 10% of all CHD cases, and from 20% to 40% of new CHD cases (2, 15). Females are more likely to have ASD II but not the other types of ASD (18, 19).

Long-term outcomes of ASD vary according to geographic location, ethnic and socioeconomic variation. Some authors have suggested ethnic differences in ASD long-term outcomes are associated with socioeconomic disadvantage and reduced access to diagnostic services, more than genetic predisposition (5, 20, 21). In developed countries, surgical and catheter-based interventions in ASD patients have facilitated survival to adulthood and life expectancy between 50–60 years (21). In the United States, adults with CHD now are more numerous than children, and the ASD cases constitute 60% of the total CHD population (3). Therefore, developed Western countries are also making additional efforts to properly treat a rapidly growing population of adolescents and adults with ASD. Effective medical therapy for cardiac and non-cardiac-comorbidities are gaining increasing attention (3, 8).

Standard and guideline-based therapeutic decisions, age-appropriate screening, preventive care and training additional physicians skilled in the assessment and management of ASD have facilitated early treatment and better outcomes (22). Murphy et al. reported that closure procedure can reduce the mortality risk if an ASD patient get a defect closure before the age of 24 years. However, if an ASD patient gets a closure procedure after the age of 24 years, he or she can increase the mortality risk. Consequently, most studies suggested that ASD patients undergoing closure procedures had lower relative mortality (21).

In developing countries, health services are less developed that cause late diagnosis and treatment in patients with ASD. Frequently, there is limited population-based data on the main epidemiologic characteristics of ASD in countries with the lowest incomes leading to underestimation of ASD burden and treatment cost in those countries (20, 23). Treatment by surgery or interventional cardiac catheterization is relatively expensive in those nations. It is shown that expense represents a significant barrier to achieving good cardiac care of these populations (20).

1.4. Situation of ASD in Vietnam

Vietnam is an Asian country with a majority of the population in low middle-income social class. The healthcare system of Vietnam includes public and private hospitals. However, the total number of public hospitals is nearly eight times that private hospitals; however, the number of private hospitals is increasing, and private hospitals now provide around 60% of outpatient services and have become an important element of the national health system in recent years. By administrative structure, healthcare facilities in Vietnam are divided into four levels, including central, province, district and commune (24).

By 2013, Vietnam reported birth rate was 16.6 births per 1,000 of population. It is estimated that each year about 1,500,000 children are being born, so the number of children born with CHD can be about 15,000 every year (1% of live births) (25). According to a cohort of Vietnamese children study, malnutrition rates are high in children with CHD. Preterm delivery, low-birth-weight, mother's income stability, and father's education are risk factors for malnutrition in these children, and possible modifiable factors include breastfeeding and age at weaning (26).

In 2017, around 25 centers (public and private) performing approximately 8,000 cardiac surgery operations per year in Vietnam, which are done mainly in the major cities (Ha Noi, Hue, Da Nang, and Ho Chi Minh City). Four cardiac surgery reference centers perform on average more than 1000 cases each hospital per year. High-risk congenital and neonatal surgery is available only in several centers. It is estimated that over 100 cardiac surgeons (senior, junior, assistants) perform over 8000 procedures annually in Vietnam (27). Despite total improvements in public health and decreases in morbidity and mortality when compared to developed nations, Vietnam specific challenges in CHD care include inadequate infrastructure and supply of drugs, late detection and diagnosis and limited expertise and trained personnel (25).

In Vietnam, ASD is also one of the most common CHD with the incidence rate from 0.5 to 2.5 per 1000 live births between 1945 and 2009, respectively. It occurs more frequently in women and is mostly diagnosed in adulthood (28). Nowadays, with the increased recognition by using 2D (two dimensional) echocardiography, the total incidence and prevalence of ASD seem to be growing secondary in Vietnam (27). For the treatment of ASD, catheter interventions for ASD are expensive because of installation costs of expensive equipment, the requirement of trained personnel, and the need for a large inventory of hardware (25, 29). As a result, many catheter intervention procedures have been promoted by voluntary international groups and different international organizations, which financially support and oversee the development of cardiac surgery and treatment to poor patients across Vietnam (30). The central government also provides financial support for children less than six years of age with CHD undergoing open-heart surgery. However, the coverage is not universal, since there are varying differences in government coverage at the ward, district, provincial and central hospital levels (27). Dang et al. reported their experience in a small case series (25 patients) with all endoscopic operation ASD repair in a referral hospital in Vietnam. In this case series, 23 patients with isolated ASD II and 2 patients with ASD combined with a partial anomalous pulmonary venous connection were successfully performed by endoscopic ASD repair (28).

1.5. Related risk factors for ASD

Most types of ASD are generally sporadic with no identifiable cause. ASD etiology is associated with several causal mechanisms. Some genetic abnormalities have been found associated with ASD, which include the mutations of cardiac transcription factor-encoding genes NKX2-5, GATA4, TBX5 and MYH6. These factor-encoding genes were known to locate on chromosome 14q12 (13). ASD II is often associated with several genetic syndromes, such as Down, Holt-Oram, Noonan, Ellis van Creveld, Jarcho-Levine and Budd-Chiari (13, 18). In Down syndrome, ASD I and ASD II account for 42% and 39% of major CHD, respectively. It is also found that if ASD II associated with an atrioventricular block, the defect would link to mutations in NKX2.5 (13).

Several substances exposed during the perinatal period may associate with ASD. In addition, maternal risk factors include advanced maternal age (superior to 35 years), diabetes and high-glycemic index diets in women without diabetes (13). The mechanisms to develop ASD with maternal exposure to alcohol is still unknown. However, several studies have shown that alcohol drinking in pregnant women may have affected on the Wnt/β-catenin signaling. This impact can create a problem for cardiogenesis and normal gene activation (31). Abnormal cell development and cell death are the hypothesized mechanism for the relationship between ASD formation and alcohol consumption. In a systematic review published in 2006, maternal caffeine use during pregnancy was associated with a slight elevation in cardiovascular malformations, including ASD (31).

In a Hungarian population-based study conducted between 1980 and 1996, Csáky-Szunyogh et al. reported a higher risk of ASD was associated with acute pelvic inflammatory disease (PID), phenolphthalein treatment due to severe constipation of mothers and chronic paroxysmal supraventricular tachycardia diagnosis. This study included 472 ASD II cases, 678 matched controls and 38,151 available controls without any defects. PID was defined as an inflammation of ovary, fallopian tube, peritoneum and pelvic cellular tissue, and is frequently associated with endometritis, cervicitis and/or vulvovaginitis. The same study reported a protective effect of high doses of folic acid during the first trimester. This study did not show an association between overt diabetes mellitus and ASD II found in a previous study by Ferencz et al. (32).

1.6. Health consequences of ASD

Health consequences of ASD are related to the dimension of the atrial septal defect, the pulmonary vascular bed's reactivity and the duration and the amount of shunting. Isolated ASD was observed in most of ASD cases. However, concomitant cardiac anomalies might have a negative impact on prognosis. Several factors have been associated with the possibility of using ASD closure procedure (19). Common associated cardiac anomalies with ASD include PDA, PS and partial anomalous pulmonary venous return (PAPVR). Ostium primum and sinus venosus ASD usually have a significant shunt. In sinus venosus ASD and ostium primum ASD, the defect's size usually do not decrease, and patients need surgical closure (13).

The rate of spontaneous ASD closure has been reported to range from 14% to 55%. Recent studies have reported a percentage of spontaneous ASD closure of 66% - 92% and the highest rates occurred in patients younger than two years. The size and age at diagnosis of the ASD are the most important factors in the likelihood of spontaneous closure. Defects smaller than 6mm have higher spontaneous closure rates, whereas defects larger than 8mm may need surgical or device closure more frequently (14). Kim et al. reported that a significant enlargement of the defect with greater than 50% of the initial size was observed in 30% of ASD cases (33).

In ASD II patients, if the defect can not close spontaneously, the size of defect can increase with age and in those patients living at high altitude. Occasionally, a minority of patients (5–10% of adults with untreated ASD) develops severe pulmonary artery hypertension (PAH). These patients can develop to Eisenmenger syndrome, which is a pulmonary vascular obstructive disease associated with or without right-to-left shunting at the atrial-level (13). ASD closure is contraindicated in the presence of irreversible PAH without left-to-right shunt. Association between large ASD with a right-to-left flow and PAH has been described (34).

Older ASD patients frequently experience cardiovascular complications with potentially serious adverse consequences. The common consequences can be pulmonary hypertension, supraventricular arrhythmias, and tricuspid valve insufficiency (33). In addition, the most common arrhythmias in older ASD patients are atrial flutter and fibrillation. The incidence of arrhythmias was observed to increase with age. In addition, it is reported that there are several other symptoms of tachyarrhythmias and atrioventricular block, which associated with genetic mutations (e.g., NKX2-5) (13). ASD poses significant risks of perioperative acute ischemic stroke from paradoxical emboli due to right to left shunting. The mortality rate in patients with ASD is still higher than that in the general population. The most frequent causes of death in patients with ASD include heart failure, tachyarrhythmias, and sudden cardiac death (7, 8, 13). In some studies, patients with ASD with closure procedure have lower relative mortality than that among the patients without closure procedure (21).

1.7. Methods to diagnose ASD

Diagnosis of ASD is based on clinical presentation, physical exam and echocardiography. Patients with an isolated ASD often remain asymptomatic until the third or fourth decades. In some cases, even children with a large shunt from left to right atrium they may not have clinical symptoms until adulthood. Symptoms become more frequent with advancing age (1, 13). In neonates and infants, ASD could be diagnosed by an echocardiogram based on a heart murmur, a chest X-Ray abnormal finding or an electrocardiogram (13). Common initial symptoms are exercise intolerance, palpitation and fatigue. Supraventricular tachycardia is not infrequently the first clinical manifestation in patients over 40 years. With this symptom, if ASD left untreated, it eventually can develop right-sided heart failure, and it is often with mild to moderately elevated pulmonary arterial pressure (18).

On cardiac auscultation, children and even young adults with unrepaired ASD can have wide and fixed splitting in S2, systolic pulmonary flow murmur and a mid-diastolic flow murmur at the tricuspid valve. In case of a holosystolic flow murmur at cardiac apex, it suggests about mitral regurgitation or mitral valve prolapse, and suspicion for an ASD I. In infants, cyanosis is absent and there is often precordium hyperdynamic to palpation. Electrocardiogram may show right-axis deviation, evidence of RV hypertrophy right-axis deviation, incomplete right bundle-branch block, first-degree AV block, and left superior axis in primum defects. Chest x-ray may show both central and peripheral pulmonary artery dilation and/or enlargement of the right ventricle (1, 13). Transthoracic and transesophageal echocardiography are primary imaging modalities for the diagnosis of ASD, and it can be used to assess its hemodynamic consequences (15, 18).

Advances in noninvasive radiology help cardiac catheterization to become a treatment option recently (35). The advances in noninvasive imaging include 2D transthoracic echocardiography (TTE) and 3-dimensional imaging by echocardiography, transesophageal echocardiography (TEE). It is a high diagnostic sensitivity for ASD in young adults and children when transthoracic echocardiography is used. However, the sensitivity is lower for ASD patients with restricted acoustic windows due to fat impedance secondary to obesity and overweight and in patients with previous thoracic surgery. In this case, transesophageal echocardiography is a good option for diagnosis.

Magnetic resonance angiography (MRA) can be used for associated systemic venous and pulmonary venous anomalies. High-resolution cardiac computed tomography (CT) is capable of anatomical diagnosis of ASD and offers an alternative in patients with contraindications to magnetic resonance imaging (MRI). Diagnostic cardiac catheterization is an invasive technique and commonly needs anesthesia, therefore is only indicated when the possibility of closure is uncertain in patients with increased pulmonary artery pressure on echocardiography (13, 18).

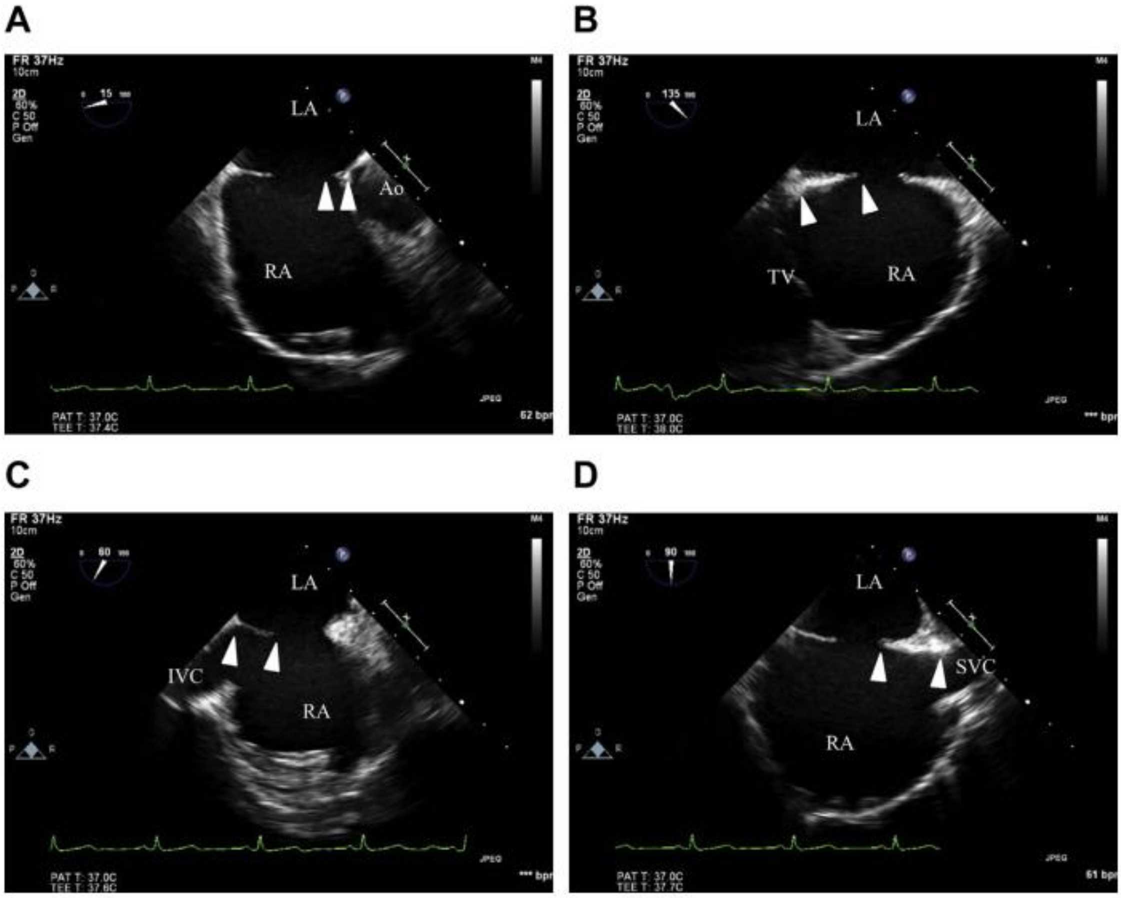


Figure 2: Rim measurements on transesophageal echocardiographic: deficient RAo rim (A), an AVV rim (B), an IVC rim (C), and a SVC rim (D) (36)

The diagnostic cardiac catheterization is suggested to use for high-flow or low-flow in ASD patients with semilunar valve stenosis and low-flow lesions. In addition, diagnostic catheterization may be indicated in case of the inability of noninvasive examinations to provide the diagnosis after surgery for ASD. For example, if an important residual left-to-right shunt is suspected after a closure procedure, the catheterization can be used to calculate shunt size and severity (35). The transesophageal or intracardiac echocardiography can be used along with real-time fluoroscopy to deliver and deploy the ASD closure device. Balloon sizing using transesophageal echocardiography and fluoroscopy could be conducted to assess the defect size and help to obtain an appropriate waist diameter of ASD closure device. Direct measurement of pressures within cardiac chambers and great arteries can be used to classify the risk of patients, and they can be used to assist the evaluation of medical and surgical therapy (15, 35). Balloon-sizing diameter help to classify ASD into the group simple or complex. A simple defect of ASD is defined that the defect is less 26 mm with the rim greater than 5 mm. The complex defects with diameters between 26 mm and 38 mm can be closed using transcatheter closure devices. Surgical closure is preferred in defects greater than 38 mm in diameter (15). Figure 2 illustrates how rim measurement was performed by transesophageal echocardiogram (TEE). Each rim was measured in different slide, and in the systolic phase. The length of rim is measured by the distance between the two arrowheads on the pictures. The sufficient rim is when rim is 5 mm or greater, while weak rim is when rim is less than 5 mm. Figure 2A, 2B, 2C and 2D shows a deficient rim of retro aorta (RAo rim), a sufficient atrioventricular valve rim (AVV rim), a sufficient inferior vena cava rim (IVC rim), a sufficient superior vena cava (SVC rim).

1.8. Methods to treat ASD

Early treatment is essential for ASD patients. However, the appropriate treatment for ASD patients depends on their age and the symptoms of heart failure, and the severity of the shunt. It is estimated that about 50% of ASD cases could be resolved spontaneously or can be treated with medical management, and the rest will require surgical, transcatheter (percutaneous) or hybrid approaches (16). In small asymptomatic children with ASD, the closure of large ASD can occur spontaneously. Therefore, the periodic echocardiography should be provided to these ASD children patients to check the spontaneous closure. Sometimes, it not necessary to provide any intervention for these patients (16).

There are several indications to apply ASD closure. Main indications for ASD closure need to be considered, such as right ventricle dysfunction, pulmonary hypertension, atrial arrhythmias, shunt ratio 1.5:1 (Qp:Qs), exertional dyspnea, decreasing exercise capacity, paradoxical embolism and documented platypnea–orthodeoxia (positional dyspnea and hypoxaemia). All hemodynamically significant ASD should be provided the closure procedure when it is confirmed.

It is no lower limited of age for using closure procedure, but it is suggested that asymptomatic children should be used the closure procedure when they reach the age between 3 and 5. It is reported that the technique for defect closure is safe and effective to improve the symptoms. The positive result could also be found with the elderly patients (13, 16). Sinus venosus and ASD I are not amenable to percutaneous closure and universally require surgical closure. In addition to the septal defect, AV valve repair is frequently required in ASD I, while anomalous pulmonary venous return repair is frequently required in sinus venosus defects along with surgical closure of the ASD. Mortality rate of ASD surgical closure is low, and it is reported that the range is from 0% to 3% (17, 37). Most of ASD II can be safely closed percutaneously and this is the preferred technique of closure versus surgery. Percutaneous occlusion is a safe and effective therapy in both adults and children with ASD II. The advantages of percutaneous occlusion as compared to surgical closure are the avoidance of cardiopulmonary bypass and sternotomy scar, lower incidence of complications, and shorter hospitalization (15, 16, 37).

In a study in the USA, it was reported that erosion of the aorta and migration of the ASD device during time follow-up was detected in 0.12% or 1 in 1,000 (18 out of 15,900) of the ASO implants (38). A similar prevalence (0.11%, or 1 case in 1,000 patients) in ASO closure have been reported worldwide (39). It was found that some factors may be associated with the device erosion. The main factors were mentioned, including over-sizing of the device, deficient superior vena cava rim or aortic rim, large balloon size, large atrial septal occluder (ASO), larger difference of device size - static ASD diameter, the ratio between weight and device size, and the ratio between age device size (16). Delayed and rare potentially long-term severe complications associated with percutaneous intervention include cardiac erosion, valvular damage, thromboembolic events, atrial arrhythmias, conduction abnormalities, endocarditis, nickel hypersensitivity and migraines (37)

1.8.1. Surgical closure

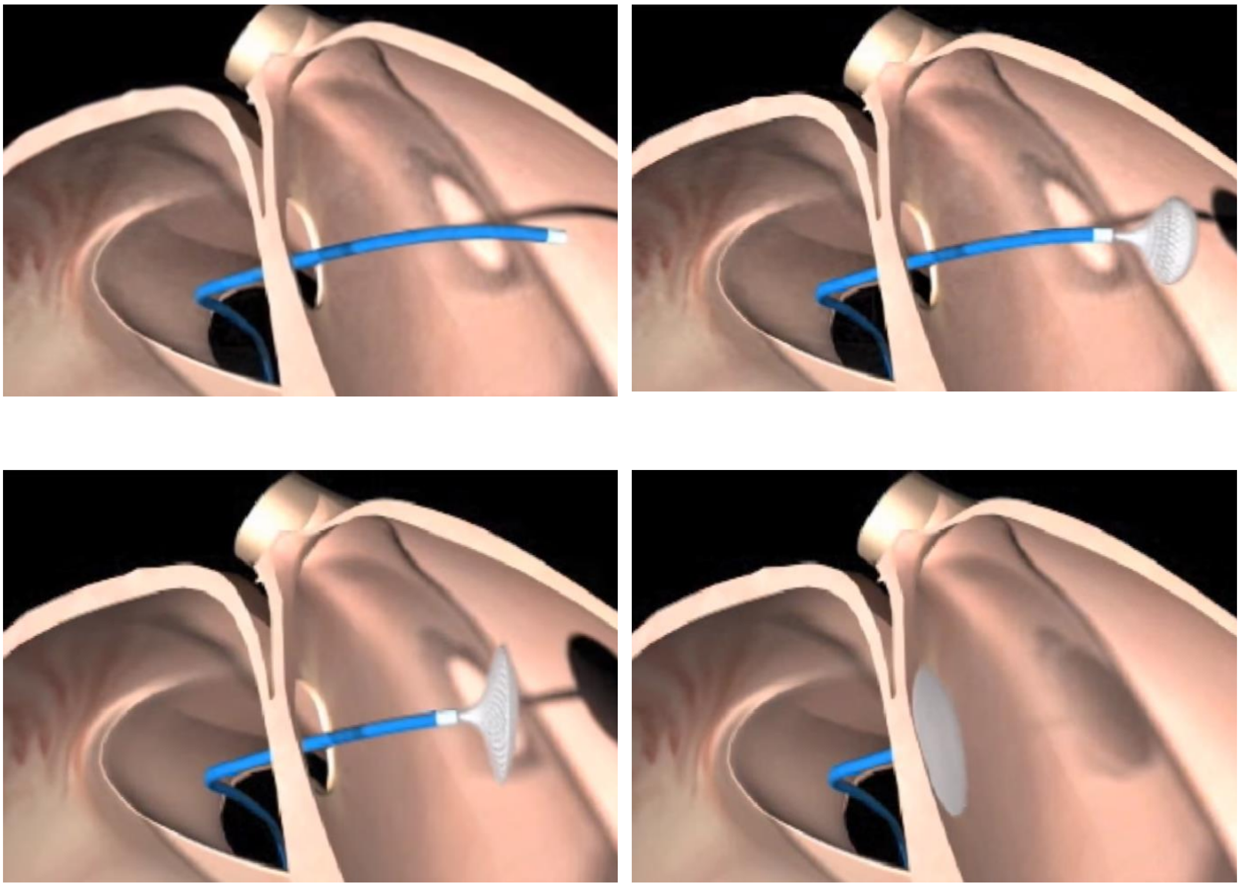
The first reported surgical repair of CHD was ligation of a PDA by Gross and Hubbard in 1939 at Boston Children's Hospital (1). Particularly in young populations, excellent results after ASD surgical correction have been well documented in long-term follow-up studies (13, 18, 40). Advances of surgical closure are a lower rate of residual shunting and negligible (less than 1%) mortality. It is estimated that the rate is less than 1%. However, several unavoidable postoperative complications were noted, such as the problems that relate to sternotomy, thoracotomy and cardiopulmonary bypass. In addition, the cost of surgery is high, but after the surgery, a patient gets a residual scar. The issues of psychological trauma to the patient and their parents also need to be considered (41, 42). Basically, the decision to select the closure procedure is based on several technical factors and the status of the defect. Thus, an ASD patient can be suggested to use transcatheter closure versus surgical procedure (42). Currently, surgery is mainly conducted for ASD patients who have poor septal rims. The reason is that the insufficient rim will not allow to use the transcatheter closure techniques. In addition, surgical closure for ASD needs to conduct for concomitant CHD. So, the surgery will not only be conducted for ASD, but also for other defects of the heart (16).

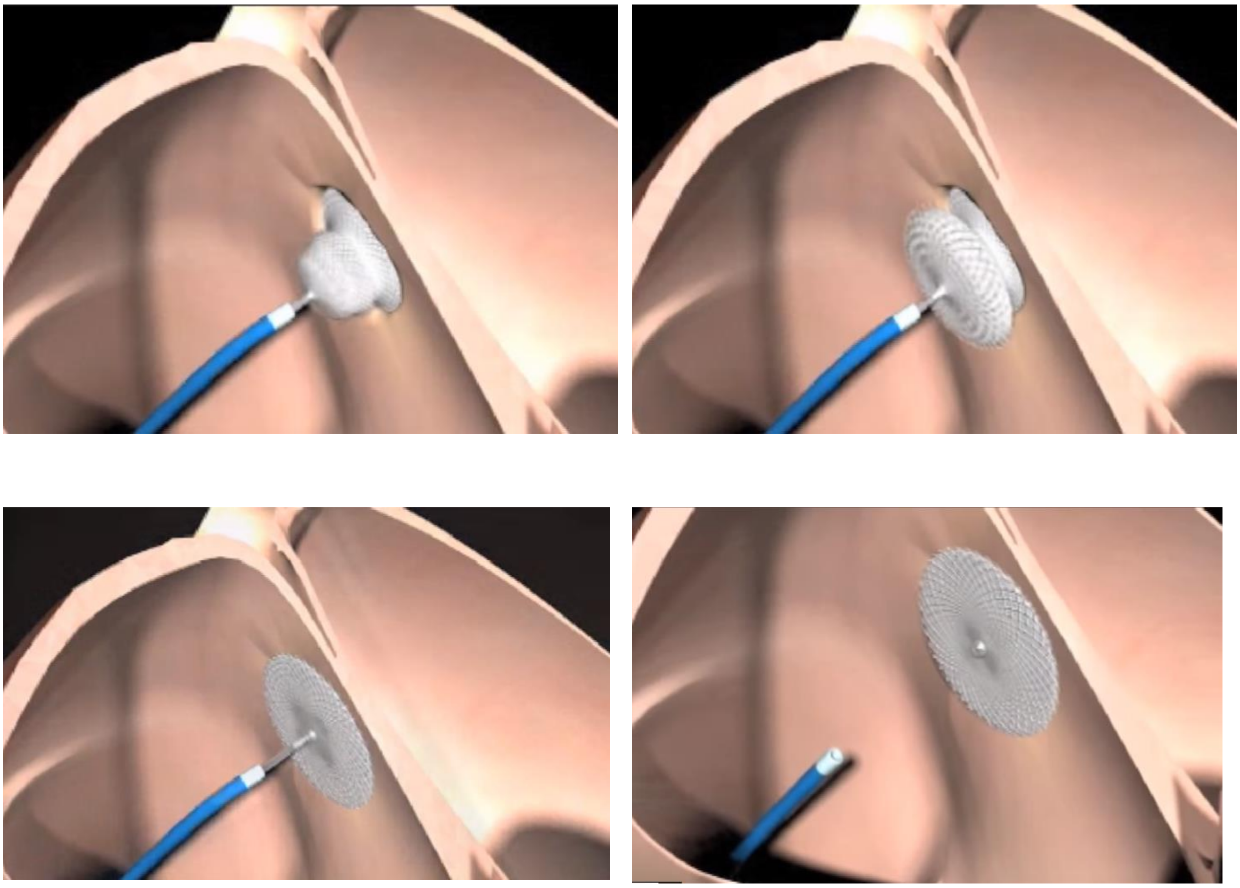
The conventional treatment option for ASD I is surgical correction. The surgical correction needs to be conducted for ASD I patients because they do not have a inferior septal rim, so they cannot be intervened by the transcatheter closure procedure. In addition, ASD I patients usually need to repair the mitral valve cleft and the insufficiency mitral valve. Mitral valve cleft is closed with interrupted suture material and an autologous pericardial patch is used to close the atrial defect. Rarely, additional prosthetic materials such as Dacron is used. If ASD II is present, it should also be repaired at the same time (16). There are different approaches to conduct surgical correction for ASD patients. The most common incisions of the ASD surgical procedure are median sternotomy, submammary, lateral thoracotomy and transxiphoid (13). In young children, residual ASD post device implantation sometimes may need to intervene by surgical procedure (43). The surgical correction for ASD patients over 60 years old showed not to have a direct influence on survival, but could have a benefit of decreasing deaths from cardiopulmonary diseases (44). Surgical correction in this population has a low incidence of postoperative complications and resulted in symptomatic improvement in the majority of these patients (44). Rudience et al. found that surgical procedure was also useful in older ASD patients with comorbidities. The benefits of ASD repair in older ASD patients with comorbidities could help to remodel the positive right and left heart, increase in exercise capacity, reduce the incidence of atrial fibrillation/flutter and decrease pulmonary arterial pressures (45).

Several minimal invasive techniques were applied to improve the cosmetic results of ASD closure. Moreover, these techniques could maintain the safety and efficacy of the traditional sternotomy(13, 43). Median sternotomy with minimal skin incision in obese children and a modified anterior mini-thoracotomy approach in thin children are innovative alternative techniques to conventional median sternotomy (43). In addition, several other minimally invasive techniques for ASD closure have been implemented, which are right parasternal mini-incision, right anterolateral thoracotomy, right posterolateral thoracotomy, partial sternotomy and total thoracoscopic surgery without robotic assistance. Most advanced techniques for ASD closure are video-assisted mini-thoracotomy and robot-assisted surgery (46). However, there are some disadvantages of minimal invasive techniques, such as restricted in some types of ASD (46).

1.8.2. Transcatheter closure

The transcatheter closure procedure for ASD was described in 1974 by King and Mills. Since then, this intervention procedure has become popular to apply for ASD closure or combination with surgery to treat other types of CHD. Recently, the common devices of transcatheter are balloon dilation, stenting, device closure, and transcatheter valve implantation (15, 37, 47). The primary therapeutic strategy for ASD II is percutaneous closure for most patients. It is found that percutaneous closure is safe and low rate of complications (48). However, large ostium secundum-type ASD (>38 mm) and defects with deficient rims usually are referred for surgical closure (49).



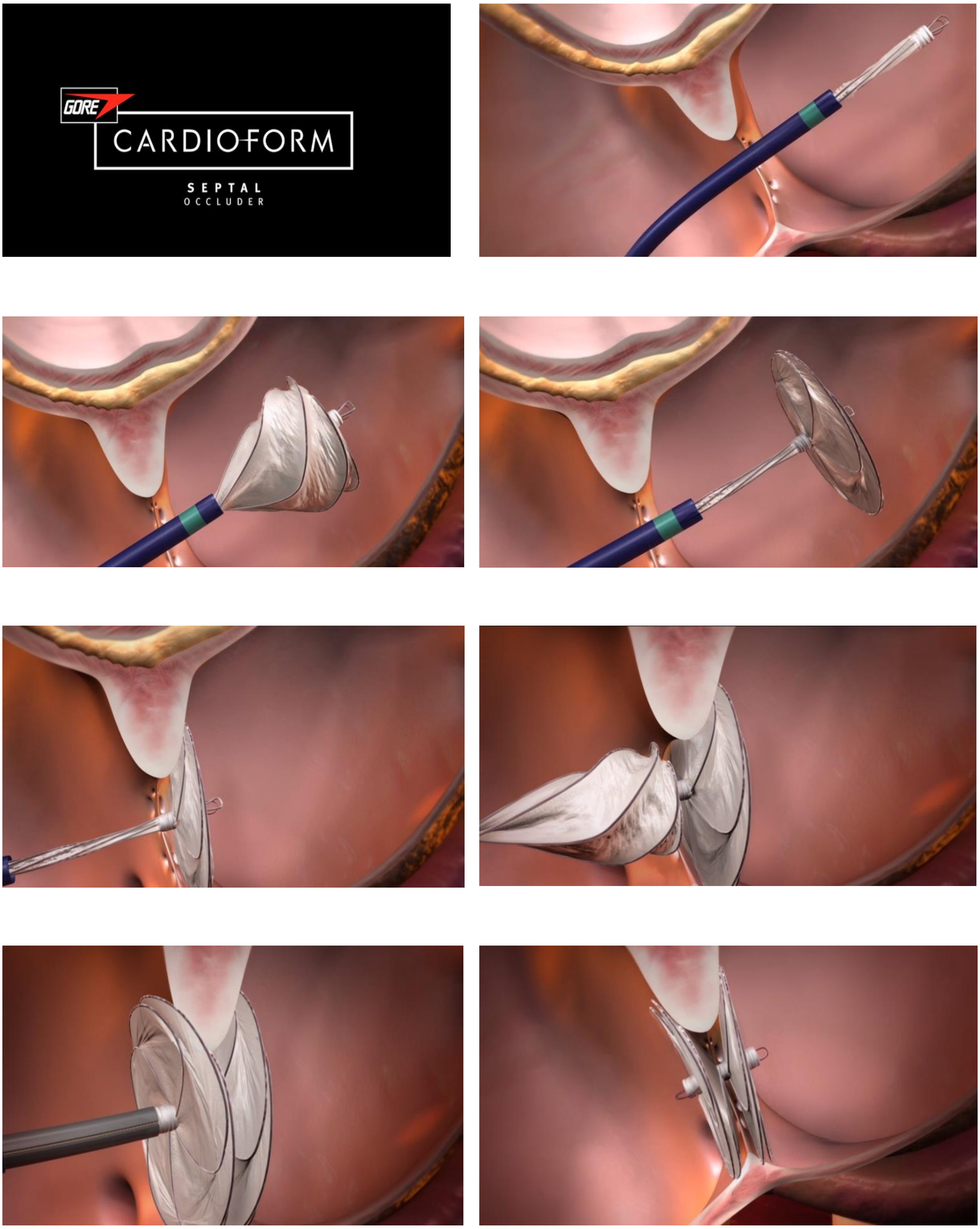


https://www.youtube.com/watch?v=I5sRAcOVGiU

Dr. Robert Frankel-Director of the Cardiac Catheterization Lab at Maimonides Medical Center

Figure 3: Demonstration of transcatheter closure technique for ASD

All available ASD closure devices are designed for ASD II, while all other types of ASD need to use the surgical procedure (35). There are several criteria that the ASD closure procedure should not be used. The transcatheter closure for ASD cannot be conducted if the shunt is small, the ratio of Qp/Qs was less than 1.5 or the high pulmonary vascular resistance greater than 8 woods units on 100% oxygen (15). In addition, it is a contradiction for ASD transcatheter procedure if there are irreversible and severe pulmonary arterial hypertension. Similarly, it is a contradiction for ASD transcatheter closure if there is significant LV dysfunction (18).



https://www.goremedical.com/products/cardioform

GORE Septal Occluder - MDEA 2013 Best-In-Show AND Gold Winner

Figure 4: Demonstration of transcatheter closure technique for ASD by GORE Septal Occluder

1.8.3. Devices for transcatheter closure

The procedure of percutaneous ASD closure has been improved enormously after the first successful performance in 1976 (15). ASD closure devices can help to reduce the rate of complication, and it can also make better long-term outcomes (15). To use ASD transcatheter procedure, there are several requirements needed to follow, but this procedure helps to reduce the risk of bleeding, residual leak, device embolization and thrombus formation with increased operator experience. The US Food and Drug Administration (FDA) approved to use several ASD closure devices, such as The Amplatzer Septal Occluder (ASO), Amplatzer Multi-Fenestrated, Septal Occluder, and Gore Helex/Cardioform Occluder. CardioSEAL STARFlex Septal Occluder was developed by NMT Medical Inc, but it was not produced anymore. ASO device is a self-expandable double disk consisting of a nitinol wire mesh. It is an FDA-approved device since 2001 and the most studied device in the literature (15, 17, 37).

Figure 5: Picture of Amplatzer Septal Occluder (50)

ASO was approved after clinical trials revealed favorable outcomes when these devices were compared with traditional surgical closure (15-17). The ASO is made of a nitinol wire mesh that is covered by Dacron fabric. It is approved for the closure of ASD II and closure of Fontan fenestrations. The ASO device is self-centering in the defect, and it can be repositioned by retracting into the delivery sheath. The ASO can be applied for the wide range of defect sizes from

4 to 38 mm. It is noted that the ASO device was successfully to fix the defect as large as 38 mm in diameter (16, 17, 35).

Amplatzer Multi-Fenestrated Septal Occluder is also known as the Cribriform Occluder. This device consists of two equal-sized discs that connect each other with a thin waist. It is used and approved for closure of multi-fenestrated ASD II. The technique to implant this device is similar to that of ASO device. However, this device is a non-self-centering device because of its small central waist. It is said that the device can be used for the defect size of 18, 25, 30, and 35 mm (16, 17).

The Gore Helex Occluder consists of a single strand of nitinol, which bonds to a piece of microporous ultrathin expanded polytetrafluoroethylene. The FDA approved this ASD closure device in 2006. When the device is deployed, it forms two inter-connected disks that lock into place across the atrial septum. This device can be used for small or moderate defect size of ASD II. The device is manufactured in 15, 20, 25, 30, and 35 mm. It is not a self-centering device, and it rides up and plays against the retroaortic septum secundum (15-17, 35). The Gore Helex Occluder has a high success rate for deployment, but it needs to learn some technical skills to deploy the device (15, 51).

Figure 6: Picture of The Figulla Flex II ASD (52)

The Figulla Flex II ASD was introduced in Europe since 2003 (52). It was reported that more than 20,000 ASD and PFO patients were implanted with this device. The Figulla Flex II ASD is made of braided Nitinol threads. The device includes two discs with a larger intermediate waist with a polyethylene patch (inside each disc) to support the immediate closure. Figure 6 shows the picture of Figulla Flex II ASD (52).

Figure 7: Picture of Cocoon Septal Occluder (50)

The Cocoon Septal Occluder is the device, which was designed for ASD. The device is a self-expanding double-disk device. It is made of nitinol wires coated with nano-platinum. The double-disk device is connected with a waist at the center of the discs. To assist in thrombogenicity, the discs of the device are filled with polypropylene fabric (50).

1.8.4. Other methods to treat ASD

Intraoperative device closure with a minimal transthoracic invasion (hybrid) for ASD is a promising third treatment alternative. There are no currently randomized clinical trials that compare percutaneous transcatheter occlusion with minimal invasive transthoracic occlusion for ASD repair, but some studies reported positive results regarding safety and efficacy (53). Tao et al. reported the results of 53 patients that undergo intraoperative device closure, from which only one patient has a minimal residual shunt, that resolved without complication (54). Peng Zhu et al. reported similar results in a series of 250 patients. They found that a closure rate of 98.3% (175/178) and 100% immediately after the operation and at the 12-month follow-up appointment, respectively. There were no deaths and no severe sequelae occurred during the perioperative period (55).

The advantages of hybrid closure include better cosmetic results compared with open-heart surgery. Moreover, the approach is less traumatic, helping to a quick recovery, shorter hospital stay and less pain. These surgical occlusions are performed in cardiac surgery operating rooms, where cardiopulmonary bypass surgery is readily available in case of a failed occlusion or other complications. Hybrid closure of ASD does not require fluoroscopy decreasing the potential for radiation injury or other sequelae; the procedure is particularly well suited for small children and women (55). When compared with the percutaneous procedure, the intraoperative closure is easier to guide the sheath across the defect, and it can calibrate the device for proper anchoring. Particularly, in patients with a large ASD and a short rim, the technique of hybrid closure could be convenient because the cardiologist can push the sheath by hand against the rim, and they then place the device in the right position (53, 55).

Intraoperative device closure with a minimal transthoracic invasion is not risk-free. There is a small risk of device embolization. If the device embolizes to the right atrium (RA) or right ventricle (RV), the device can be retrieved through the same sub-mammary incision, after going on cardiopulmonary bypass surgery. However, if the device embolizes to left-side heart, the strategy will have to be revised to midline sternotomy (53). Currently, the 3-dimensional printing technology could help to develop a better solution for ASD closure. These new technologies offer a more specific solution for each ASD individual. The potential impact on the field is large, and further innovation will be able to develop durable bioprosthetic parts and engineering functional tissue, such as the insertion of electrically competent conduction tissue (3).

1.9. Rationale and Objectives

The prevalence of CHD is not high, but it is the leading cause of death in congenital malformations. Although CHD incidence is the same worldwide, developing countries are more likely to suffer the burden of disease due to their higher birth rates than developed countries. The fertility rate in Vietnam has decreased significantly, but it is still high. In addition, CHD is on the rise in Vietnam, probably due to some factors or possibly due to improved CHD detection capacity in hospitals. Previously, patients often came to the hospital in the late stages of CHD (56), but now due to the change in awareness, patients should be examined or taken to see their doctors sooner. In addition, with better economic conditions and improvements in health insurance policies, patients have many opportunities to examine and treat CHD. Currently, there is no study in Vietnam, which explores trends in the numbers and percentage of CHD patients over the years. Moreover, there are no studies assessing CHD patients who used surgical and transcatheter closure interventions over time. With these results would help health policymakers to make a better plan for resource allocation in specific conditions.

ASD is usually diagnosed during childhood; only a small percentage is detected in adulthood. However, due to different diagnostic conditions, the trend of ASD can vary in different areas. There is also no research on the trend of ASD among CHDs in Vietnam. For ASD patients, there are currently two main interventions to address heart defects, including surgical and transcatheter closure interventions. There were several studies that addressed the criteria for determining the direction of treatment for ASD patients (49). However, no studies have been conducted in Vietnam. Therefore, criteria need to be developed to help classify patients for surgical groups or transcatheter closure groups. This would benefit patients, because using the criteria would help patients get appropriate treatment for their conditions.

Although the method of transcatheter closure is considered to be better than the method of surgical closure (57, 58), the method of transcatheter closure is not always possible, especially for cases with large defects or uncertain rim conditions. Each method needs to be assessed for effectiveness to know its applicability to actual conditions. In addition, each method would have different advantages and disadvantages, especially issues related to adverse events during and after implementation (41). Therefore, the safety of each method also needs to be assessed. Several studies in other countries were conducted to compare surgical closure and transcatheter closure (41, 57-59). However, at present, there is no study in Vietnam to compare the effectiveness and safety of the method of surgical and transcatheter closure. An evaluation of the effectiveness and safety of these two methods is necessary to be able to help plan and make appropriate decisions for each patient case.

For these reasons, this study was conducted with the following specific objectives:

- To explore the trend and the percentage of CHD patients who underwent surgical and transcatheter closure interventions in Da Nang Hospital from 2010 to 2015, focusing on ASD.
- To develop criteria that help to classify ASD patients into surgical groups or transcatheter closure group in Da Nang Hospital.
- To compare the effectiveness and safety of two interventions of surgical and transcatheter methods for ASD patients in Da Nang Hospital.

2.METHODS

2.1. Study setting

This study was conducted in Da Nang city. This is the fourth largest city in Vietnam and the largest seaside city in Central Vietnam (Figure 8). With a population of over 1 million people in the area of 1285 km2. The health system in Da Nang is relatively developed, managed and directed by the Da Nang Department of Health. At the provincial level, there are provincial hospitals and provincial preventive medicine centers. At the district level, there are district hospitals and district health centers, and at the commune level, there is a commune/ward health station. According to the report of the Health Department of Da Nang city, as of 2017, Da Nang city has 69 health facilities, including 13 hospitals and 56 commune health stations.

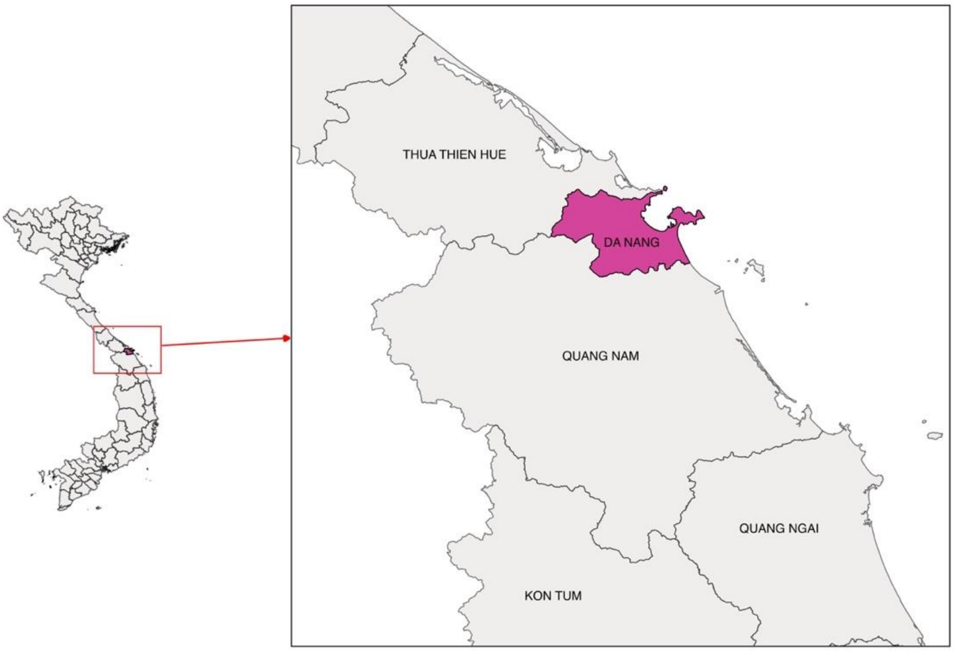


Figure 8: Maps of Da Nang city and nearby provinces

Da Nang Hospital is one of the largest hospitals in Central Vietnam and is responsible for treating patients in Da Nang city and neighboring provinces of South-Central Vietnam. Da Nang Hospital is a general hospital of 1000 beds, which could provide treatment for all types of cardiovascular, thoracic, urological, gastrointestinal, neurological and osteoarthritis etc. Da Nang Hospital is one of the few hospitals with open-heart surgery in Vietnam. Da Nang is the fourth largest center in Vietnam for the treatment of CHD after Ha Noi, Ho Chi Minh City and Thua Thien Hue province.

Fifteen years ago, all CHD patients in Central Vietnam had to go to Ho Chi Minh City or go to Ha Noi capital city for treatment, because only these big cities have hospitals that can conduct the open-heart operation. Traveling far away makes it difficult and expensive for patients and their families. Even due to the overload of the hospitals in Ha Noi and Ho Chi Minh City, many patients had to wait for years to have surgery, and many of them had died because they could not wait until the surgery. In response to this inadequacy, in 2006 Da Nang Hospital invested and implemented a project of open-heart operation in Da Nang. Groups of cardiologists and technicians have been sent to the Carpentier Heart Institute in Ho Chi Minh City. After the trained doctors and technicians, Carpentier Heart Institute continued to support Da Nang hospital to master the technique and perform the first cases of heart surgery and intervention. Until now, Surgery - Intervention Cardiology Department has been established for about 15 years. Currently, the department can conduct most cardiac surgery and cardiovascular intervention for patients with CHD.

2.2. Data sources and data collection

Data collected from medical records of congenital heart patients treated at Da Nang Hospital. We have collected all patient records for the period from January 1, 2010 to December 31, 2015.

- Inclusion criteria: We selected only CHD patients who underwent surgical or transcatheter closure procedure. In addition, we selected cases with completed information in their medical records.
- Exclusion criteria: We did not select CHD cases if these cases had no indication for surgery or transcatheter closure. We also excluded CHD patients with only internal medical treatment.

Figure 9 shows the patients flow through the study by objectives. A total of 1254 patients with CHD was selected at the first stage using inclusion criteria. After excluding 34 patients, including:

- 11 patients were treated by internal medicine because of severe and irreversible pulmonary arterial hypertension, complex CHD with severe heart failure or severe dysfunction of the left ventricle.
- 9 patients without indication for surgery or transcatheter closure include cases with small ASD, VSD or PDA that can be closed spontaneously.
- 14 patients with incomplete relevant document.

We included 1220 patients with CHD in our study analysis. Of them, 266 patients with ASD were analyzed to develop the criteria for surgical or transcatheter closure interventions. These 266 patients with ASD were also analyses for comparison of effectiveness and safety between surgical and transcatheter closure groups. After collecting data from the hospital, we made a phone call to all 266 patients with ASD, however we only reached158 patients, who were asked about their health status and events related to their surgical or transcatheter closure at the hospital previously. The number of lost follow-up was 108 cases, accounting for 40.6% of ASD cases.

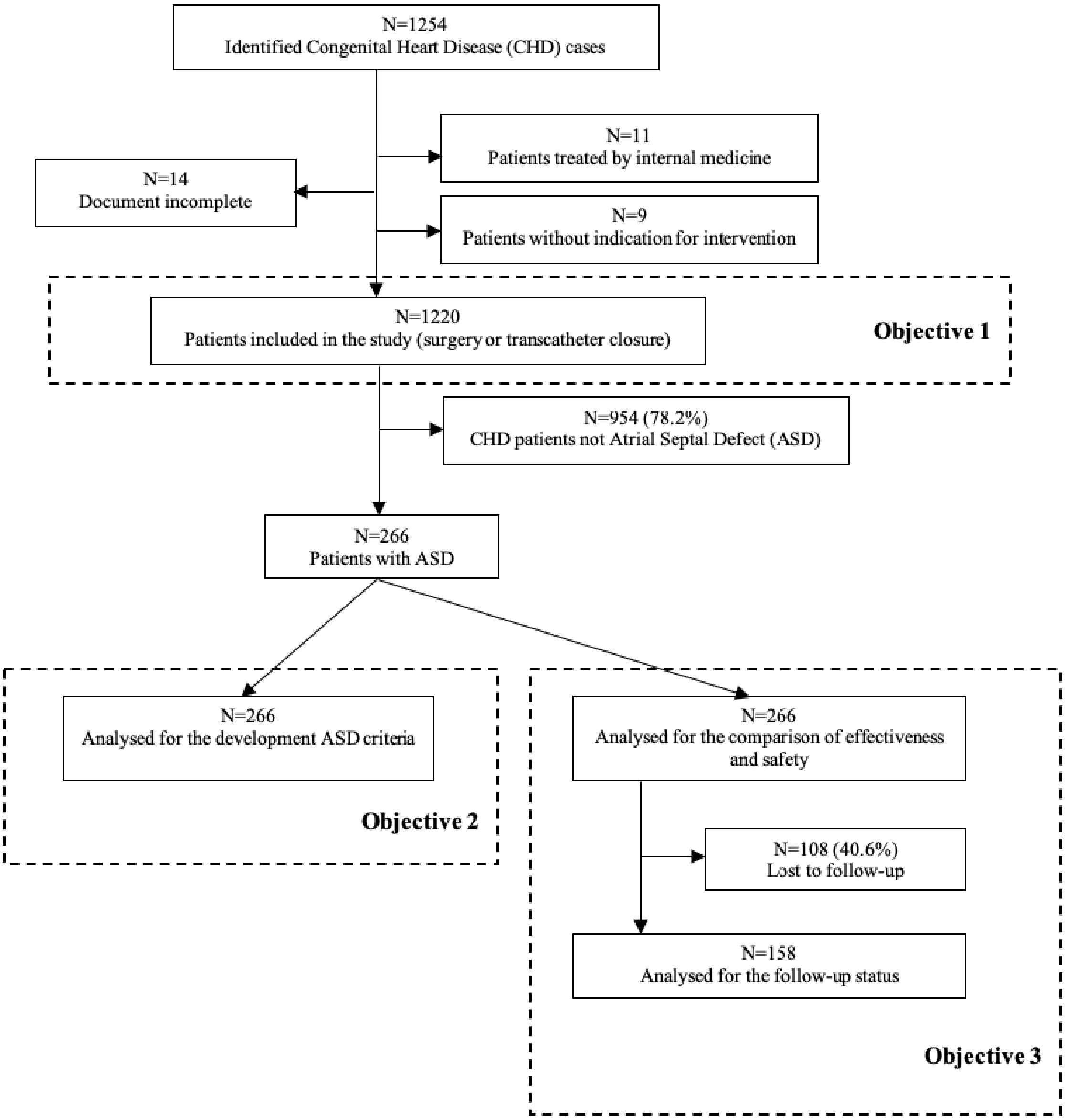


Figure 9: Patients flow through the study by objectives

2.3. Variables

The main variables in this study were about the status of CHD, including ASD, VSD, PDA and other types of CHD. The diagnosis of CHD was based on clinical symptoms and echocardiograms. To be diagnosed CHD, a patient was performed echocardiogram by two experienced doctors. The two results from two doctors were checked to make sure they were the same. If those results were different, a meeting would be conducted to make a final decision. However, this is a retrospective study; the confirmation of CHD was based on the final the doctor's final conclusion in the medical record. Specifically, if the patient had surgery, the surgeon's report would be used for CHD confirmation. In the case of patients with transcatheter closure, the report from a doctor who performed transcatheter closure would be used for CHD confirmation. Other variables were collected, including age, sex, weight, occupation, place of residence. We also recorded the history of the patient's CHD as well as the patient's family members. For the subclinical results, we took data such as chest X-ray, electrocardiography. In echocardiography, we got detailed data on echocardiography, such as the position of organs in the body, the position and size of cardiac defects, pulmonary artery pressure, and dilatation of the heart chambers, cardiac function, pericardial fluid and other abnormalities. We also reread all the surgical reports carefully to get specific information about heart damage recorded by surgeons. In addition, we recorded type of treatment (surgery or transcatheter closure), type of device using for transcatheter closure. Other variables were also used were a time of treatment (before and after the intervention) and early and late complications related to surgery and catheter intervention for all of CHD after discharge.

In this study, effectiveness was measured by comparing the duration of hospital stay and the price of treatment of ASD patients between surgical and transcatheter closure groups. The length of hospital stay was estimated by the time before the intervention, the time in the intensive care unit, and the time after the intervention. Based on the length of hospital stay at different prices, the cost of hospitalization is estimated. In addition, the total price of either surgical or transcatheter closure groups was collected. In terms of safety assessment, several complications have been reported and compared between surgical and transcatheter groups. Recorded complications include pneumonia, septicemia (clinical symptom), hearth failure, incision infection, cerebrovascular injury, respiratory insufficiency, a drop of the device and transcatheter closure failure.

2.4. Data collection

The research team has a detailed strategy and data collection methods. Members of the research team have contacted the Director Board of Da Nang Hospital to discuss specific data collection. After the study plan was approved by the Ethical Committee Board of Da Nang Hospital, the research team collaborated with relevant departments to search for the patients' medical records.

A questionnaire was developed based on the study objectives to collect data. The questionnaire was designed by experienced researchers in the research team. The content of the questionnaire included general information of congenital heart patients, medical history problems, clinical signs, laboratory tests, echocardiography, treatments and complications.

Figure 10: Da Nang Hospital where the data were collected

Because patients in Da Nang Hospital were not yet managed by electronic medical records, data collection must be based on paper medical records. PhD student of this study recruited two data collectors to collect data. These two data collectors are nurses with more than 5 years of experience and knowledge of CHD. The PhD student trained the two data collectors on how to find relevant medical records and collect information. In the first 3 months, the PhD student worked directly with two data collectors to assist them in reading medical records and collecting data. The medical records were written by hand of many different doctors, so the data collection team needed a lot of time to read and record the data. Data from the medical records were collected into the study questionnaires. In case of unclear information, data collectors contacted PhD student for final comments and decisions.

Data after collecting by the two data collectors were forwarded to a doctor who was a member of the research team to check the logic and completeness of the data. In case of detecting errors in the data collection process, researchers would mark and request data collectors to fix and fulfill those errors. Finally, data were transferred to PhD student for the final inspection. The entire process of finding medical records and collecting data is taking place within 2 years from July 2016 to July 2018.

2.5. Statistical analysis

Descriptive statistics were used to estimate the proportion of each types of CHD. The proportion of ASD was also estimated. The proportion of CHD was categorized by different characteristics of CHD patients, e.g. age, sex, weight, occupation and place of residence. Quantitative variables were presented as mean and standard deviation. Sometimes, we presented quantitative data as min and max values. Qualitative variables were presented as absolute numbers and percentages. To compare the differences between groups, we used Student's t test or the Mann–Whitney U test for quantitative variables and Chi-square test for qualitative variables. Multivariate logistic regression analysis to adjust for the rim to identify the threshold of the length and width of defect. All statistical analyses in this study were conducted by STATA® 13.1. We set the level of statistical significance at $p = 0.05$.

2.6. Ethical consideration

The research proposal was approved by the Ethical Committee Board at Da Nang Hospital in Vietnam under Decision No. 380/BVĐN-YĐ dated 18/7/2016. The proposal was also agreed and approved by the Ethical Committee Board of the Ludwig - Maximilian University of Munich, Germany (Document LMU, project no. 18-221 dated May 2nd, 2018). All of the personal information of the patients in the research were removed and be kept confidentially. All of the coded data were stored and secured according to hospitals' guidelines and requirements. No perceived harm, risk, or possible hurt was anticipated from this study. The data were kept in a secure location in The School of Medicine and Pharmacy of The University of Da Nang.

3. RESULTS

3.1. Status of CHD

Table 1: Characteristics of CHD patients in Da Nang Hospital during the period of 2010-2015

Characteristic	n (%)	Women	Men
		N (%)	
Year			
2010	109 (8.9)	62 (56.9)	47 (43.1)
2011	262 (21.5)	156 (59.5)	106 (40.5)
2012	254 (20.8)	142 (55.9)	112 (44.1)
2013	232 (19.0)	142 (61.2)	90 (38.8)
2014	204 (16.7)	120 (58.8)	84 (41.2)
2015	159 (13.0)	97 (61.0)	62 (39.0)
Age group (year)			
0-9	856 (70.2)	470 (54.9)	386 (45.1)
10-19	167 (13.7)	97 (58.1)	70 (41.9)
20-39	125 (10.2)	92 (73.6)	33 (26.4)
40+	72 (5.9)	60 (83.3)	12 (16.7)
Province of residence			
Da Nang city	370 (30.3)	202 (54.6)	168 (45.4)
Quang Nam	545 (44.7)	328 (60.2)	217 (39.8)
Quang Ngai	205 (16.8)	125 (61.0)	80 (39.0)
Other	100 (8.2)	64 (64.0)	36 (36.0)
Known about CHD status			
Yes	1206 (98.9)	712 (59.0)	494 (41.0)
No	14 (1.1)	7 (50.0)	7 (50.4)
Total	1220 (100)	719 (58.9)	501 (41.1)

Table 1 shows the characteristics of CHD patients in Da Nang Hospital during 2010 and 2015. A total of 1220 CHD patients were recruited in the study, of which 58.9% were women, and 41.1% were men. By characteristics, the proportion of women was slightly higher rates than that of men. By year, the lowest rate in 2010 (8.9%), then the highest increased in 2011 (21.5%). The rate gradually decreased from 2012 (20.8%) to 2015 (13.0%). Most of CHD patients belonged to the age group of 0-9 (70.2%), the age group above 40 only accounted for 5.9%. Most of Da Nang study 's patients were in Da Nang city, and they came from neighboring provinces, including Quang Nam (44.7%) and Quang Ngai (16.8%). Most patients (98.9%) reported that they knew about their CHD condition.

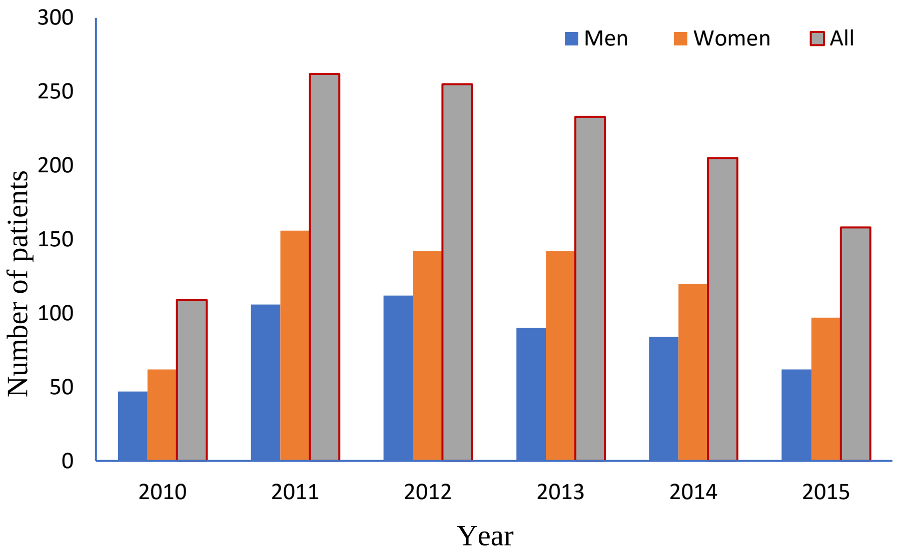


Figure 11: Trends in numbers of CHD patients in Da Nang hospital by sex and year, 2010-2015

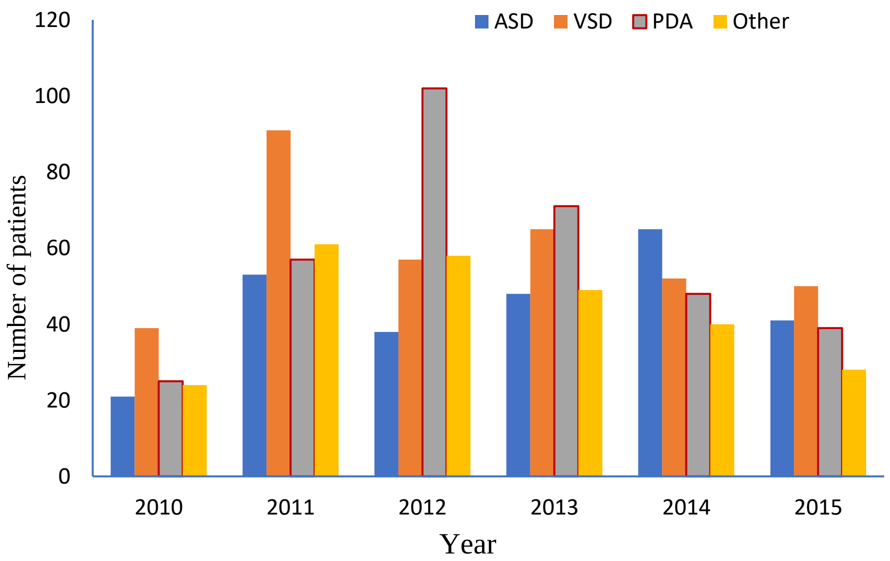


Figure 12: Trends in numbers of CHD patients in Da Nang hospital by types of CHD, 2010-2015

Figure 11 presents the numbers of CHD patients in Da Nang Hospital by sex and year during 2010 and 2015, while Figure 12 presents the numbers of CHD patients in Da Nang Hospital by type of CHD during 2010 and 2015. Female patients were higher than male patients in all years. The number of patients was lowest in 2010, then increased sharply in 2011. From 2012 to 2015, the total number of patients decreased. In 2010 and 2011, patients with VSD had the highest number, followed by PDA and ASD patients. However, PDA patients had the highest number in 2012, then the number of PDA patients gradually decreased until 2015. From 2012, ASD patients increased gradually until 2014, then the number of ASD patients decreased in 2015. Patients with VSD fluctuated between years from 2012 to 2015, and still accounted for a significant amount compared to other CHD patients.

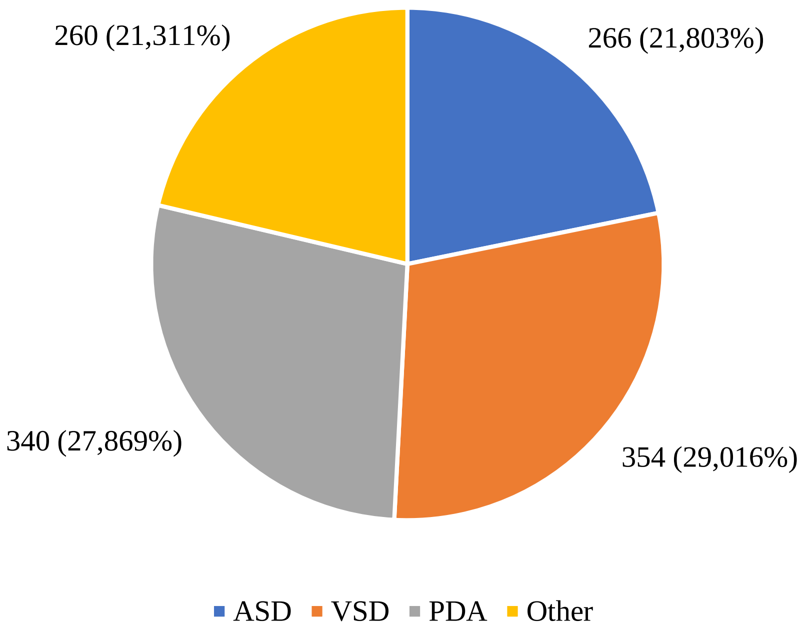


Figure 13: Total numbers (percentage) of CHD patients in Da Nang Hospital by types of CHD, 2010-2015

The proportion of patients by a different type of CHD is presented in Figure 13. Within 6 years of the study, in Da Nang study most CHD patients had VSD (29.0%), PDA (27.9%) and ASD (21.8%). The remaining CHD patients account for only 21.3%, which includes cases of patients with a combination of other cardiovascular diseases or defects, such as Pulmonary artery stenosis, Tetralogy of Fallot, Right ventricular infundibular stenosis, Partial atrioventricular canal defect etc.

Table 2: Number of CHD patients in Da Nang Hospital by types of CHD, 2010-2015

Type of CHD	N	%
VSD		
Doubly committed VSD (outlet VSD)	9	0.7
Perimembranous VSD	259	21.2
Infundibular VSD (inlet VSD)	82	6.7
Muscular VSD	4	0.3
Sub-total	354	29.0
ASD		
ASD I	2	0.2
ASD II	258	21.1
Sinus venous ASD	6	0.5
Sub-total	266	21.8
PDA	340	27.9
OTHER		
Tetralogy of Fallot	36	3.0
Tetralogy of Fallot + ASD + Right ventricular infundibular stenosis	1	0.1
Tetralogy of Fallot + ASD	2	0.2
Tetralogy of Fallot + PDA	9	0.7
Tetralogy of Fallot + Pulmonary artery stenosis	1	0.1
Tetralogy of Fallot + Right ventricular infundibular stenosis	5	0.4
Pulmonary artery stenosis	67	5.5
Pulmonary artery stenosis + ASD	17	1.4
Pulmonary artery stenosis + VSD	2	0.2
Pulmonary artery stenosis + VSD + Right Ventricular Infundibular Stenosis	1	0.1
Aortic coarctation	1	0.1
Pulmonary atresia with ventricular septal defect (PA-VSD)	3	0.2
Partial atrioventricular canal defect	18	1.5
Complete atrioventricular canal defect	5	0.4

Type of CHD	N	%
Foramen oval persistent	1	0.1
Aortopulmonary window	2	0.2
Double outlet right ventricle (DORV)	1	0.1
VSD + ASD	3	0.2
VSD + PDA	12	.0
VSD + Pulmonary artery stenosis	2	0.2
VSD + Right ventricular infundibular stenosis	15	1.2
VSD + Aortic arch hypoplasia	3	0.2
VSD + Mitral stenosis and regurgitation	3	0.2
VSD + ASD + PDA	2	0.2
VSD + PDA + Pulmonary artery stenosis	1	0.1
VSD + ASD + Mitral stenosis and regurgitation	1	0.1
ASD + PDA	3	0.2
ASD + Anomalous pulmonary venous return (APVR)	1	0.1
ASD + Mitral stenosis and regurgitation	1	0.1
ASD + PDA + Pulmonary artery stenosis	1	0.1
PDA + Pulmonary artery atresia	1	0.1
PDA + Pulmonary atresia with ventricular septal defect (PA-VSD)	1	0.1
PDA + Pulmonary artery stenosis	34	2.8
PDA + Atrioventricular canal defect	1	0.1
PDA + Transposition of great arteries	1	0.1
PDA + Aortic arch hypoplasia	1	0.1
PDA + VSD + Aortic arch hypoplasia	1	0.1
Sub-total	260	21.3
Total	**1220**	**100.0**

Table 2 shows the percentage of patients by types of CHD. In patients with VSD, the highest proportion was perimembranous VSD (21.2%). While among ASD patients, the proportion of ASD II was the highest (21.1%). In other CHD group, the highest proportion was from Pulmonary artery stenosis (5.1%), Tetralogy of Fallot (3.0%), PDA combining with Pulmonary artery stenosis (2.5%), and Partial atrioventricular canal defect (1.5%).

Table 3: Age and weight of CHD patients in Da Nang Hospital by year, 2010-2015

Year	n	Age (year)			Weight (kg)		
		Mean	Min*	Max	Mean	Min	Max
2010	109	12.2	2.0	57.0	25.6	4.0	70.0
2011	262	9.4	2.0	56.0	21.9	3.3	62.0
2012	254	7.7	2.0	61.0	17.1	3.0	64.0
2013	232	10.2	1.0	61.0	20.0	3.0	64.0
2014	204	9.5	1.0	72.0	19.4	3.0	74.0
2015	159	9.0	1.0	55.0	18.8	3.0	75.0
Total	1220	9.4	1.0	72.0	20.0	3.0	75.0

Note: *: in month

As shown in Table 3, the age and weight of CHD patients in Da Nang Hospital by year. The average age of CHD patients decreased from 12.2 years in 2010 to 7.7 years in 2012. During the period from 2013 to 2015, the average age of CHD patients decreased from 10.2 years to 9.0 years. The patient with the smallest age in the years 2010-2012 was 2 months, while the youngest patient in 2013-2015 was 1 month. The highest patient age ranges from year to year between 55 years and 72 years. The average weight of CHD patients also decreased in the period from 2010 to 2012. Following that, the weight of CHD patients continued to decrease from 20 kg in 2013 to 18.8 kg in 2015. Lowest weight in 2010, the patient's weight was 4 kg, however, in the following years (from 2012 to 2015) CHD patients' lowest weight was only 3 kg. The largest CHD patients weight varied from year to year between 62 kg and 75 kg.

Table 4: Age and weight average of CHD patients in Da Nang Hospital by types of CHD, 2010-2015

Type of CHD	n	Age (year)			Weight (kg)		
		Mean	Min*	Max	Mean	Min	Max
ASD	266	20.2	5.0	72.0	31.8	4.8	74.0
VSD	354	6.8	3.0	55.0	18.7	3.2	69.0
PDA	340	5.8	1.0	67.0	14.9	3.0	75.0
Other	260	6.7	1.0	61.0	16.4	3.0	61.0
Total	1220	9.4	1.0	72.0	20.0	3.0	75.0

Note: *: in month

The smallest average age belonged to the group of PDA patients (5.8 years), while the largest average age belonged to ASD patients. The youngest age is 1 month (PDA patients and patients with the other CHD). The largest age of CHD patients was in ASD patients (72 years). The lowest average weight was in the PDA patients (14.9 kg) group, while the highest average weight was in the ASD patient group (31.8 years). The lowest weight is 3kg (PDA group and patients with the other CHD group). The highest weight of the groups ranged from 61 kg to 75 kg (Table 4).

Table 5: Type of CHD patients in Da Nang Hospital by sex, 2010-2015

Type of CHD	n	Women	Men
		N (%)	
ASD	266	186 (69.9)	80 (30.1)
VSD	354	176 (49.7)	178 (50.3)
PDA	340	226 (66.5)	114 (33.5)
Other	260	131 (50.4)	129 (49.6)
Total	1220	719 (58.9)	501 (41.1)

Table 5 shows the type of CHD patients in Da Nang Hospital by sex during 2010-2015. In general, the proportion of women was higher than the proportion of men. As for the VSD patient group, the proportion of men (50.3%) was slightly higher than the proportion of women (49.7%).

3.2. Status of ASD and criteria to treat ASD patients

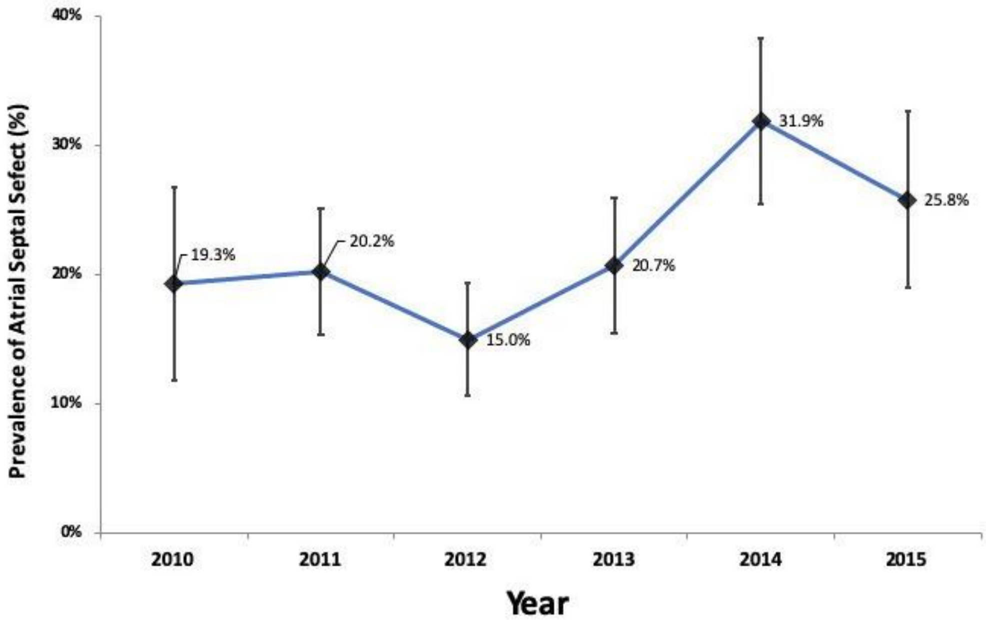


Figure 14: Trends in prevalence and 95% CI of ASD among CHD patients, 2010-2015 (60)

The trends in prevalence and 95% CI of ASD among CHD patients were presented in Figure 14. The prevalence and 95%CI by year are presented from 2010 to 2015. The prevalence varied between years, ranging between 15% and 31.9%. It tended to decrease between 2010 and 2012. However, it sharply increased between 2012 and 2014, then slightly decreased between 2014 and 2015.

Table 6: ASD patients in Da Nang Hospital by year and sex, 2010-2015

Year	Total	Women	Men	p-value
	N (%)			
2010	21 (7.9)	14 (7.5)	7 (8.8)	
2011	53 (19.9)	37 (19.9)	16 (20.0)	
2012	38 (14.3)	24 (12.9)	14 (17.5)	0.92
2013	48 (18.1)	34 (18.3)	14 (17.5)	
2014	65 (24.4)	48 (25.8)	17 (21.3)	
2015	41 (15.4)	29 (15.6)	12 (15.0)	
Total	266 (100.0)	186 (100)	80 (100)	

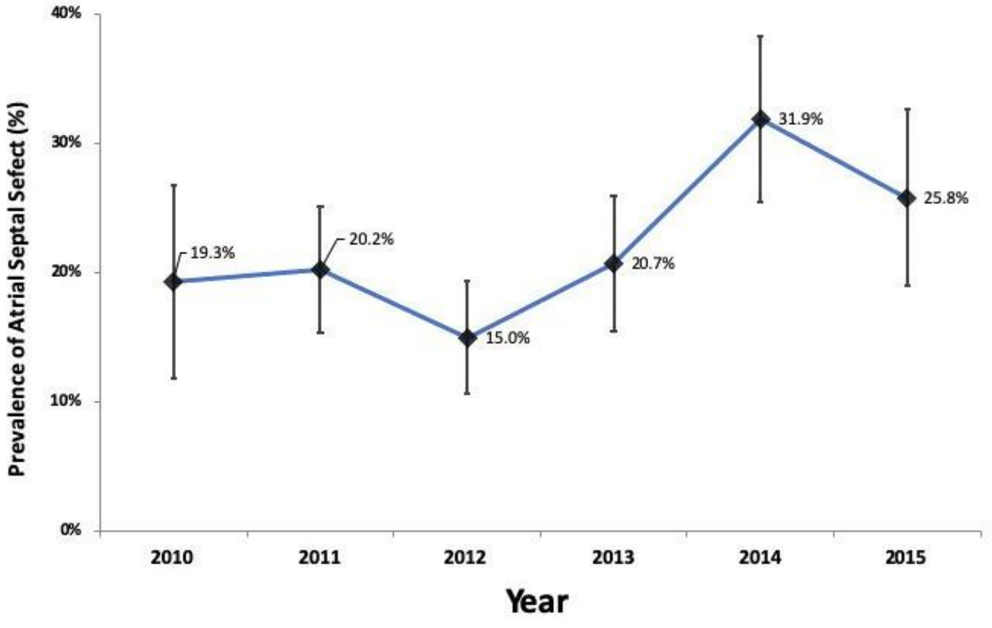


Figure *14*: Trends in prevalence and 95% CI of ASD among CHD patients, 2010-2015 (60)

The trends in prevalence and 95% CI of ASD among CHD patients were presented in Figure 14. The prevalence and 95%CI by year are presented from 2010 to 2015. The prevalence varied between years, ranging between 15% and 31.9%. It tended to decrease between 2010 and 2012. However, it sharply increased between 2012 and 2014, then slightly decreased between 2014 and 2015.

Table *6* presents the number and percentage of ASD patients in Da Nang Hospital by year and sex during 2010-2015. A total of 266 ASD patients were included in the study, of which 186 women (69.9%) and 80 men (30.1%). The distribution of male and female proportions was relatively similar between years. In particular, the number of ASD patients was low in 2010, then increased in 2011. The number of patients with ASD decreased after 2012, then continued to increase until 2014. ASD patients in the year 2015 decreased as compared to the number of 2014.

Table 7: Age and weight of ASD patients in Da Nang Hospital by year, 2010-2015

Year	n	Age (year)			Weight (kg)		
		Mean	Min*	Max	Mean	Min	Max
2010	21	23.5	17.0	57.0	33.6	5.0	60.0
2011	53	17.2	10.0	56.0	31.0	6.0	62.0
2012	38	27.2	5.0	61.0	38.5	6.8	62.0
2013	48	22.9	7.0	61.0	34.7	6.3	64.0
2014	65	17.1	6.0	72.0	27.7	6.5	74.0
2015	41	17.4	7.0	55.0	28.6	4.8	62.0
Total	266	20.2	5.0	72.0	31.8	4.8	74.0

Note: *: in month

The description of age and weight of ASD patients in Da Nang Hospital by year are shown in Table 7. The age of patients with ASD tends to decrease over the years. In particular, ASD patients' lowest age also decreased accordingly. Between 2012 and 2015, the lowest age of ASD patients ranged from 5-7 months. For weight, ASD patients' average weight also decreased over time. ASD patients' smallest weight was 4.8 kg in 2015.

Table 8: Demographic characteristics of ASD patients in surgical and transcatheter closure groups

Characteristics	Surgical group	Transcatheter closure group	p-value
	N (%)		
Sex			
Women	27 (62.8)	159 (71.3)	0.26
Men	16 (37.2)	64 (28.7)	
Age group (year)			
0-9	14 (32.6)	91 (40.8)	0.52
10-19	11 (25.6)	37 (16.6)	

20-39	10 (23.3)	52 (23.3)	
40+	8 (18.6)	43 (19.3)	
Province of residence			
Da Nang	15 (34.9)	70 (31.4)	0.14
Quang Nam	21 (48.8)	110 (49.3)	
Quang Ngai	3 (6.9)	36 (16.1)	
Other	4 (9.3)	7 (3.1)	
Total	43 (100)	223 (100)	

Table 8 shows the demographic characteristics of ASD patients in the surgical and transcatheter closure groups. Of 266 ASD patients, 43 cases (16.2%) were operated on, while 223 cases (83.8%) were applied the transcatheter closure. The proportional distribution in the two groups by gender, age group and provinces of residence was relatively similar (all $p > 0.05$). In both groups, the proportion of women was higher than the proportion of men. The proportion of age group 0-9 years was the highest in both groups (32.6% in the surgical group and 40.8% in the transcatheter closure group). Most ASD patients in the two groups were in Da Nang city, Quang Nam and Quang Ngai province.

Table 9: Dimension (diameter) of the ASD defects in surgical and transcatheter closure group

Diameter of defect	Surgical group	Transcatheter closure group	p-value*
Length (mm)			
Mean (SD)	26.3 (8.6)	20.4 (7.6)	<0.01
Min	10	5	
Max	41	38	
Width (mm)			
Mean (SD)	24.8 (8.3)	18.5 (7.5)	<0.01
Min	10	5	
Max	41	38	

*: t-test

As shown in Table 9, the average length of the defect in the surgical group (26.3 mm) was significantly longer than that in the transcatheter closure group (20.4 mm). The maximum and minimum lengths of defects in the surgical group are also larger than that in the transcatheter group. The average width of defects in the surgical group (24.8 mm) was significantly longer than that in the transcatheter closure group (18.5 mm). Similarly, the maximum and minimum width of defects in the surgical group are also larger than that in the transcatheter group.

Table 10: Surgical and transcatheter closure group by type of ASD

Type of ASD	n	Surgical group	Transcatheter closure group
		N (%)	
ASD I	2	2 (100.0)	0 (0.0)
ASD II	256	35 (13.6)	223 (87.1)
Sinus venous ASD	6	6 (100.0)	0 (0.0)
Total	266	43 (16.2)	223 (83.8)

Table 10 shows the surgical and transcatheter closure group by types of ASD. The entire ASD patients in transcatheter closure group is ASD II. ASD II has also made up the majority of the surgical group (35/43 cases). In ASD II alone, patients who had an operation were 35 people (13.6%), and those with transcatheter were 223 people (87.1%). All patients that had ASD I and Sinus venous ASD belonged to the surgical group.

Table 11: Characteristics of different types of ASD patients in Da Nang Hospital among the surgical group, 2010-2015

	ASD I	ASD II	Sinus venous ASD	Total
	Mean (SD)			
Age (age)	29 (11.3)	22.4 (17.3)	5.3 (3.9)	20.3 (16.9)
Height (m)	1.6 (0.1)	1.3 (0.3)	1.0 (0.2)	1.3 (0.3)
Weight (kg)	44.3 (10.9)	33.4 (15.6)	17.6 (9.9)	31.7 (15.8)
Diameter of ASD				
Length (mm)	28.5 (16.3)	27.9 (8.1)	18.0 (5.5)	26.6 (8.7)
Width (mm)	28.5 (16.3)	26.2 (7.8)	18.0 (5.5)	25.1 (8.2)

The characteristics of different types of ASD patients among the surgical group were shown in Table 11. The average age in the sinus venous ASD patient group was the smallest (5.3 years). The average height and weight of sinus venous ASD patients were also the smallest.

Similarly, the diameter of the defects of sinus venous ASD patients was also the smallest. The ASD I patients group had the highest of age, the highest of height, heaviest of weight and the largest of the diameter of the largest defect.

Table 12: Characteristics of different types of ASD patients in Da Nang Hospital among the transcatheter closure group, 2010-2015

	ASD I	ASD II	Sinus venous ASD	Total
	Mean (SD)			
Age (age)	NA	20.1 (18.3)	NA	20.1 (18.3)
Height (m)	NA	1.3 (0.4)	NA	1.3 (0.4)
Weight (kg)	NA	31.8 (17.9)	NA	31.8 (17.9)
Diameter of ASD	NA		NA	
Length (mm)	NA	20.6 (7.6)	NA	20.6 (7.6)
Width (mm)	NA	18.7 (7.5)	NA	18.7 (7.5)

Table 12 shows the characteristics of different types of ASD patients in Da Nang Hospital among the transcatheter closure group. In the transcatheter closure group, all patients had ASD II. The average age of these patients was 20.1 years, the average height was 1.3 m, and the average weight was 31.8 kg. The average diameter of the defects was 20.6 mm in length and 18.7 mm in width.

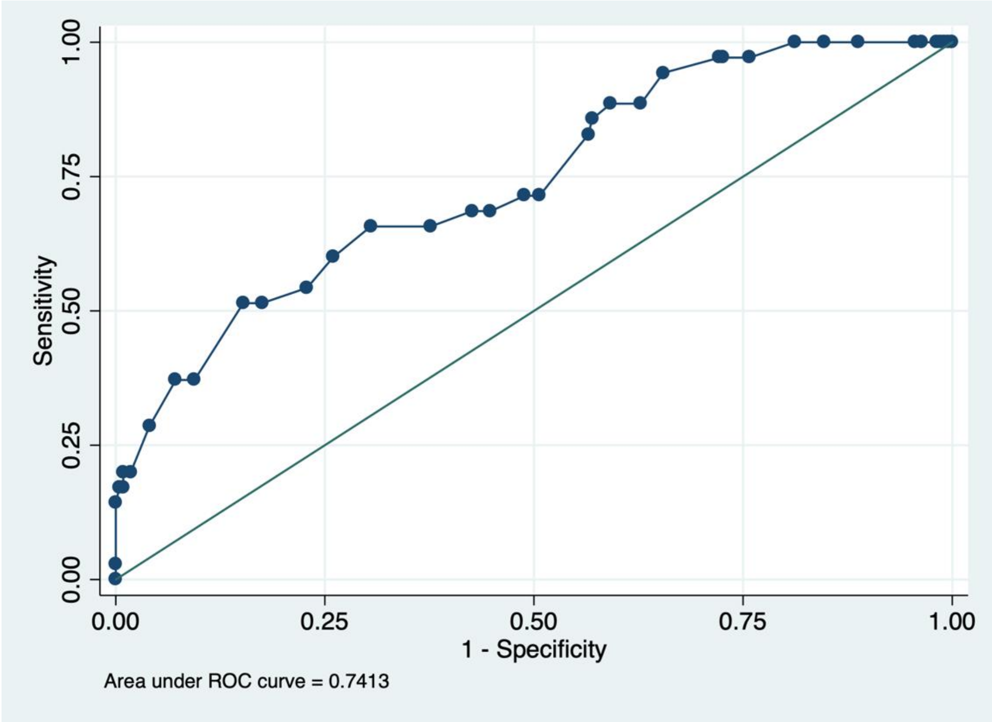


Figure 15: ROC curve of the length of the defect for predicting surgical treatment of ASD

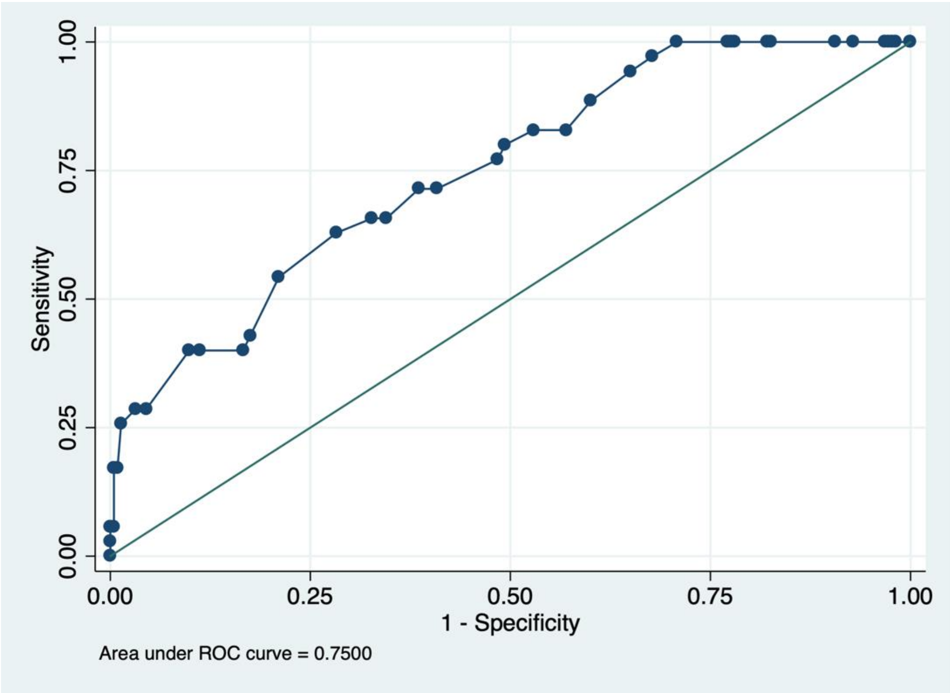


Figure 16: ROC curve of the width of the defect for predicting surgical treatment of ASD

Figure 15 illustrates the ROC curve of the length of the defect for predicting surgical treatment, while Figure 17 also shows the ROC curve of the width of the defect for predicting surgical treatment. The Area under ROC curve were both around 0.75, indicating that the length and width of the defects could be used to predict if a ASD patient should go for an operation or not.

Table 13: Cut-off point of the diameter of the defect to decide the type of treatment

	Cut-off point (mm)	Sensitivity (%)	Specificity (%)
Diameter			
Length	25.5	66	70
Width	24.5	63	72

Table 13 shows the cut-off point of the diameter of the defect to decide if a ASD patient should go for surgical or transcatheter closure groups. For the length of the defect, the cut-off point for an operation would be 25.5 mm. For the width of the defect, the cut-off point for an operation would be 24.4 mm.

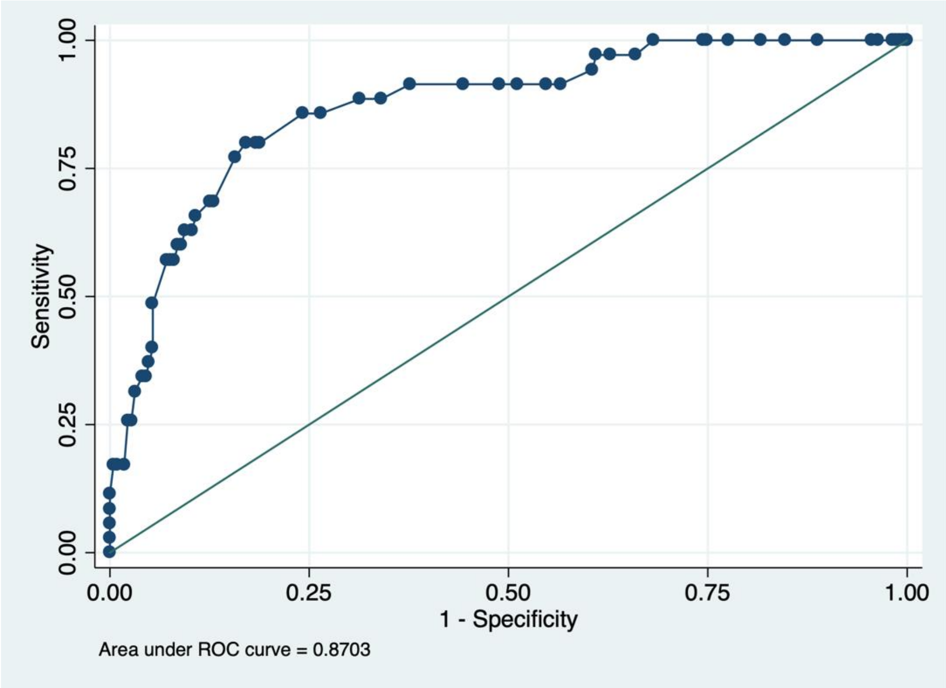


Figure 17: ROC curve of the length of the defect for ASD predicting surgical treatment after adjusting for rim

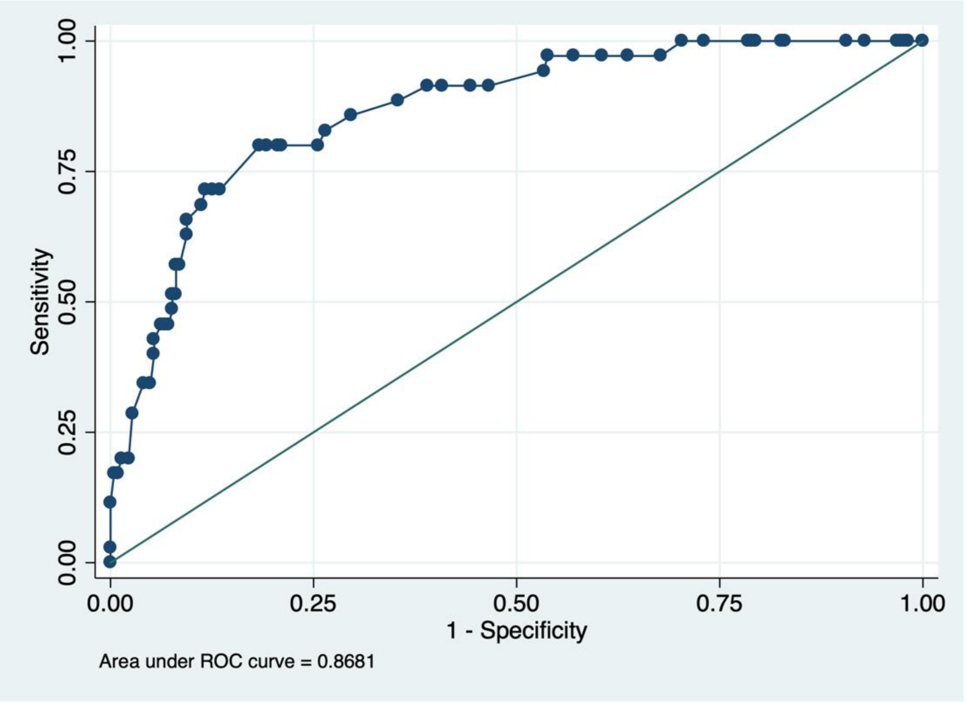


Figure 18: ROC curve of the width of the defect for ASD predicting surgical treatment after adjusting for rim

Figure 17 and Figure 18 present the ROC curves of length and width of the defects for ASD predicting surgical treatment after adjusting for rim. The sufficient rim of atrial tissue should be greater than 5mm surrounding the defect. Thus, after adjusting for rim, the Area under ROC curve of the length and width of the defects both increased to around 0.87, indicating that if rim was available, it could be better to decide that an ASD patient should go for the transcatheter closure procedure.

Table 14: Cut-off point of the diameter of the defect to decide the type of treatment after adjusting for sufficient rim

	Cut-off point (mm)	Sensitivity (%)	Specificity (%)
Diameter adjusted for rim			
Length	34.1	83	81
Width	33.3	82	81

Table 14 presents the cut-off point of the diameter of the defect after adjusting for sufficient rim to decide if a ASD patient should go for surgical or transcatheter closure groups. For the length of the defect, the cut-off point for an operation would be 34.1 mm. For the width of the defect, the cut-off point for an operation would be 33.3 mm. After adjusting for rim, the cut-off points increased, and they became better with higher sensitivity (83% for length and 82% for width) and specificity (81%). If the rim was available, the cut-off point increased, so fewer patients would need to be referred to surgery, and instead, they can use transcatheter closure.

3.3. Effectiveness and safety of surgical and transcatheter methods for ASD patients

Table 15: Type of device using for the transcatheter closure group

Device	N	%
Figulla Flex II ASD	52	24.1
ASO Cocoon	88	40.7
ASO Amplatzer	76	35.2
Total	216	100.0

Table 15 shows the type of device using for the ASD transcatheter closure group. Among the tools used, ASO Cocoon was most used (40.7%), followed by ASO Amplatzer (35.2%) and Figulla Flex II ASD (24.1%).

Table 16: Diameter of defect among the transcatheter closure group by type of devices

	Devices for transcatheter closure			
	Figulla Flex II ASD	ASO Cocoon	ASO Amplatzer	Total
	Mean (SD)			
Diameter of defect				
Length	17.4 (7.5)	20.3 (7.3)	22.4 (7.3)	20.4 (7.6)
Width	15.4 (6.9)	17.9 (7.1)	21.2 (7.5)	18.5 (7.5)

The diameter of defect among the ASD transcatheter closure group by type of devices are shown in Table 16. The ASO Amplatzer has been used with defects with the largest average diameter (22.4 mm in length and 21.2 mm in width). Figulla Flex II ASD was used with defects with the smallest mean diameter (17.4 mm in length and 15.4 mm in width).

Table 17: Complications of ASD surgical group and transcatheter closure (TC) group

Complication	Surgical group (n=43) N (%)	TC group (n=223) N (%)	Total
Pneumonia	3 (7.0)	0	3
Septicemia (clinical symptom)	4 (9.3)	0	4
Heart failure	3 (7.0)	0	3
Incision infection	1 (2.3)	0	1
Cerebrovascular injury	1 (2.3)	0	1
Respiratory insufficiency	1 (2.3)	0	1
Convulsion	1 (2.3)	0	1
Dropping of device	NA	2 (0.9)	2
Transcatheter closure failure	NA	5 (2.2)	5
Total	14 (32.6)	7 (3.1)	21

Note: NA: Not applicable

Table 17 shows the complications of the ASD surgical group and transcatheter closure group. There have been 7 ASD cases of complications occurring in the transcatheter closure group, while 14 cases had been reported in the surgical group. Complications with the highest numbers among the surgical group were septicemia (4 cases), pneumonia (3 cases) and heart failure (3 cases). Regarding complication due to the transcatheter closure technique, there were 5 ASD cases with device failure during the implantation period and 2 cases with dropping device in the same day after procedure. However, those cases were sent to surgery, and they recovered completely.

Table 18: Hospital days of surgical and transcatheter closure groups for ASD patients in Da Nang Hospital

Time (day)	Surgical group	Transcatheter closure group	p-value*
	Mean (SD)		
Before intervention	15.0 (8.4)	12.3 (8.5)	0.06
Intensive care unit	1.2 (0.5)	-	
After intervention	8.0 (3.0)	6.4 (2.4)	<0.001
Total of hospital days	24.1 (9.3)	18.6 (8.8)	<0.001

Table 18 presents the hospital days of the surgical and transcatheter closure groups for ASD patients. Time of inpatient of the surgical group (24.1 days) was significantly longer than that of the transcatheter closure group (18.6 days). ASD patients in the transcatheter closure group did not need to stay in intensive care unit, while patients in the surgical group needed to stay on average of 1.2 days in intensive care unit.

Table 19: Unit price of different category for ASD patients in Da Nang Hospital

Price category	Unit price (USD)
Bed-day	8.4 USD /day
Transcatheter closure procedure	2150.5 USD /case
Operation	3010.8 USD /case
Bed-day in intensive care	17.7 USD /day
Bed-day in post-operation room	12.6 USD /day

Note: 1 USD=23,250 (in 2019)

Table 19 presents the unit price for different categories for ASD patients. The unit price for a case of operation was 3010.8 USD, while for a case of transcatheter was 2150.5 USD. The price of a bed-day was 8.4 USD/day. If a ASD patient needs an operation, he or she has to use another type of bed with the price of 17.7 USD/day in a intensive care unit, and 12.6 USD/day in a post-operation room.

Table 20: Price for using surgical or transcatheter closure methods for an ASD patient in Da Nang Hospital

Price category	Price for using methods (USD)		p-value
	Surgery Mean (SD)	Transcatheter closure Mean (SD)	
Bed-day before intervention	125.4 (70.5)	103.0 (71.3)	0.06
Price of Operation/Transcatheter	3010.8	2150.5	
Bed-day in intensive care	21 (9.6)		
Bed-day after intervention	99.9 (37.2)	53.3 (20.1)	<0.001
Total	3257.0 (86.6)	2306.8 (73.5)	<0.001

Note: excluded medicine, food and transportation price.

Table 20 provide the estimation of price for using surgical and transcatheter closure methods. The total price for a case of ASD operation (3257.0 USD) was significantly higher than that for a case of transcatheter closure (2306.8 USD).

Table 21: Follow-up of surgical and transcatheter intervention group for ASD patients in Da Nang Hospital

	Surgery (n=32)	Transcatheter closure (n=126)
	N (%)	
Variable		
Good health	31 (97.0)	126 (100.0)
Complications	1 (3.0)	0 (0.0)
Shunt	0 (0.0)	0 (0.0)

Table 21 provides the follow-up information of ASD patients after 3 to 8 years. Most patients in both groups had good health. There was only 1 case in the surgical group that has complications. This case then returned to the hospital and the complication was solved.

4. DISCUSSION

4.1. Status of CHD

Gender Difference in Congenital Heart Disease

Scientists, experts and researchers in the field of cardiology have embarked on conducting research to establish the real course of gender differences in CHD (61). Recent studies indicate that gender influences the manifestation of CHD as well as its management in both men and women. In order to expose the role of gender differences in CHD, the Euro Heart Survey database was explored. From the database, the intervention and diagnosis procedures, their results and the medical history of the patients were analyzed and separated according to gender (62). The results of this study were similar to those found in the research conducted in Da Nang Hospital in Vietnam. The aim of the Euro Heart Survey study, however, was to establish the reasons behind gender difference in the prevalence of CHD. From the study, a few gender differences were established. There was a larger percentage of females compared to that of males who were symptomatic (63, 64). But for the 5 year period when the study was conducted, the mortality rate of men was found to be higher than that of females. These results coincide with those found in Da Nang Hospital in the years 2010 to 2015. Within this period, a larger proportion of men was frequently diagnosed and underwent chronic procedures. In recent studies, however, the research on the role of gender in relation to CHD has not been through since most of it has been focused on the risk factor of CHD to pregnancy as stated by Somerville et al. (65). Despite the fact that Warnes et al.'s study aimed at giving physicians some pieces of advice, his work provided more information in relation to the existence of differences in gender among CHD patients. He also found out that Eisenmenger female patients have a higher mortality rate (64).

The Euro Heart Survey database provided a potential way to further studies on the relationship between gender and CHD (62). The differences in the prevalence of diverse defects in relation to gender have however not been explained. Considering the confounding source, the assumption of the idea that the existing disparities spring around it is very unlikely. The analysis of the available data could not bear any significant results that could be used in the explanation of this phenomenon (62). Gender differences have been found to achieve an element of stability from birth to adulthood, which indicates that the mortality rate among diverse genders is more or less equivalent (66). However, from the findings of all the studies conducted on gender differences in CHD, it was discovered that the mortality rate was lower among females than males regardless of the risks posed by CHD to women. These results are very surprising that present a need for further research. Researchers are left to wonder if the severity of the condition is related to higher mortality in women. In reference to Transposition of the Great Arteries (TGA), we can conclude that higher mortality in men is partly related to smoking and arrhythmias, which has been seen to occur frequently in men (67, 68). Moreover, functional limitations were some of the few factors discovered to be more common in women despite the paradoxical nature of this discovery, it could be assumed that due to the high mortality rate caused by arrhythmias, the occurrence of sudden deaths in males leaves a huge proportion of females surviving.

There exists a general cardiological assumption that in similar physical conditions, there is a higher likelihood of fewer women suffering from CHD to receive medication and undergo diagnosis compared to men in developing countries. This is known as the Yentl syndrome (66). However, further studies to assess the credibility of this phenomenon found some more contradicting results. In terms of approaches on men and women, there was no satisfactory evidence in a study conducted by Roeters et al. A survey conducted on the Euro Heart Survey is however said to have found significant differences in the gender outcomes and management. The evidence relating to medical management, mortality and morbidity differences found in Euro heart survey in diverse genders support Yentl research relating to CHD (66). Regardless, it can be concluded that there is a difference in morbidity, mortality, and management of CHD in men and women born with the condition. These results coincide with those obtained in Da Nang Hospital in 2015.

Prevalence of CHD

According to the study, almost a third of all congenital complications comprise of CHD, the prevalence of this condition at birth varied over time (69). Regardless, CHD is characterized as a global problem that needs the attention of researchers, doctors and all concerned stakeholders. It was found out that all congenital anomalies comprise of 28% of CHD cases with a prevalence of the same estimated to be 8 infants in every 1000 live births (70). It has also discovered that the condition occurs from birth. In a bid to ensure that individuals born with this condition are able to survive, various breakthroughs have been achieved in the diagnosis and surgery of the cardiovascular and cardiothoracic sections. With the advancement in technology, the chances of survival of newborn babies with this condition can have significantly increased (71). Essentially, a large number of patients have been able to reach adulthood, but still suffering from Grown Up Congenital Heart Disease (GUCH). Such patients are constantly in need of long-term complex healthcare, which is expensive for many of them to afford. With such a large number of patients, there is a huge burden for global healthcare programs. To shed more light on the etiology of CHD, it is very essential to be acquainted with the global prevalence of CHD at birth. Through such an endeavor, better care can be provided to the patients (72).

The reports relating to the increased prevalence of CHD could be associated with improvement in detection and diagnosis technology rather than an actual true increase (69). Essentially, the rate of survival of the people with this condition has gradually increased with improvements in anesthesia use and cardiothoracic surgery (72). Moreover, various special units, including a large number of highly skilled pediatrics in the field of cardiology, were registered. This made it easy to register more patients with CHD detection at birth. Before echocardiography registries were discovered, the prospects of CHD were analyzed through the use of surgical reports, catheterization, X-ray, physical examination, death certificates, and autopsy reports. In such cases, only severe cases could be established. Echocardiography use has made it possible to diagnose patients with mild lesions and asymptomatic ones. Such developments basically explain the increased prevalence of CHD to date (73).

Moreover, other CHD related complications such as PDA, ASD, and VSD have also been able to be discovered and their prevalence has continued to increase with the advancement in technology. Warnes et al. found that the diagnosis of minor CHD complications were improved with the use of echocardiography (64). Some researchers argue that it is not the improvement in technology only that has led to the detection of more cases of CHD and related conditions, but also these conditions have naturally increased over time. Employment of improved medical technology has also led to the increasing number of infants who survive to adulthood despite being patients of CHD and other minor conditions. Furthermore, women in most of the world's developed nations are giving births in their late ages, hence increasing the congenital abnormalities of their offspring (72). The environment and increased industrialization have also been associated with increased prevalence of CHD over years (71). Furthermore, patient’s population has been seen to increase over time, hence increasing the number of people at risk of developing CHD and related conditions. This has been characterized by the used of products like marijuana, organic solvents, use of vitamin A, exposure to various therapeutic drugs, infection, febrile illness, and phenylketonuria. An increase in pregnancy termination as a result of fetal echocardiography is expected to improve over the next few years. This will eventually improve the survival of infants with CHD and related conditions (71).

Effects of Spatial Location and Differences in Income Groups

Differences in the prevalence of CHD were established. The prevalence in Da Nang city is different from that of Quang Ngai and Quang Nam in the 2010-2015 research conducted in Da Nang Hospital. According to Stavsky et al., the rate of prevalence of CHD in kids born from consanguineous mothers was higher than those from non-consanguineous mothers, indicating that there is a role played by genetics in the prevalence of this condition (74). Higher birth prevalence was also found in cases of left ventricular outflow tract obstruction and pulmonary outflow tract obstruction (TOF and PS) (72). These results are consistent with those of Jacobs et al., who stated that abnormalities such as right ventricular outflow lesion are common among Chinese children while left ventricular obstructive lesion is common among white children. These results indicate that genetics is a potential aspect of further research in explaining these cases. Europe with a rate of 8.9/1000 live births is the second continent in terms of CHD prevalence (75). However, it is not very clear why such results are possible when Europe is compared with North America, which has a relatively lower prevalence of 6.9/1000 live births yet the populations in both places are comparable. Such differences can be attributed to environmental, socioeconomic and ethnic differences. Differences in referral systems and healthcare might also have largely contributed to these results. Underestimation of the actual CHD prevalence at birth can also be caused by income differences, which leads to poor referral, screening, and insurance programs as well as the lack of resources. Nonetheless, factors such as age, diagnostic tools, population under investigation and the study design affect the results obtained. For example, CHD highly depends on the specificity and sensitivity of the screening tools. Moreover, there is still a question of whether the results obtained, indicating a gradual increase in CHD prevalence is reality or just differences arising from the methodologies employed. Therefore, more research is needed to clarify these results (72).

Reasons for Higher CHD Prevalence in 2011 and 2012

Vietnam has advanced its fields of CHD, cardiology and pediatrics making the provision of services reliable, but not as much as that of other developed nations (76). The less developed technology and health sector inhibits CHD screening at an early age. Essentially people tend to get diagnosed with CHD later in life, leading to numerous complex issues during and after the operation. The use of surgery and other advanced technologies in CHD intervention has led to the improvement of this sector (77). Currently, CHD and all related cases can successfully be treated in both infants and adults. Children under the age of 6 years in the country are now under insurance, which caters for their medical bill in case of surgery or catheter intervention done in public health facilities for free. People who are economically deprived have largely benefited from this program. However, interventions for CHD normally are costly, so many cases of CHD need to get free treatment supported by different donation programs. In addition, the infrastructure was not enough to cover all the CHD patients at once, leading to a long list of those who have to wait for attendance (78). Numerous other problems have also complicated the process of medical care delivery to CHD patients.

The organization of the health care system in Vietnam is on the basis of cities, provinces, districts, and wards located in areas where people reside. The government has improved the health care system by providing more hospitals to the citizens of Vietnam, where public hospitals have risen to over eight times the number of private hospitals. There existed over 20 pediatric hospitals, but the problem remains that they only operated mostly open-heart surgery in the big city hospitals. According to Phuc et al., CHD occurs in 10% of the fetus aborted and 0.8% to 1.0% live births in Vietnam (25). The government has recognized the burden that conditions such as CHD have to the patient’s family. Apart from the free health insurance for the children, approximately 19 cardiac centers that cater to children have been established within the country’s border. There only exist 5 centers that care for complex CHD cases for infants. Over 5000 CHD patients are attended to in these facilities every year, hence saving the lives of many children. Unfortunately, these centers are still not fully developed, hence the long list of patients waiting for cardiac surgery (78).

A patient who is diagnosed with CHD has to be moved from the district through the provincial to the city hospital. For complex cases that cannot be admitted in these hospitals, the patient is transferred to one among the five cardiac centers in the biggest cities in Vietnam that specialize in such complex cases. However, numerous more children are still dying from complex CHD cases that have not been detected at an early stage of development (25).

Lack of expert cardiologists and pediatrics leads to problems of the detection of CHD only in later stages in most patients. Patients with such complex cases will only be taken to the hospital when experiencing severe symptoms such as severe pulmonary hypertension, shock, heart failure, and severe hypoxia (64). The existence of such cases is as a result of numerous barriers to referrals. Moreover, there are additional barriers such as inadequate and poor echo machines, which are unable to detect CHD cases at an early stage. In addition, there are few experts in the field of fetal echocardiography and only in some big cities. In most provinces in Vietnam, there was no doctor who can do fetal echocardiography during the period 2010-2015. There was also poor communication between the pediatricians and obstetricians. It has been discovered that pregnant women get a chance to visit their doctors for not less than 3 times before they give birth. Unfortunately, the cases of CHD that have been discovered during pregnancy are almost zero (61). The only step that has been made to prevent such issues is doctors from various provinces visit the facilities in towns to learn more about CHD and the technology used. When they acquire the relevant information, echocardiography machines are then bought and transported to where the doctors came from for use.

The Vietnamese government has taken an initiative of expanding the cardiac team by training more doctors and technicians both in Vietnam and overseas. Through establishing links with the organization from foreign countries, a few experts are gradually being produced to aid the process of CHD detection diagnosis and treatment. Despite the numerous challenges, various improvements have been noted since 2008 due to support provided by foreign nations and organizations (78). For example, the Heart for Heart Foundation from Munich, Germany provided machines to intervene in CHD cases for Da Nang Hospital. This Foundation also provided financial support for the CHD operation or intervention program in Da Nang Hospital. By 2009, the country's health care programs had begun to offer cardiac intervention treatments. With improved health service, the risk of death in CHD patients and those with related conditions have significantly been reduced. It also led to an increased number of people who were found to be having CHD in 2011 and 2012 in Da Nang city. With increased detection, there was also and increase in diagnosis and treatment. Various treatment measures such as surgery and catheter were adopted, especially during an early age leading to less number of adults suffering from CHD and related cases (69). These cases have progressively been reduced in Da Nang Hospital in 2015.

4.2. Status of ASD and criteria to choose treatment methods for ASD patients

People from the same provinces tend to share almost similar environments and have a relationship in genetic factors. They are also exposed to similar environmental conditions such as pollution, which essentially leads to the noted prevalence (79). Other studies in the methylation pattern of DNA using genome-wide examination indicate that there are several cases of epigenetic cases as a result of ASD-association in discordant twins. This indicates that environmental disruption can provoke modification of the epigenetic factor that then results in ASD heritability. Various environmental factors have been seen to elevate the risk of ASD prevalence. Such factors include progressive fatherly age and exposure to environmental contaminants at an early age. Other factors, such as mother's exposure to valproic acid, teratogens, and thalidomide are associated with ASD. There have also been cases of dysfunction of the immune system, which is associated with ASD. The idea has triggered more research into early age immune activation, which might not only be important to ASD, but also in millions of other conditions (80).

Neurodevelopment impairment is subject to impairment in ASD associated genes. Despite the developments and advancement in the whole exome and genome sequencing analysis as well as the genome-wide association, it has been discovered that less than 20% of all ASD cases are accounted for by gene mutation as well as susceptible genes. There have been very few cases of genes related to ASD. This in return has led to more research into the environmental factors presumed to be ASD risk factors (79). Furthermore, the prevalence of ASD has been seen to rise in recent years and this has attracted further speculation into exposure to environmental agents such as dietary changes, air pollution, and toxins. Various studies indicate that non-twin siblings have a higher ASD concordance than dizygotic twins indicating that there is a role played by environmental factors in ASD etiology. Recent studies indicate that there is a relationship between the sharing of the environment and the risk of ASD. This is attributed to 62% of ASD twin concordance, while only 38% is attributed to genetics and mutation. This can explain the variance in the prevalence of ASD in Quang Ngai, Quang Nam, and Da Nang, among other provinces in Vietnam.

ASD is Highly Prevalent in Women Than Men

Among most of the other CHD conditions studied in Da Nang Hospital, the prevalence of ASD was found to be higher on women than men. This has been a topic of discussion and research that has caught the attention of many scholars (81). From the percentage of ASD patients in Da Nang Hospital by sex during 2010-2015, 69.9% of ASD patients were women, and 30.1% were men. The proportion female to male was relatively similar between years. In both groups of surgery and transcatheter closure, the proportion of women was higher than that of men. Although the topic of gender differences in the prevalence of ASD has not been well understood, these differences have been said to contribute to the prevalence of the condition in both genders.

Treatment of Atrial Septal Defects

For several years, the prevalence of ASD has been on the rise. However, Vietnam has been able to adopt various technologies that are used in the diagnosis and treatment of ASD. Surgical procedures, transcatheter and hybridization are now efficient in saving the lives of patients suffering from various types of CHD. Through technologies like echocardiography, the detection of this ASD increased, hence the high figures in 2010. Moreover, numerous people have been able to be treated, hence, it high figures from 2010 through 2011. With efficient and effective methods of treatment, more ASD patients were able to receive treatment leading to a decline in the number of patients suffering from the condition. Vietnam has continued to adopt new technologies that are able to detect ASD in early ages and later in life, hence the number of cases that are being identified is on the rise.

In order for an ASD to be treated, several factors are considered. In Vietnam, factors such as the shunt's severity, the existence of heart failure symptoms and the age of the patient are considered. Despite the lack of several advanced pieces of equipment and several highly skilled professionals to treat such complications, the cardiac centers available have seen numerous improvements in the past few years. The rest of the cases will have to be resolved with the use of methods such as hybridization, transcatheter or even surgery. It is possible for the closure of even large ASD in small children with the use of the available effective and efficient methods. To provide a prospect for spontaneous closure, such children will have to undergo frequent echocardiography. Factors such as paradoxical embolism, exercise capacity decrease, atrial arrhythmias, dysfunction of the right ventricle and pulmonary hypertension among others are some of the factors that determine the closure of ASD.

There is no minimum age for ASD closure, but children tend to be referred to a safer ASD closure procedure at 3-5 years. The closure of such defects improves the lifespan of the patient and is more secure even in aged patients. Percutaneous closure for ASD I and sinus venosus ASD is not possible. Therefore, universally, they are closed surgically. ASD I closure also requires an additional repair of atrioventricular (AV) valve (82). Moreover, sinus venosus ASD closure requires frequent return repair in addition to surgical procedures. The mortality rate of surgical closure is said to range between 0 and 3%, indicating its effectiveness (in Da Nang study, there was no death after ASD closure surgery). In cases of ASD II, percutaneous closure is the most preferred method over surgery. It has been discovered to be the safest method for both children and adults, and it is also associated with a low mortality rate (in Da Nang study, there was no death from ASD transcatheter closure). It is also said to cause very few postprocedural complication incidences, shorter hospitalization period and allows sternotomy scar and cardiopulmonary bypass to be avoided. The use of the new generation devices in percutaneous closure has ensured that there are fewer incidences of thrombus formation, device embolization, residual leak and risk of bleeding.

Surgical Closure of Atrial Septal Defects

When surgical procedures are conducted for ASD treatment, the risk of mortality and residual shunting is very negligible. However, it is hard to avoid postoperative complications, cardiopulmonary bypass, thoracotomy and sternotomy that may result in death. Furthermore, there are other disadvantages associated with surgery such as psychological trauma, residual scar, long hospital stay and high cost. The defect's anatomy, as well as technical factors, determines the decision to carry out surgery or transcatheter correction. Surgery is currently reserved for the ostium primum ASD patients whose septal rims are poor, making it impossible to employ transcatheter technique (83). The lack of inferior septal rim in ASD I and posterior septal rim in ASD II also make it possible for surgical measures to be employed. The patient is usually in need of being placed in a cardiopulmonary bypass after making the median sternotomy incision when the patient is placed under anesthesia. ASD is closed using an autologous pericardial patch, while the interrupted suture is used to close the cleft on the mitral valve.

In order to have access to the heart, there are a number of approaches that can be used. Approaches such as transxiphoid, lateral thoracotomy, submammary incision and median sternotomy are the most commonly used methods. Total cardiopulmonary bypass, as well as midline sternotomy, are the best conventional closure methods used. The efficiency and safety of outmoded sternotomy are ensured by the use of minimally invasive techniques. The conformist median sternotomy is currently being phased out due to the introduction of anterior mini-thoracotomy tactic in a modified dimension as well as minimal skin incision through the use of median sternotomy. These techniques are very efficient in thin and fat kids consecutively. Other minimally invasive techniques being used include partial sternotomy, right posterolateral thoracotomy, right anterolateral thoracotomy, and right posterolateral thoracotomy among others. Other feasible techniques that have been used include robotic-assisted surgery and video-assisted mini-thoracotomy among others (84). However, minimally invasive techniques have numerous disadvantages such as aortic cross-clamping, peripheral cannulation complexities and a restricted field of operations. For complete shunt termination, the direct suture is being phased out and replaced with a synthetic or pericardial patch.

Transcatheter Closure of Atrial Septal Defects

Transcatheter closures have become very common in cardiac centers. They are being used in combination with cardiac surgeries in the treatment of ASD and can also be used as sole treatment modalities. Various catheter mechanisms are currently being used. Methods such as implantation of transcatheter valves, device closure, stenting and balloon dilation are common. Percutaneous closure is the most popular method used in ASD II patients. This method is safe, but it can be successful with the maximum defects of 38 mm. The existence of deficient rims in the existing defects, as well as an over 38mm ASD II, makes the patient to be referred for surgery (85). For ASD types, the devices available have been designed purposely for its closure. When oximetry or Fick principle are employed in cardiac catheterization, various contraindications on the ASD devices used such as the resistance of pulmonary vascular to a very high degree that is greater than 8 wood unit, shunt sizes that cause Qp/Qs is more than 1.5:1 and pulmonary arterial hypertension. The device used in this method is introduced in a femoral vein via a sheath. Echocardiography and fluoroscopy methods are used to guide this instrument. Antiplatelet therapy is prescribed by many therapists, but there is no existing data to support this procedure. In Da Nang Hospital, patients were prescribed Aspirin 81 mg one tablet every day during 6 months after device closure for device thrombosis prevention. Devices such as Amplatzer Septal Occluder, ASO Cocoon, Figulla Flex II ASD are used in this study.

Determinants for the Defect Closure Method of Atrial Septal Defects

It was discovered that the average length of the defect was at 20.4 mm for the patients who received transcatheter closure and 26.33 mm for those who had surgical procedures in this study. This indicates that larger sized ASD can high probability be corrected using surgery. The minimum and maximum atrial septal defect sizes in the transcatheter group were also lower than those of surgical closure groups. The average defect width for the transcatheter group was 18.5 mm while that of surgical procedure was 24.8 mm. This study is yielded similar results to that in another study where the mean ASD size for surgical and device procedures was found to be 28.7 ± 10.0 mm and 14.2 ± 5.6 mm respectively (59). To determine if the patient should have a surgical procedure or not, the ROC curve was used. The regions under the curve were both found to be under 0.75 indicating that the width and the length of the defect can be used as a determinant for the type of closure. These results compare with those found in another study (81). The type of closure is also subject to the cut off points. For surgery, the length cut off point was found to be 25.5 mm while the width was 24.5 mm these results compare with those found in several studies (86-88). In this study, if the rim was available, the cut-off point for length and width of ASD to decide surgery increase, which would mean less patients need to have surgery. With this finding, if the rim is available, it is better for the patient to use transcatheter closure. Otherwise, surgical procedure has to be employed.

4.3. Effectiveness and safety of surgical and transcatheter methods for ASD patients

In this study, both transcatheter and surgical closures for ASD patients had good clinical outcomes. The transcatheter procedure had a lower rate of complication as compared to the surgical procedure, e.g. pneumonia, septicemia, heart failure. Moreover, the price of transcatheter closure was lower than that of surgical closure. With the same clinical outcomes, but lower price, the transcatheter procedure could be considered as a better choice for ASD patients as compared with the surgical procedure.

Types of Device

In this study, we found that there were three main types of the ASD closure device using for the transcatheter closure in Da Nang Hospital. Three types of devices were ASO Cocoon, ASO Amplatzer and Figulla Flex II ASD. ASO (Atrial Septal Occluder) is a new device specifically used for ASD patients. Although it is a new tool, it has been applied in Da Nang Hospital. These instruments are all rated to be effective for patients (89-96).

In our study ASO Amplatzer was used for large diameter medium-sized vents, then ASO Cocoon and Figulla Flex II ASD. Various devices have been used depending on the patient's condition and depending on the presence of a device available in the Da Nang Hospital. In some other studies, there are similar data about average size corresponding to each instrument used. Understanding the corresponding features of the device will help the doctor make the appropriate choices for the respective defect (90, 91).

Currently, in Vietnam, social health insurance has been implemented under the administration of the government. More than 80% of people are covered by health insurance, but private insurance is negligible. For social health insurance, patients less than 6 years old will be exempt from 100% of the normal hospital fee. In our study at Da Nang Hospital, the social health insurance also paid for the entire normal hospital fee of CHD patients less than 6 years old, however, the insurance only paid 50% of cost for surgery or transcatheter closure. Normally, the remaining cost of surgery or transcatheter closure was supported by charity organizations. For older CHD patients with health social insurance, they would be paid 80% of hospital costs and 50% of the cost of surgery or transcatheter closure. The remaining costs for older CHD patients also often got support from donors. Although CHD patients are supported by health insurance and donors, patients still had to pay many other expenses during their treatment periods, such as some additional medicines, food and travel costs.

Complications Happening More in the Surgical Group

There was not death in both surgical and transcatheter groups in this study. Most of ASD patients who used transcatheter closure service did occur any complications after the intervention. However, five ASD patients were failed to implant the transcatheter closure devices. These five ASD patients were sent to surgery, and they were operated successfully. The reason for the failure to implant the transcatheter closure devices was that the defect was too large, and the rims were weak. The doctors tried to implant transcatheter closure devices, but the transcatheter closure devices did not stick to the rims of the defects. The doctors decided to withdraw the transcatheter closure devices. Then, these five ASD patients were sent to surgery in the following week, and they were operated successfully. In addition, two ASD patients got chest pain and felt hard to breathe after implantation of transcatheter closure devices on the same day of the intervention. This information was reported to the doctors, and it was diagnosed by echocardiography as a device dropping after transcatheter closure, one in the right ventricle and one in the pulmonary artery. These two patients were also sent to surgery immediately to withdraw the closure devices and close the defects.

Meanwhile, the surgical group in Da Nang study recorded 14 cases with complications. The most complications were septicemia, pneumonia and heart failure. Some studies also show a higher probability of complications for ASD surgical treatment (57, 97). This may also explain that cases of surgery are often more severe than cases of transcatheter closure, so there is a greater risk of complications. Only a few cases of complications in the transcatheter closure group were observed, and it was also noted in some studies (96, 98, 99). In another study, Behjati et al. reported that they observed 4 complications for the transcatheter closure group, including 1 case with tamponade requiring drainage, 2 cases with device embolization to the left atrium and right ventricular outflow tract, and 1 with late wire fracture (96). In Da Nang study, complication rate of the surgical group was 32% (14/43) and transcatheter closure group was 3% (7/223). Suchon et al. found that though more serious complications happened in the surgical group, the total complication rate for the surgical group and the transcatheter closure group was not significantly different (97).

Costs for Treatment

Patients who enter the Da Nang Hospital for CHD treatment will often have to go through 3 stages. Those stages included hospitalization before the intervention, hospitalization in the intensive care unit room after the procedure, then in the post-operative room or post-transcatheter closure room. For cases of transcatheter closure, the patient did not need to use intensive care unit room after closure. In our study, if we compared the number of inpatient days for surgical and transcatheter closure, we found that the surgical group had a significantly longer inpatient period than the transcatheter closure group. Thus, the application of transcatheter closure could benefit ASD patients that they reduced their inpatient days as compared to the surgical group. Our research results are similar to some other research results that also compared surgical and transcatheter closure (41, 100, 101).

In our study, most patients had to be hospitalized one week in advance to perform diagnostic tests and preparations before surgery or transcatheter closure. Because patients often lived far away and the hospital needed time to complete tests, patients needed to be hospitalized. It is important for the patient to be fully tested before deciding to have surgery or transcatheter closure. According to the process of Da Nang Hospital, two experience doctors on echocardiography would perform echocardiography for the same patient but on a different day to compare and contrast the results. In the next week, based on the results, doctors of the Surgery and Intervention Cardiovascular Department (including surgeon, pediatric cardiologist, doctor on echocardiography, doctor on anesthesia and intensive care) would meet and decide on surgery or transcatheter closure. After the treatment decision was made, the patient will be operated on or implanted a transcatheter closure device in the third week. Therefore, a patient will usually need to be hospitalized for about 3 weeks.

At each stage of treatment, patients would have to use different services. In which, if patients use a normal hospital bed, it would usually have the smallest cost, while the price of a bed-day in the intensive care room would be higher. In Da Nang Hospital, we estimated that the price for one case of transcatheter closure was 2150.5 USD, while one case of operation was 3010.8 USD.

Based on the length of stay at the respective stages and prices, we estimated the average price for surgical and transcatheter closure case. We found that the price for a surgical case was significantly higher than that for a transcatheter closure case. Due to the time, budget and data constraints, we could not estimate the cost of all services. The current price does not include the costs related to labor, travel, food and other indirect costs related to the patient. Cost calculation to make policy decisions is necessary and this is an open direction for further research. Other studies also reported that the cost for the transcatheter closure much lower than that for the surgical group (41, 100, 101). Given the clinical outcome and lower price, the transcatheter procedure would benefit more for ASD patients as compared to the surgical procedure.

4.4. Strength and limitation of the study

Strength of the study

This is the first study to assess CHD patients in the Central region of Vietnam. The study collected information on all CHD patients who had surgery or transcatheter closure at Da Nang hospital over a 6-year period from 2010 to 2015. The study was large in size and the patient's information was well collected. The study provided information on trends in the treatment of CHD patients by year at a big cardiovascular center in the Central region of Vietnam. In addition, this study focused on in-depth understanding of ASD patients, which has shown the necessary criteria to decide whether an ASD case should be used surgical or transcatheter closure procedures. In addition, multivariate logistic regression models were applied to adjust for available rim. With this finding, doctors may be able to have better decisions on specific ASD patients. Finally, this study also compared the effectiveness and safety of surgical or transcatheter closure procedures for ASD patients. This would be the basis for doctors who can advise patients to choose better treatment options.

Limitation of the study

The data used was also obtained from one hospital. This time span and data used might not enough to establish the actual trend of CHD. Although the use of a questionnaire to collect data is very common, the methodology used does not provide a complete assessment picture. For example, the differences in the standards of the content tests, as well as the test specifications that may lead to the noted discrepancies, were not provided. Furthermore, the study focused on only the main types of CHD, such as PDA, ASD, and VSD. Notably, ASD was thoroughly analyzed leaving no room for the analysis of several other diseases that are part of CHD. This led to the data analyzed to be insufficient to make the conclusions that were reached since the inclusion of other minor CHD complications would have had an impact on the results. The safety measures and their effectiveness on CHD inclined so much towards ASD. From the study, only the price of the measures employed was estimated. The effectiveness and safety of the procedures employed are very relevant. However, other procedures like robot-assisted surgery are still under development, hence their safety and efficacy is not yet conclusive. Furthermore, the studies conducted did not involve test subjects from diverse spatial locations, which would take care of the environmental and genetic influences that can possibly have an impact on the procedure used. Rather, the conclusions were made from single or a few studies, hence the data available could not be used to make full conclusions. The efficacy and safety of the other existing methods were overlooked. Moreover, the focus of the treatment methods on one type of CHD does not give a full picture of the efficacy and safety of the same methods on other CHD patients.

5. CONCLUSION

From the study, it was concluded that women were more prone to CHD compared to men. However, the number of CHD cases that have been reported reduce as age progresses such that the number is highest in children from the age of 0-9 years and least in people with more than 40 years old. Moreover, by the year 2015 when the study was completed, the prevalence of CHD tended to reduce. Most of CHD patients were VSD, PDA and ASD. The common type of VSD was perimembranous VSD, while the common type of ASD was ASD II. The minimum age and weight of CHD patients reduced from 2010 to 2015.

Although the proportion of ASD in women was higher than that in men, the distribution of male and female proportions was relatively similar between years. The min age of ASD patients was 5 months, while the min weight of ASD patients was 4.8 kg. The diameter of the defect in ASD surgical group was larger than the in ASD transcatheter closure group. Most common type of ASD was ASD II in both surgical and transcatheter closure groups. The cut-off points to send ASD patients to the operation were 25.5 mm (for the length of defect) and 24.5 mm (for the width of defect). If a patient had sufficient rim, the cut-off points to send ASD patients to the operation were 34.1 mm (for the length of defect) and 33.3 mm (for the width of defect). If the defect is smaller than the cut-off point, the transcatheter closure procedure should be considered to use.

Three types of devices were used for the transcatheter in Da Nang Hospital was ASO Cocoon, ASO Amplatzer and Figulla Flex II ASD. A total of 14 complications were recorded with the surgical group, while 5 cases with device closure failure during the implantation period and 2 cases with the complication of dropping device after procedure was observed in the transcatheter closure group. The inpatient time of the surgical closure group was significantly longer than that of the transcatheter closure group. In addition, the total price for a case of ASD operation was significantly higher than that for a case of transcatheter closure. For the following up ASD cases, most of ASD patients in both surgical and transcatheter closure group had good health.

Based on the results, we suggest that Vietnam should continue investing more in early diagnosis and treatment for CHD patients. Further study should be conducted to explore factors related to CHD in Vietnam. Pediatric cardiologists and doctors who conduct the transcatheter closure technique should consider using cut-off points and rim to decide to send patients to surgery or transcatheter closure. Hospital in Vietnam should update the technology and find transcatheter closure devices with reasonable prices so that more ASD patients would afford to use.

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Appendix 1: STATA scripts for statistical analysis

```
****************************************************************************
*use "File", clear
*Objective 1
*Table 1: Characteristics of CHD patients
tab year sex, col chi2
recode age (0/9.999=1 "0-9") (10/19.999=2 "10-19") (20/39.999=3
"20-39") (40/max=4 "40+"), gen(agegr)
foreach x of varlist year agegr province know_chd {
codebook `x'
tab `x'
tab `x' sex, row chi2
}

*Figure 10: Trends in numbers of CHD patients in Da Nang hospital
by sex and year
tab year
tab year if sex==1
tab year if sex==0

*Figure 11: Trends in numbers of CHD patients in Da Nang hospital
by types of CHD

tab chd
tab year chd

*Figure 12: Total numbers (percentage) of CHD patients
tab chd

*Table 3: Age and weight of CHD patients by year
tabstat age, by(year) stat(mean min max)
tabstat weight,  by(year) stat(mean min max)
```

```
*Table 4: Age and weight average of CHD patients by type of CHD
tab chd
tabstat age, by(chd) stat(mean min max)
tabstat weight,  by(chd) stat(mean min max)

*Table 5 Type of CHD patients by sex
tab chd
tab chd sex, row

****************************************************************
*************
*Objective 2
gen asd=a602
lab var asd "Atrial Septal Defect"
keep if asd==1
rename a61 intervention
label define inter 1"Surgery" 2"Transcatherter"
label values intervention inter


*Table 6: ASD patients in Da Nang Hospital by year and sex, 2010-
2015
tab year sex, col

*Tab 7: Age and weight of ASD patients in Da Nang Hospital by year,
2010-2015
tab year
tabstat age, by(year) stat(mean min max)
tabstat weight, by(year) stat(mean min max)

*Table 8: Demographic characteristics of ASD patients in surgical
and transcatheter closure groups
tab sex intervention, chi col
```

```
tab agegr intervention, chi col
tab province intervention, chi col

*Table 9: Dimension (diameter) of the ASD defects in surgical and
transcatheter closure group
*destring a25,gen(d1)

ttest length, by(intervention)
ttest  width, by(intervention)

tabstat length, by(intervention) stat(mean min max)
tabstat width, by(intervention) stat(mean min max)


*Table 10: Surgical and transcatheter closure group by type of ASD
gen asdtype=a445+a446*2+a447*3
label define asdtype 1 Primium 2 Secundum 3 Venous
label values asdtype asdtype
tab asdtype
tab asdtype intervention, row

*Table 11: Characteristics of different types of ASD patients in
surgical group
recode intervention 2=0
label define inter2 1"Surgery" 0"Transcatherter"
label values intervention inter2

tabstat age if intervention==1, by(asdtype) stat(mean sd)
tabstat height if intervention==1, by(asdtype) stat(mean sd)
tabstat weight if intervention==1, by(asdtype) stat(mean sd)
tabstat length if intervention==1, by(asdtype) stat(mean sd)
tabstat width if intervention==1, by(asdtype) stat(mean sd)
```

```
*Table 12: Characteristics of different types of ASD patients in transcatheter group
tabstat age if intervention==0, by(asdtype) stat(mean sd)
tabstat height if intervention==0, by(asdtype) stat(mean sd)
tabstat weight if intervention==0, by(asdtype) stat(mean sd)
tabstat length if intervention==0, by(asdtype) stat(mean sd)
tabstat width if intervention==0, by(asdtype) stat(mean sd)


*Prepare for figure
recode a281-a284 (0 1=0) (2=1)
gen rim=cond(a281==0&a282==0&a283==0&a284==0,0,1)
label define rimlab 0"tot" 1"yeu"
label values rim rimlab
tab rim

*Figure 13: ROC curve of the length of the defect for predicting surgical treatment of ASD
roctab intervention length, graph

*Figure 14: ROC curve of the width of the defect for predicting surgical treatment of ASD
roctab intervention width, graph


*Table 13: Cut-off point of the diameter of the defect to decide the type of treatment
*Install cutpt package
cutpt intervention length
cutpt intervention width

*Figure 15: : ROC curve of the length of the defect for ASD
*predicting surgical treatment after adjusting for rim
logistic intervention length rim
```

```
lroc
*Figure 16: ROC curve of the width of the defect for ASD
*predicting surgical treatment after adjusting for rim
logistic intervention width rim
lroc

*Table 14: Cut-off point of the diameter of the defect to decide
the type of treatment
*after adjusting for sufficient rim
logit intervention length rim
predict length_rim, pr
cutpt intervention length_rim
*cutoff logit(p)= b1x1 + b2x2 +c
*-> x1=(exp(p) - b2x2 -c)/b1 //rim= 0 and 1
di (exp(.15048368) + 5.959563 - 2.519199)/(.1349289) //estimated
based on logit model

logit intervention width rim
predict width_rim, pr
cutpt intervention width_rim
di (exp(.15623783) + 5.54411  - 2.408812)/(.1294145 ) //convert to
mm


*Table 15: Type of device using for the transcatheter closure group
gen device=a471+a476*2+a4712*3
tab device if device!=0

*Table 16: Diameter of defect among the transcatheter closure group
by type of devices
tabstat length if device!=0, by(device) stat(mean sd)
tabstat width if device!=0, by(device) stat(mean sd)
```

```
*Prepare for costing estimation
gen bed1=day_before_inter
gen bed2=a59 //intensive care
gen bed3=day_after_inter-a59 //post-operation room
gen bedall=bed1+bed2+bed3

*Table 18: Hospital days of surgical and transcatheter closure groups for ASD patients
ttest day_before_inter, by(intervention)
sum bed2 if intervention==1
ttest bed3, by(intervention)
ttest bedall, by(intervention)


*Prepare for estimate in Table 20
gen bed1vnd=195000*bed1/1000
gen bed2vnd=411000*bed2/1000
gen bed3vnd=292000*bed3/1000 if intervention==1
replace bed3vnd=195000*bed3/1000 if intervention==0
gen intervnd=50000000/1000
replace intervnd=70000000/1000 if intervention==1
gen totvnd=bed1vnd+bed2vnd+bed3vnd+intervnd

tabstat bed1vnd, by(intervention) stat(mean sd)
tabstat bed2vnd, by(intervention) stat(mean sd)
tabstat bed3vnd, by(intervention) stat(mean sd)
tabstat totvnd, by(intervention) stat(mean sd)


ttest bed1vnd, by(intervention)
ttest bed3vnd, by(intervention)
ttest totvnd, by(intervention)

sca usdrate=23.250
```

```
gen bed1usd=bed1vnd/usdrate
gen bed2usd=bed2vnd/usdrate
gen bed3usd=bed3vnd/usdrate
gen interusd=intervnd/usdrate
gen totusd=bed1usd+bed2usd+bed3usd+interusd

*Table 20: Price for using surgical or transcatheter closure methods for an ASD patient
ttest bed1usd, by(intervention)
ttest bed3usd, by(intervention)
ttest totusd, by(intervention)

*Table 21:Follow-up of surgical and transcatheter intervention group for ASD patients
keep if a631!=.
tab a632 intervention, col chi2 exact m
tab a633 intervention, col chi2 exact m
tab a636 intervention, col chi2 exact m
```

Appendix 2: List of study participants

Number	Year	ID	Age month	Age year	Sex	Job	Address	In-hospital day	Out-hospital day	Surgical / transcatheter closure day
1	10	215		1	f	0	1	7/1/2010	19/1/2010	15/1/2010
2	10	580		12	m	4	2	18/1/2010	4/2/2010	29/1/2010
3	10	597	6		m	0	2	18/1/2010	1/2/2010	25/1/2010
4	10	626	30		f	0	2	19/1/2010	8/2/2010	24/1/2010
5	10	806		4	m	0	1	25/1/2010	5/2/2010	30/1/2010
6	10	827		26	m	7	1	25/1/2010	5/2/2010	2/2/2010
7	10	915		16	f	4	13	26/1/2010	4/2/2010	30/1/2010
8	10	962		24	m	2	2	26/1/2010	22/2/2010	1/2/2010
9	10	1893	3		m	0	2	23/2/2010	9/3/2010	3/3/2010
10	10	2019	18		m	0	2	25/2/2010	19/3/2010	10/3/2010
11	10	2021		6	f	0	1	25/2/2010	9/3/2010	3/3/2010
12	10	2025		25	f	3	3	25/2/2010	12/3/2010	4/3/2010
13	10	2223		16	m	4	2	2/3/2010	15/3/2010	10/3/2010
14	10	2240		13	f	4	7	2/3/2010	12/3/2010	10/3/2010
15	10	2289		4	m	0	12	3/3/2010	19/3/2010	7/3/2010
16	10	2419		6	m	0	2	8/3/2010	31/3/2010	19/3/2010
17	10	2698		3	f	0	1	15/3/2010	30/3/2010	25/3/2010
18	10	2857	22		f	0	2	17/3/2010	30/3/2010	25/3/2010
19	10	3004	2		f	0	2	22/3/2010	5/4/2010	31/3/2010
20	10	3082		42	f	6	2	23/3/2010	12/4/2010	30/3/2010
21	10	3122	8		f	0	2	23/3/2010	6/4/2010	31/3/2010
22	10	3434	22		f	0	1	31/3/2010	20/4/2010	16/4/2010
23	10	3435	22		f	0	1	31/3/2010	20/4/2010	14/4/2010
24	10	3599	4		m	0	2	5/4/2010	20/4/2010	14/4/2010
25	10	3679		2	f	0	2	6/4/2010	22/4/2010	12/4/2010
26	10	5845		30	f	1	2	25/5/2010	13/7/2010	29/6/2010
27	10	5920		16	m	4	3	25/5/2010	8/6/2010	4/6/2010
28	10	7097		22	m	4	2	22/6/2010	9/7/2010	29/6/2010

Num ber	Year	ID	Age month	Age year	Sex	Job	Address	In-hospital day	Out-hospital day	Surgical / transcatheter closure day
29	10	7203	30		m	0	3	23/6/2010	6/7/2010	30/6/2010
30	10	7221		6	m	0	3	23/6/2010	7/7/2010	27/6/2010
31	10	7231		9	f	4	3	21/6/2010	8/7/2010	27/6/2010
32	10	7307	23		m	0	1	28/6/2010	20/7/2010	14/7/2010
33	10	7308		17	m	4	2	28/6/2010	14/7/2010	6/7/2010
34	10	7334	26		f	0	2	28/6/2010	14/7/2010	6/7/2010
35	10	7391		55	m	0	2	28/6/2010	19/7/2010	14/7/2010
36	10	7392		16	f	4	3	28/6/2010	19/7/2010	14/7/2010
37	10	7393		5	f	0	3	28/6/2010	13/7/2010	5/7/2010
38	10	7439	11		f	0	1	29/6/2010	13/7/2010	5/7/2010
39	10	7482		46	f	1	2	29/6/2010	19/7/2010	13/7/2010
40	10	7508		40	f	11	1	30/6/2010	5/8/2010	17/7/2010
41	10	7539		4	f	0	3	2/7/2010	19/7/2010	8/7/2010
42	10	7603		24	f	10	1	2/7/2010	18/7/2010	13/7/2010
43	10	7675		15	f	7	3	5/7/2010	29/7/2010	14/7/2010
44	10	7683		5	m	0	2	5/7/2010	26/7/2010	13/7/2010
45	10	7801		35	f	11	3	5/7/2010	19/7/2010	14/7/2010
46	10	7951		3	f	0	3	9/7/2010	19/7/2010	13/7/2010
47	10	7955		3	m	0	1	9/7/2010	20/7/2010	14/7/2010
48	10	8621		14	f	4	3	26/7/2010	17/8/2010	11/8/2010
49	10	8784		10	f	4	3	27/7/2010	12/8/2010	5/8/2010
50	10	8817		15	m	4	1	28/7/2010	13/8/2010	4/8/2010
51	10	8873		24	f	3	2	28/7/2010	9/8/2010	4/8/2010
52	10	8953		12	f	4	9	2/8/2010	24/8/2010	14/8/2010
53	10	10194		15	f	4	1	23/8/2010	9/9/2010	1/9/2010
54	10	10279		37	m	1	1	26/8/2010	28/9/2010	21/9/2010
55	10	10943	19		m	0	1	10/9/2010	30/9/2010	21/9/2010
56	10	11025	5		m	0	3	10/9/2010	28/9/2010	22/9/2010
57	10	11069		4	f	0	2	13/9/2010	28/9/2010	22/9/2010

Number	Year	ID	Age month	Age year	Sex	Job	Address	In-hospital day	Out-hospital day	Surgical / transcatheter closure day
58	10	11100		13	m	4	3	13/9/2010	4/10/2010	23/9/2010
59	10	11148		15	m	4	3	14/9/2010	30/9/2010	19/9/2010
60	10	11151		3	f	0	3	14/9/2010	30/9/2010	18/9/2010
61	10	11171		12	f	4	3	15/9/2010	8/10/2010	30/9/2010
62	10	11176		4	f	0	2	15/9/2010	20/10/2010	8/10/2010
63	10	12017		56	f	0	2	4/10/2010	13/10/2010	8/10/2010
64	10	12151		6	f	0	3	5/10/2010	21/10/2010	12/10/2010
65	10	12152		6	f	0	4	5/10/2010	13/10/2010	8/10/2010
66	10	12547	30		m	0	1	14/10/2010	2/12/2010	27/10/2010
67	10	12553	13		f	0	2	14/10/2010	19/11/2010	8/11/2010
68	10	12609		16	m	4	1	15/10/2010	5/11/2010	1/11/2010
69	10	12658		3	f	0	2	18/10/2010	12/11/2010	6/11/2010
70	10	12732		12	f	4	2	18/10/2010	22/11/2010	15/11/2010
71	10	12754		14	m	4	2	18/10/2010	8/11/2010	29/10/2010
72	10	12784		9	f	4	2	19/10/2010	3/11/2010	26/10/2010
73	10	12826		21	f	1	2	20/10/2010	3/12/2010	3/11/2010
74	10	12866		2	f	0	1	21/10/2010	22/11/2010	17/11/2010
75	10	12868		12	f	0	2	21/10/2010	12/11/2010	6/11/2010
76	10	12890		14	f	4	13	20/10/2010	5/11/2010	1/11/2010
77	10	12908	16		m	0	1	22/10/2010	12/11/2010	6/11/2010
78	10	12960		37	f	10	1	25/10/2010	11/11/2010	3/11/2010
79	10	12983		37	f	1	3	25/10/2010	12/11/2010	7/11/2010
80	10	13002	29		m	0	2	25/10/2010	12/11/2010	2/11/2010
81	10	13052		8	m	4	2	15/10/2010	23/12/2010	17/12/2010
82	10	13211		5	m	0	2	28/10/2010	26/11/2010	18/11/2010
83	10	13219	17		f	0	2	28/10/2010	8/12/2010	1/12/2010
84	10	13266		13	m	4	2	28/10/2010	17/11/2010	9/11/2010
85	10	13339		24	f	2	1	1/11/2010	22/11/2010	15/11/2010
86	10	13556		12	m	4	1	4/11/2010	19/11/2010	10/11/2010

Number	Year	ID	Age month	Age year	Sex	Job	Address	In-hospital day	Out-hospital day	Surgical / transcatheter closure day
87	10	13813		4	f	0	14	9/11/2010	30/11/2010	24/11/2010
88	10	13868	29		f	0	2	11/11/2010	30/11/2010	24/11/2010
89	10	14107		18	m	4	1	17/11/2010	2/12/2010	24/11/2010
90	10	14160	11		m	0	2	17/11/2010	23/12/2010	17/12/2010
91	10	14248	19		m	0	2	22/11/2010	23/12/2010	17/12/2010
92	10	14358	42		m	0	2	22/11/2010	3/12/2010	29/11/2010
93	10	14375	17		m	0	1	22/11/2010	8/12/2010	3/12/2010
94	10	14401		15	f	4	2	23/11/2010	3/12/2010	29/11/2010
95	10	14501		57	f	10	1	25/11/2010	6/12/2010	1/12/2010
96	10	14790		36	m	8	2	30/11/2010	23/12/2010	17/12/2010
97	10	14819	41		f	0	14	30/11/2010	22/12/2010	17/12/2010
98	10	14860		3	m	0	2	2/12/2010	10/12/2010	6/12/2010
99	10	14884		10	f	4	2	2/12/2010	24/12/2010	15/12/2010
100	10	14899	9		f	0	3	1/12/2010	21/12/2010	13/12/2010
101	10	14990		39	m	1	2	6/12/2010	28/12/2010	16/12/2010
102	10	15047		19	m	4	2	6/12/2010	17/12/2010	13/12/2010
103	10	15049	31		m	0	14	7/12/2010	21/12/2010	15/12/2010
104	10	15097		41	f	1	2	7/12/2010	31/12/2010	23/12/2010
105	10	15117	5		f	0	2	8/12/2010	21/12/2010	13/12/2010
106	10	15139	4		m	1	2	8/12/2010	21/12/2010	15/12/2010
107	10	15416		3	m	0	1	15/12/2010	24/12/2010	22/12/2010
108	10	15475		3	f	0	1	16/12/2010	18/1/2011	11/1/2011
109	10	15563		1	f	4	10	20/12/2010	12/1/2011	29/12/2010
110	11	69		26	f	2	2	4/1/2011	17/1/2011	10/1/2011
111	11	133	32		m	0	1	4/1/2011	18/1/2011	11/1/2011
112	11	149	16		f	0	2	5/1/2011	14/1/2011	12/1/2011
113	11	190		3	m	0	14	5/1/2011	19/1/2011	9/1/2011
114	11	192	26		m	0	1	5/1/2011	17/1/2011	10/1/2011
115	11	232	8		f	0	1	6/1/2011	21/1/2011	17/1/2011

Number	Year	ID	Age month	Age year	Sex	Job	Address	In-hospital day	Out-hospital day	Surgical / transcatheter closure day
116	11	661		4	f	0	2	17/1/2011	30/1/2011	26/1/2011
117	11	726	13		f	0	1	17/1/2011	25/1/2011	21/1/2011
118	11	2279		5	m	0	2	21/2/2011	25/3/2011	13/3/2011
119	11	2307	15		f	0	1	22/2/2011	10/3/2011	5/3/2011
120	11	2316		11	f	4	2	22/2/2011	10/3/2011	5/3/2011
121	11	2361		6	f	0	2	23/2/2011	10/3/2011	5/3/2011
122	11	2438		45	f	1	2	24/2/2011	7/3/2011	28/2/2011
123	11	2486		23	f	4	3	25/2/2011	15/3/2011	9/3/2011
124	11	2604		38	f	11	3	28/2/2011	10/3/2011	5/3/2011
125	11	2640		7	m	4	3	1/3/2011	10/3/2011	5/3/2011
126	11	2720		2	m	0	2	2/3/2011	10/3/2011	5/3/2011
127	11	2746		2	f	0	3	1/3/2011	15/3/2011	5/3/2011
128	11	2747	17		f	0	2	2/3/2011	10/3/2011	5/3/2011
129	11	2821		2	f	0	15	3/3/2011	15/3/2011	5/3/2011
130	11	2881		49	f	5	1	7/3/2011	25/3/2011	14/3/2011
131	11	2883		21	f	2	19	7/3/2011	4/4/2011	24/3/2011
132	11	2909	22		m	0	1	7/3/2011	29/3/2011	18/3/2011
133	11	2986		4	f	0	1	8/3/2011	7/4/2011	29/3/2011
134	11	2995		46	f	10	1	8/3/2011	25/3/2011	18/3/2011
135	11	3040		4	m	0	2	8/3/2011	25/3/2011	12/3/2011
136	11	3168	21		f	0	6	11/3/2011	29/3/2011	24/3/2011
137	11	3384	17		f	0	1	15/3/2011	29/3/2011	23/3/2011
138	11	3462		28	m	3	2	16/3/2011	1/4/2011	18/3/2011
139	11	3491	16		f	0	2	16/3/2011	4/4/2011	30/3/2011
140	11	3648	22		f	0	2	21/3/2011	1/4/2011	28/3/2011
141	11	3724	19		m	0	2	22/3/2011	29/3/2011	24/3/2011
142	11	3728		4	m	0	3	22/3/2011	15/4/2011	6/4/2011
143	11	3762		26	f	2	1	23/3/2011	14/4/2011	7/4/2011
144	11	4039		14	f	4	2	29/3/2011	18/4/2011	8/4/2011

Num ber	Year	ID	Age month	Age year	Sex	Job	Address	In-hospital day	Out-hospital day	Surgical / transcatheter closure day
145	11	4095		5	f	0	2	30/3/2011	19/4/2011	15/4/2011
146	11	4103		3	f	0	2	30/3/2011	13/4/2011	6/4/2011
147	11	4104		6	m	0	1	30/3/2011	14/4/2011	6/4/2011
148	11	4118		6	m	0	2	30/3/2011	13/4/2011	6/4/2011
149	11	4198	22		m	0	2	1/4/2011	4/5/2011	18/4/2011
150	11	4214		3	m	0	1	4/4/2011	27/4/2011	19/4/2011
151	11	4242		11	m	4	2	4/4/2011	19/4/2011	15/4/2011
152	11	4354		56	f	1	1	5/4/2011	19/4/2011	13/4/2011
153	11	4740		5	f	0	2	14/4/2011	9/5/2011	28/4/2011
154	11	4759	15		f	0	2	14/4/2011	26/4/2011	20/4/2011
155	11	4779	18		f	0	2	14/4/2011	26/4/2011	20/4/2011
156	11	4792		17	m	4	1	15/4/2011	5/5/2011	25/4/2011
157	11	4832	27		m	0	2	18/4/2011	9/5/2011	4/5/2011
158	11	4915	24		f	0	2	18/4/2011	5/5/2011	25/4/2011
159	11	4990		11	m	4	2	19/4/2011	27/4/2011	23/4/2011
160	11	4999		3	f	0	2	19/4/2011	4/5/2011	23/4/2011
161	11	5000		2	f	0	2	19/4/2011	6/5/2011	26/4/2011
162	11	5091	19		m	0	2	20/4/2011	27/4/2011	23/4/2011
163	11	5137	18		m	0	1	21/4/2011	13/5/2011	6/5/2011
164	11	5344		9	f	4	2	26/4/2011	9/5/2011	4/5/2011
165	11	5467		2	m	0	2	29/4/2011	15/5/2011	6/5/2011
166	11	5516		23	f	4	2	4/5/2011	24/5/2011	18/5/2011
167	11	5738	12		m	0	3	5/5/2011	23/5/2011	18/5/2011
168	11	5762	17		m	0	2	5/5/2011	23/5/2011	18/5/2011
169	11	5879	18		m	0	2	9/5/2011	23/5/2011	18/5/2011
170	11	5880		2	m	0	2	9/5/2011	25/5/2011	16/5/2011
171	11	5881	5		m	0	1	9/5/2011	23/5/2011	16/5/2011
172	11	5896		32	m	11	2	9/5/2011	23/5/2011	16/5/2011
173	11	5933	20		f	0	4	9/5/2011	25/5/2011	17/5/2011

Number	Year	ID	Age month	Age year	Sex	Job	Address	In-hospital day	Out-hospital day	Surgical / transcatheter closure day
174	11	6042		3	m	0	2	10/5/2011	23/5/2011	18/5/2011
175	11	6043	24		f	0	2	10/5/2011	14/6/2011	9/6/2011
176	11	6104		17	m	4	3	12/5/2011	30/5/2011	23/5/2011
177	11	6105		33	f	3	1	12/5/2011	28/6/2011	22/6/2011
178	11	6221	14		m	0	1	16/5/2011	22/6/2011	15/6/2011
179	11	6225		17	f	7	2	16/5/2011	8/7/2011	29/6/2011
180	11	6324	13		f	0	1	16/5/2011	16/6/2011	6/6/2011
181	11	6323	12		f	0	3	16/5/2011	16/6/2011	9/6/2011
182	11	6338	14		f	0	3	17/5/2011	21/6/2011	14/6/2011
183	11	6350		13	f	4	2	17/5/2011	31/5/2011	24/5/2011
184	11	6418		5	f	0	2	18/5/2011	14/6/2011	7/6/2011
185	11	6419		28	f	2	1	18/5/2011	1/7/2011	27/6/2011
186	11	6421		12	f	4	1	18/5/2011	21/6/2011	15/6/2011
187	11	6423		12	f	4	1	17/5/2011	10/6/2011	29/5/2011
188	11	6578		15	f	4	1	23/5/2011	10/6/2011	31/5/2011
189	11	6585		7	m	4	1	23/5/2011	21/6/2011	15/6/2011
190	11	6662		4	f	0	1	23/5/2011	10/6/2011	30/5/2011
191	11	6724		3	m	0	1	24/5/2011	8/6/2011	28/5/2011
192	11	6769		4	f	0	2	24/5/2011	8/6/2011	28/5/2011
193	11	6989		31	f	7	1	30/5/2011	16/6/2011	7/6/2011
194	11	7156	8		m	0	14	1/6/2011	16/6/2011	10/6/2011
195	11	7299		10	m	4	1	6/6/2011	17/6/2011	13/6/2011
196	11	7400		8	f	0	1	7/6/2011	21/6/2011	17/6/2011
197	11	7408		7	m	4	10	7/6/2011	26/7/2011	15/7/2011
198	11	7410		2	f	0	2	8/6/2011	17/6/2011	13/6/2011
199	11	7479	21		f	0	1	8/6/2011	21/6/2011	13/6/2011
200	11	7525		37	f	11	3	8/6/2011	12/7/2011	8/7/2011
201	11	7545	21		m	0	3	9/6/2011	21/6/2011	17/6/2011
202	11	7546		9	m	4	2	9/6/2011	12/7/2011	8/7/2011

Number	Year	ID	Age month	Age year	Sex	Job	Address	In-hospital day	Out-hospital day	Surgical / transcatheter closure day
203	11	7547		6	m	0	3	9/6/2011	17/6/2011	13/6/2011
204	11	7548	6		m	0	2	9/6/2011	23/6/2011	15/6/2011
205	11	7631	15		m	0	3	9/6/2011	23/6/2011	17/6/2011
206	11	7668		22	m	15	1	13/6/2011	29/6/2011	21/6/2011
207	11	7678		17	f	4	2	13/6/2011	1/7/2011	27/6/2011
208	11	7706		8	m	4	2	13/6/2011	19/7/2011	15/7/2011
209	11	7776		6	f	0	2	13/6/2011	26/7/2011	22/7/2011
210	11	7799		20	f	0	1	14/6/2011	12/7/2011	8/7/2011
211	11	7866		16	f	4	2	15/6/2011	12/7/2011	8/7/2011
212	11	7869		8	m	4	2	15/6/2011	29/6/2011	22/6/2011
213	11	8018	18		m	0	2	20/6/2011	5/7/2011	29/6/2011
214	11	8046	6		m	0	2	20/6/2011	5/7/2011	29/6/2011
215	11	8055		17	f	0	2	20/6/2011	5/7/2011	1/7/2011
216	11	8182		33	m	2	1	21/6/2011	5/7/2011	29/6/2011
217	11	8220	8		f	0	2	22/6/2011	1/7/2011	27/6/2011
218	11	8263		30	m	3	2	22/6/2011	1/7/2011	27/6/2011
219	11	8288		16	f	4	3	23/6/2011	5/7/2011	1/7/2011
220	11	8303		14	f	4	16	23/6/2011	1/7/2011	27/6/2011
221	11	8304		4	f	0	3	23/6/2011	13/7/2011	5/7/2011
222	11	8305		21	m	4	2	23/6/2011	6/7/2011	29/6/2011
223	11	8308		4	f	0	2	23/6/2011	5/7/2011	1/7/2011
224	11	8349		12	f	4	2	24/6/2011	15/7/2011	1/7/2011
225	11	8411		9	m	4	2	27/6/2011	12/7/2011	4/7/2011
226	11	8491	28		m	0	3	27/6/2011	15/7/2011	6/7/2011
227	11	8498		5	f	0	2	27/6/2011	11/7/2011	1/7/2011
228	11	8506		8	f	0	3	27/6/2011	12/7/2011	4/7/2011
229	11	8604		14	m	4	2	29/6/2011	12/7/2011	6/7/2011
230	11	8662	23		m	0	1	30/6/2011	7/7/2011	4/7/2011
231	11	8664		14	f	4	1	30/6/2011	29/7/2011	21/7/2011

Number	Year	ID	Age month	Age year	Sex	Job	Address	In-hospital day	Out-hospital day	Surgical / transcatheter closure day
232	11	8715		27	m	3	1	4/7/2011	15/7/2011	10/7/2011
233	11	8733		2	m	0	3	4/7/2011	3/8/2011	25/7/2011
234	11	8740		17	m	4	2	4/7/2011	19/7/2011	15/7/2011
235	11	8772		3	m	0	1	4/7/2011	26/7/2011	20/7/2011
236	11	8897		16	f	4	3	5/7/2011	15/7/2011	11/7/2011
237	11	8932		16	m	4	1	5/7/2011	21/7/2011	13/7/2011
238	11	8956	13		f	0	2	5/7/2011	1/8/2011	27/7/2011
239	11	8967		21	f	4	14	6/7/2011	15/7/2011	11/7/2011
240	11	9026		2	f	0	10	7/7/2011	22/7/2011	18/7/2011
241	11	9120		12	f	4	2	11/7/2011	29/7/2011	19/7/2011
242	11	9213		23	f	3	2	11/7/2011	26/7/2011	20/7/2011
243	11	9226		7	f	4	5	11/7/2011	26/7/2011	20/7/2011
244	11	9276	7		m	0	3	12/7/2011	22/7/2011	18/7/2011
245	11	9286		8	f	0	1	12/7/2011	1/8/2011	29/7/2011
246	11	9505		5	m	0	3	18/7/2011	1/8/2011	27/7/2011
247	11	9506		15	m	4	3	18/7/2011	9/8/2011	3/8/2011
248	11	9631		19	f	4	3	19/7/2011	9/8/2011	1/8/2011
249	11	9650		2	m	0	3	19/7/2011	11/8/2011	4/8/2011
250	11	9651		3	f	0	3	19/7/2011	2/8/2011	29/7/2011
251	11	9652		8	m	4	3	19/7/2011	1/8/2011	25/7/2011
252	11	9664		6	f	4	3	19/7/2011	1/8/2011	27/7/2011
253	11	9719		2	m	0	1	20/7/2011	19/8/2011	12/8/2011
254	11	10086		9	f	4	2	27/7/2011	12/8/2011	9/8/2011
255	11	10094	14		m	0	2	26/7/2011	11/8/2011	8/8/2011
256	11	10260		48	f	1	2	1/8/2011	11/8/2011	8/8/2011
257	11	10261		39	f	1	1	1/8/2011	16/8/2011	12/8/2011
258	11	10304	21		f	0	1	1/8/2011	15/8/2011	9/8/2011
259	11	10307		24	f	7	1	1/8/2011	17/8/2011	9/8/2011
260	11	10329		17	f	7	3	1/8/2011	11/8/2011	8/8/2011

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261	11	10414	2		f	0	1	2/8/2011	11/8/2011	8/8/2011
262	11	10415		9	f	4	3	2/8/2011	23/8/2011	19/8/2011
263	11	10478		5	f	0	1	3/8/2011	11/8/2011	8/8/2011
264	11	10494		9	m	4	1	3/8/2011	18/8/2011	15/8/2011
265	11	10495		9	f	4	1	3/8/2011	23/8/2011	16/8/2011
266	11	10506		8	m	4	1	3/8/2011	16/8/2011	12/8/2011
267	11	10521		9	m	7	2	3/8/2011	5/9/2011	23/8/2011
268	11	10537	21		f	0	16	3/8/2011	16/8/2011	8/8/2011
269	11	10690	3		m	0	1	8/8/2011	23/8/2011	17/8/2011
270	11	10703	3		m	0	3	8/8/2011	22/8/2011	15/8/2011
271	11	10807	10		f	0	3	9/8/2011	23/8/2011	17/8/2011
272	11	10846	17		m	0	1	9/8/2011	23/8/2011	18/8/2011
273	11	10854	5		f	0	1	9/8/2011	16/8/2011	12/8/2011
274	11	10880	23		f	0	2	10/8/2011	18/8/2011	15/8/2011
275	11	10906		28	f	1	10	9/9/2011	8/10/2011	27/9/2011
276	11	10953	13		f	0	2	11/8/2011	23/8/2011	19/8/2011
277	11	11038	9		f	0	2	15/8/2011	30/8/2011	24/8/2011
278	11	11070		18	f	4	2	15/8/2011	31/8/2011	24/8/2011
279	11	11167		16	f	4	10	16/8/2011	30/8/2011	24/8/2011
280	11	11255	7		m	0	12	17/8/2011	5/9/2011	29/8/2011
281	11	11256		11	f	4	10	17/8/2011	26/8/2011	22/8/2011
282	11	11287		16	m	4	2	18/8/2011	15/9/2011	6/9/2011
283	11	11323		4	m	0	2	19/8/2011	13/9/2011	31/8/2011
284	11	11355		9	m	4	1	19/8/2011	19/9/2011	5/9/2011
285	11	11361		7	f	4	3	29/8/2011	13/9/2011	7/9/2011
286	11	11475		3	m	0	10	22/8/2011	13/9/2011	7/9/2011
287	11	11517		54	m	1	2	23/8/2011	13/9/2011	7/9/2011
288	11	11519		4	m	0	2	23/8/2011	13/9/2011	8/9/2011
289	11	11545	26		f	0	1	23/8/2011	9/9/2011	5/9/2011

Num ber	Year	ID	Age month	Age year	Sex	Job	Address	In-hospital day	Out-hospital day	Surgical / transcatheter closure day
290	11	11546	22		f	0	2	23/8/2011	27/9/2011	19/9/2011
291	11	11571		3	f	0	1	24/8/2011	13/9/2011	7/9/2011
292	11	11596		4	m	0	3	25/8/2011	13/9/2011	8/9/2011
293	11	11605	17		f	0	1	25/8/2011	13/9/2011	8/9/2011
294	11	11609		6	f	4	2	25/8/2011	13/9/2011	7/9/2011
295	11	11612		7	m	4	2	25/8/2011	20/9/2011	12/9/2011
296	11	11619		12	m	4	10	25/8/2011	13/9/2011	7/9/2011
297	11	11620		3	m	0	1	25/8/2011	13/9/2011	8/9/2011
298	11	11649	42		f	0	2	20/10/2011	6/11/2011	24/10/2011
299	11	11722		27	f	7	2	29/8/2011	9/9/2011	5/9/2011
300	11	11824	24		f	0	2	20/8/2011	16/9/2011	7/9/2011
301	11	11834		17	f	4	2	30/8/2011	16/9/2011	12/9/2011
302	11	11851	31		f	0	16	30/8/2011	9/9/2011	5/9/2011
303	11	11864	51		f	0	2	31/8/2011	3/10/2011	23/9/2011
304	11	12050	35		f	0	2	5/9/2011	5/10/2011	26/9/2011
305	11	12051	35		f	0	2	5/9/2011	4/10/2011	28/9/2011
306	11	12102		11	m	4	2	5/9/2011	20/9/2011	14/9/2011
307	11	12191	17		f	0	3	6/9/2011	16/9/2011	12/9/2011
308	11	12237		7	m	4	2	7/9/2011	28/9/2011	20/9/2011
309	11	12303	66		m	0	3	9/9/2011	26/9/2011	14/9/2011
310	11	12318	32		f	0	1	8/9/2011	26/9/2011	15/9/2011
311	11	12355	2		f	0	2	7/9/2011	20/9/2011	14/9/2011
312	11	12399		5	f	0	10	9/9/2011	5/10/2011	27/9/2011
313	11	12688		33	m	0	2	13/9/2011	27/9/2011	21/9/2011
314	11	12692	14		f	0	2	15/9/2011	27/9/2011	21/9/2011
315	11	12699		5	f	0	17	15/9/2011	23/9/2011	19/9/2011
316	11	12776		17	m	4	1	19/9/2011	7/10/2011	3/10/2011
317	11	12922		14	f	4	2	19/9/2011	30/9/2011	27/9/2011
318	11	12989	40		m	0	1	21/9/2011	30/9/2011	26/9/2011

Number	Year	ID	Age month	Age year	Sex	Job	Address	In-hospital day	Out-hospital day	Surgical / transcatheter closure day
319	11	13329		17	m	7	3	26/9/2011	7/10/2011	3/10/2011
320	11	13333	21		f	0	3	27/9/2011	28/10/2011	17/10/2011
321	11	13352	17		m	0	1	28/9/2011	14/10/2011	10/10/2011
322	11	13353	12		f	0	1	28/9/2011	31/10/2011	20/10/2011
323	11	13357		7	m	4	1	28/9/2011	11/10/2011	5/10/2011
324	11	13411		14	m	4	6	29/9/2011	11/10/2011	5/10/2011
325	11	13430	38		m	0	1	28/9/2011	11/10/2011	5/10/2011
326	11	13541	14		f	0	1	3/10/2011	18/10/2011	10/10/2011
327	11	13654		23	f	10	1	4/10/2011	20/10/2011	17/10/2011
328	11	13781	18		m	0	3	6/10/2011	13/11/2011	19/10/2011
329	11	13893	10		f	0	1	10/10/2011	28/10/2011	21/10/2011
330	11	13992	56		f	0	2	10/10/2011	28/10/2011	17/10/2011
331	11	14077	23		f	0	2	12/10/2011	25/10/2011	21/10/2011
332	11	14137		19	m	4	2	13/10/2011	28/11/2011	21/10/2011
333	11	14394	13		f	0	3	19/10/2011	28/10/2011	24/10/2011
334	11	14414		13	f	4	2	19/10/2011	8/12/2011	28/11/2011
335	11	14477	12		f	0	3	20/10/2011	28/10/2011	24/10/2011
336	11	14744		40	f	1	2	26/10/2011	11/11/2011	7/11/2011
337	11	14914	18		m	0	1	31/10/2011	7/12/2011	14/11/2011
338	11	15071		13	m	4	1	2/11/2011	18/11/2011	8/11/2011
339	11	15104		14	f	4	1	2/11/2011	11/11/2011	7/11/2011
340	11	15320		6	f	0	2	7/11/2011	25/11/2011	14/11/2011
341	11	15362	17		f	0	2	7/11/2011	25/11/2011	16/11/2011
342	11	15539		3	f	0	1	16/11/2011	29/11/2011	23/11/2011
343	11	15554	4		f	0	2	14/11/2011	29/11/2011	23/11/2011
344	11	15726	27		f	0	2	16/11/2011	29/11/2011	23/11/2011
345	11	15733		4	m	0	1	16/11/2011	2/12/2011	22/11/2011
346	11	16061	2		f	0	2	21/11/2011	30/11/2011	23/11/2011
347	11	16140		12	f	0	3	24/11/2011	6/12/2011	30/11/2011

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348	11	16141	17		f	0	3	24/11/2011	6/12/2011	28/11/2011
349	11	16202		17	f	4	2	23/11/2011	9/12/2011	5/12/2011
350	11	16502		28	f	2	1	2/12/2011	27/12/2011	13/12/2011
351	11	16666		18	f	4	1	5/12/2011	20/12/2011	14/12/2011
352	11	16686		6	m	0	1	6/12/2011	20/12/2011	12/12/2011
353	11	16711		28	f	1	2	6/12/2011	20/12/2011	12/12/2011
354	11	16809		4	f	0	14	7/12/2011	22/12/2011	16/12/2011
355	11	16829		21	m	7	2	8/12/2011	20/12/2011	14/12/2011
356	11	17010	11		f	0	2	12/12/2011	27/12/2011	21/12/2011
357	11	17035	16		m	0	1	13/12/2011	3/1/2012	19/12/2011
358	11	17072		4	f	0	12	12/12/2011	22/12/2011	19/12/2011
359	11	17073		21	f	4	4	12/12/2011	27/12/2011	21/12/2011
360	11	17075		47	f	1	2	13/12/2011	27/12/2011	19/12/2011
361	11	17144	22		f	0	6	14/12/2011	22/12/2011	16/12/2011
362	11	17252		9	m	4	18	19/12/2011	30/12/2011	26/12/2011
363	11	17257		11	f	4	2	19/12/2011	9/1/2012	27/12/2011
364	11	17326	14		m	0	1	19/12/2011	30/12/2011	26/12/2011
365	11	17362	16		m	0	1	19/12/2011	13/1/2012	4/1/2012
366	11	17542		6	f	0	2	23/12/2011	10/1/2012	30/12/2011
367	11	17564		7	m	4	3	26/12/2011	16/1/2012	30/12/2011
368	11	17614	9		f	0	1	25/12/2011	11/1/2012	6/1/2012
369	11	17615		12	f	4	6	20/12/2011	9/1/2012	4/1/2012
370	11	17617	15		m	0	2	26/12/2011	9/1/2012	4/1/2012
371	11	17768		8	f	4	2	28/12/2011	17/1/2012	10/1/2012
372	12	708	11		f	0	2	19/1/2012	30/1/2012	20/1/2012
373	12	1250		19	m	4	1	31/1/2012	10/2/2012	6/2/2012
374	12	1328	4		m	0	1	2/2/2012	21/2/2012	13/2/2012
375	12	1546	12		f	0	6	7/2/2012	2/3/2012	22/2/2012
376	12	1684	12		m	0	6	9/2/2012	10/3/2012	22/2/2012

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377	12	1751		31	f	0	2	9/2/2012	21/2/2012	15/2/2012
378	12	1774	24		m	0	2	13/2/2012	29/2/2012	21/2/2012
379	12	1805	6		f	0	1	13/2/2012	27/2/2012	20/2/2012
380	12	1930	10		f	0	3	13/2/2012	1/3/2012	20/2/2012
381	12	1937	26		f	0	1	14/2/2012	1/3/2012	23/2/2012
382	12	2007		15	m	4	2	15/2/2012	28/2/2012	24/2/2012
383	12	2008	6		m	0	1	15/2/2012	28/2/2012	24/2/2012
384	12	2060	5		f	0	1	15/2/2012	27/2/2012	22/2/2012
385	12	2071	2		m	0	1	16/2/2012	27/2/2012	20/2/2012
386	12	2103	13		f	0	2	15/2/2012	28/2/2012	22/2/2012
387	12	2104		4	f	0	2	15/2/2012	27/2/2012	23/2/2012
388	12	2212		5	m	0	2	20/2/2012	6/3/2012	29/2/2012
389	12	2329	9		f	0	2	21/2/2012	2/3/2012	21/2/2012
390	12	2330		6	m	0	6	20/2/2012	6/3/2012	2/3/2012
391	12	2331		21	m	4	1	21/2/2012	2/3/2012	27/2/2012
392	12	2438	2		m	0	2	23/2/2012	6/3/2012	29/2/2012
393	12	2516	8		f	0	2	27/2/2012	3/4/2012	29/3/2012
394	12	2526		27	m	0	2	27/2/2012	6/4/2012	1/4/2012
395	12	2530	7		m	0	2	27/2/2012	3/4/2012	29/3/2012
396	12	2532	11		m	0	2	27/2/2012	3/4/2012	29/3/2012
397	12	2813	9		f	0	1	2/3/2012	3/4/2012	30/3/2012
398	12	2877		10	m	4	6	5/3/2012	23/3/2012	13/3/2012
399	12	2948	19		m	0	6	3/3/2012	23/3/2012	14/3/2012
400	12	3031		41	f	5	2	6/3/2012	4/4/2012	30/3/2012
401	12	3070	8		m	0	2	7/3/2012	6/4/2012	3/4/2012
402	12	3145		30	f	4	9	8/3/2012	10/4/2012	3/4/2012
403	12	3172		52	f	1	2	9/3/2012	4/4/2012	1/4/2012
404	12	3238	32		f	0	1	12/3/2012	3/4/2012	30/3/2012
405	12	3237	6		f	0	1	12/3/2012	3/4/2012	29/3/2012

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406	12	3362	16		f	0	11	12/3/2012	3/4/2012	29/3/2012
407	12	3447	26		m	0	2	14/3/2012	9/4/2012	3/4/2012
408	12	3539	3		m	0	2	15/3/2012	3/4/2012	30/3/2012
409	12	3553		4	m	0	2	19/3/2012	3/4/2012	30/3/2012
410	12	3676	33		f	0	2	19/3/2012	9/4/2012	4/4/2012
411	12	3677	13		m	0	2	19/3/2012	9/4/2012	4/4/2012
412	12	3682	30		m	0	1	19/3/2012	3/4/2012	30/3/2012
413	12	3967		3	f	0	3	26/3/2012	9/4/2012	3/4/2012
414	12	3968		2	m	0	3	26/3/2012	10/4/2012	4/4/2012
415	12	3971	12		f	0	1	26/3/2012	3/4/2012	30/3/2012
416	12	3972	21		f	0	3	26/3/2012	9/4/2012	4/4/2012
417	12	3973		19	f	4	3	26/3/2012	11/4/2012	31/3/2012
418	12	3976		45	f	1	2	26/3/2012	16/4/2012	9/4/2012
419	12	4041	36		m	0	1	27/3/2012	19/4/2012	11/4/2012
420	12	4057		3	f	0	1	27/3/2012	21/4/2012	10/4/2012
421	12	4060	15		m	0	2	27/3/2012	9/4/2012	4/4/2012
422	12	4066	6		f	0	1	27/3/2012	3/4/2012	30/3/2012
423	12	4083	4		f	0	9	26/3/2012	3/4/2012	29/3/2012
424	12	4311	9		m	0	1	3/4/2012	16/4/2012	9/4/2012
425	12	4447	5		m	0	1	4/4/2012	20/4/2012	9/4/2012
426	12	4460	44		f	0	2	4/4/2012	16/4/2012	9/4/2012
427	12	4580	7		f	0	2	12/4/2012	25/4/2012	20/4/2012
428	12	4579	4		f	0	4	6/4/2012	20/4/2012	16/4/2012
429	12	4580	13		f	0	1	7/4/2012	23/4/2012	18/4/2012
430	12	4626	33		f	0	3	9/4/2012	23/4/2012	18/4/2012
431	12	4676	3		m	0	2	9/4/2012	23/4/2012	18/4/2012
432	12	4697	5		m	0	1	9/4/2012	20/4/2012	16/4/2012
433	12	4742		5	m	0	2	10/4/2012	27/4/2012	19/4/2012
434	12	4748	5		f	0	2	10/4/2012	23/4/2012	18/4/2012

Num ber	Year	ID	Age month	Age year	Sex	Job	Address	In-hospital day	Out-hospital day	Surgical / transcatheter closure day
435	12	4848	9		f	0	2	11/4/2012	23/4/2012	18/4/2012
436	12	4849	6		f	0	2	11/4/2012	20/4/2012	16/4/2012
437	12	4853	5		m	0	2	20/4/2012	8/5/2012	2/5/2012
438	12	4875		6	f	0	1	12/4/2012	23/4/2012	18/4/2012
439	12	4905	4		f	0	9	12/4/2012	25/4/2012	20/4/2012
440	12	4948	12		f	0	2	12/4/2012	2/5/2012	23/4/2012
441	12	4994		19	f	4	2	16/4/2012	15/5/2012	8/5/2012
442	12	4995	8		m	0	1	16/4/2012	2/5/2012	23/4/2012
443	12	5105	6		f	0	10	17/4/2012	13/6/2012	24/4/2012
444	12	5108	6		f	0	1	17/4/2012	2/5/2012	24/4/2012
445	12	5149		5	m	0	2	18/4/2012	3/5/2012	24/4/2012
446	12	5152		8	f	4	10	16/4/2012	2/5/2012	23/4/2012
447	12	5153		8	f	0	10	17/4/2012	2/5/2012	23/4/2012
448	12	5154	26		f	0	10	17/4/2012	2/5/2012	24/4/2012
449	12	5155	8		f	0	2	18/4/2012	8/5/2012	2/5/2012
450	12	5176	14		f	0	10	18/4/2012	8/5/2012	2/5/2012
451	12	5181	2		m	0	1	18/4/2012	3/5/2012	19/4/2012
452	12	5380	6		f	0	2	23/4/2012	15/5/2012	7/5/2012
453	12	5481	6		f	0	1	24/4/2012	8/5/2012	2/5/2012
454	12	5534	9		f	0	10	24/4/2012	10/5/2012	2/5/2012
455	12	5547	4		f	0	12	28/4/2012	10/5/2012	2/5/2012
456	12	5548	15		m	0	10	25/4/2012	10/5/2012	4/5/2012
457	12	5640	4		m	0	2	2/5/2012	15/5/2012	9/5/2012
458	12	5669		22	f	9	2	2/5/2012	15/5/2012	9/5/2012
459	12	5943		3	f	0	6	3/5/2012	21/6/2012	24/5/2012
460	12	5977	8		f	0	2	7/5/2012	21/5/2012	18/5/2012
461	12	5999		11	m	4	6	7/5/2012	5/6/2012	29/5/2012
462	12	6168	2		m	0	11	7/5/2012	28/5/2012	14/5/2012
463	12	6189		3	m	0	6	9/5/2012	23/5/2012	15/5/2012

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464	12	6235	10		m	0	1	9/5/2012	18/5/2012	14/5/2012
465	12	6273	9		f	0	10	10/5/2012	22/5/2012	18/5/2012
466	12	6384		13	f	4	10	14/5/2012	29/5/2012	21/5/2012
467	12	6395	9		f	0	1	14/5/2012	5/6/2012	25/5/2012
468	12	6503	3		f	0	1	14/5/2012	29/5/2012	23/5/2012
469	12	6508	3		f	0	2	15/5/2012	8/6/2012	21/5/2012
470	12	6547		15	f	4	10	15/5/2012	2/6/2012	23/5/2012
471	12	6548		14	m	4	10	15/5/2012	29/5/2012	22/5/2012
472	12	6582	9		m	0	2	16/5/2012	29/5/2012	25/5/2012
473	12	6659	6		m	0	1	17/5/2012	29/5/2012	23/5/2012
474	12	6709		9	m	4	10	18/5/2012	5/6/2012	1/6/2012
475	12	6737	8		f	0	3	21/5/2012	25/6/2012	30/5/2012
476	12	6750		41	f	1	2	21/5/2012	26/6/2012	11/6/2012
477	12	6819	18		f	0	3	21/5/2012	4/6/2012	1/6/2012
478	12	6876	11		f	0	3	22/5/2012	5/6/2012	28/5/2012
479	12	6893	8		f	0	2	22/5/2012	4/6/2012	30/5/2012
480	12	6895		48	m	1	1	22/5/2012	4/7/2012	26/6/2012
481	12	6945	17		m	0	10	23/5/2012	4/6/2012	30/5/2012
482	12	7105	6		m	0	1	28/5/2012	8/6/2012	4/6/2012
483	12	7128		27	m	9	2	28/5/2012	12/6/2012	8/6/2012
484	12	7130	18		f	0	2	28/5/2012	18/6/2012	11/6/2012
485	12	7177	5		m	0	3	28/5/2012	18/6/2012	13/6/2012
486	12	7244	16		f	0	2	29/5/2012	19/6/2012	13/6/2012
487	12	7288		9	f	4	3	29/5/2012	8/6/2012	4/6/2012
488	12	7298		18	m	4	6	30/5/2012	22/6/2012	14/6/2012
489	12	7323	19		f	0	9	29/5/2012	22/6/2012	15/6/2012
490	12	7330		22	f	3	2	30/5/2012	19/6/2012	15/6/2012
491	12	7362		5	m	0	3	28/5/2012	8/6/2012	4/6/2012
492	12	7378		13	f	4	2	31/5/2012	18/6/2012	15/6/2012

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493	12	7379		24	f	4	2	31/5/2012	17/7/2012	11/7/2012
494	12	7402		4	f	0	3	31/5/2012	18/6/2012	11/6/2012
495	12	7509	7		f	0	2	4/6/2012	26/6/2012	20/6/2012
496	12	7575	5		m	0	3	4/6/2012	2/7/2012	25/6/2012
497	12	7589		61	f	1	3	5/6/2012	9/7/2012	28/6/2012
498	12	7643	5		m	0	2	4/6/2012	2/7/2012	25/6/2012
499	12	7646		23	f	2	2	4/6/2012	22/6/2012	13/6/2012
500	12	7758	20		f	0	3	7/6/2012	20/7/2012	26/6/2012
501	12	7778	7		f	0	2	6/6/2012	26/6/2012	20/6/2012
502	12	7784		14	m	0	2	7/6/2012	4/7/2012	27/6/2012
503	12	7795		13	m	4	2	8/6/2012	2/8/2012	4/7/2012
504	12	7796	37		m	0	2	8/6/2012	22/6/2012	18/6/2012
505	12	7836	30		f	0	3	11/6/2012	2/7/2012	25/6/2012
506	12	8184		13	m	4	10	15/6/2012	2/7/2012	25/6/2012
507	12	8263	13		m	0	1	18/6/2012	2/7/2012	25/6/2012
508	12	8305		27	f	3	1	18/6/2012	16/7/2012	5/7/2012
509	12	8398	8		f	0	2	18/6/2012	2/7/2012	25/6/2012
510	12	8500	4		f	0	10	19/6/2012	2/7/2012	25/6/2012
511	12	8632	5		f	0	2	25/6/2012	17/7/2012	11/7/2012
512	12	8634	12		m	0	1	25/6/2012	9/7/2012	4/7/2012
513	12	8755		5	f	0	2	26/6/2012	17/7/2012	10/7/2012
514	12	8776	23		f	0	10	26/6/2012	17/7/2012	11/7/2012
515	12	8966	7		m	0	3	2/7/2012	17/7/2012	11/7/2012
516	12	9142		10	f	7	1	3/7/2012	21/7/2012	12/7/2012
517	12	9143		4	m	0	10	2/7/2012	17/7/2012	11/7/2012
518	12	9162		3	m	0	2	3/7/2012	25/7/2012	17/7/2012
519	12	9172	30		f	0	2	3/7/2012	19/7/2012	13/7/2012
520	12	9220		32	f	2	1	4/7/2012	19/7/2012	13/7/2012
521	12	9295	7		m	0	2	5/7/2012	20/7/2012	18/7/2012

Num ber	Year	ID	Age month	Age year	Sex	Job	Address	In-hospital day	Out-hospital day	Surgical / transcatheter closure day
522	12	9375	16		f	0	1	6/7/2012	27/7/2012	18/7/2012
523	12	9428	5		f	0	2	6/7/2012	12/8/2012	23/7/2012
524	12	9429		8	m	4	10	6/7/2012	31/7/2012	25/7/2012
525	12	9437		35	f	1	2	9/7/2012	26/7/2012	18/7/2012
526	12	9443	9		m	0	2	9/7/2012	3/8/2012	18/7/2012
527	12	9925		4	m	0	14	16/7/2012	7/8/2012	27/7/2012
528	12	9999		11	m	4	14	16/7/2012	9/8/2012	31/7/2012
529	12	10058		20	f	4	2	17/7/2012	2/8/2012	25/7/2012
530	12	10059	10		f	0	1	17/7/2012	3/8/2012	27/7/2012
531	12	10126		6	m	0	3	18/7/2012	2/8/2012	27/7/2012
532	12	10137	20		m	0	1	18/7/2012	16/8/2012	4/8/2012
533	12	10220		6	m	0	14	19/7/2012	2/8/2012	25/7/2012
534	12	10237		48	f	1	2	19/7/2012	7/8/2012	1/8/2012
535	12	10388	17		m	0	3	23/7/2012	7/8/2012	1/8/2012
536	12	10389		12	f	4	3	23/7/2012	17/8/2012	10/8/2012
537	12	10397	10		m	0	4	23/7/2012	9/8/2012	6/8/2012
538	12	10399		46	f	7	1	23/7/2012	10/8/2012	1/8/2012
539	12	10551		13	f	4	3	23/7/2012	7/8/2012	30/7/2012
540	12	10556	8		f	1	3	24/7/2012	3/8/2012	30/7/2012
541	12	10557	20		f	0	2	29/7/2012	9/8/2012	6/8/2012
542	12	10607	9		f	0	2	25/7/2012	16/8/2012	8/8/2012
543	12	10667		27	f	1	3	26/7/2012	14/8/2012	6/8/2012
544	12	10671		56	f	0	9	25/7/2012	10/8/2012	27/7/2012
545	12	10687		55	m	1	2	26/7/2012	14/8/2012	2/8/2012
546	12	10787	7		m	0	1	30/7/2012	6/9/2012	29/8/2012
547	12	10960		15	f	4	1	31/7/2012	16/8/2012	5/8/2012
548	12	10978		1	m	0	1	31/7/2012	28/8/2012	22/8/2012
549	12	11047		10	f	4	1	1/8/2012	28/8/2012	22/8/2012
550	12	11127	19		f	0	1	2/8/2012	24/8/2012	20/8/2012

Number	Year	ID	Age month	Age year	Sex	Job	Address	In-hospital day	Out-hospital day	Surgical / transcatheter closure day
551	12	11189		6	f	0	2	1/8/2012	21/8/2012	15/8/2012
552	12	11527		8	f	4	1	10/8/2012	24/8/2012	20/8/2012
553	12	11794	7		m	0	2	13/8/2012	28/8/2012	22/8/2012
554	12	12065	11		m	0	2	16/8/2012	4/9/2012	29/8/2012
555	12	12081		6	m	0	1	16/8/2012	4/9/2012	27/8/2012
556	12	12263	6		f	0	2	20/8/2012	4/9/2012	29/8/2012
557	12	12616	10		f	0	2	27/8/2012	14/9/2012	5/9/2012
558	12	12650	17		m	0	1	27/8/2012	14/9/2012	5/9/2012
559	12	13087		14	f	4	2	4/9/2012	21/9/2012	17/9/2012
560	12	13114	9		m	0	3	3/9/2012	1/10/2012	26/9/2012
561	12	13115	14		f	0	3	3/9/2012	1/10/2012	24/9/2012
562	12	13120	10		m	0	2	1/9/2012	21/9/2012	17/9/2012
563	12	13265		7	m	4	2	5/9/2012	18/9/2012	12/9/2012
564	12	13278	38		f	0	3	5/9/2012	18/9/2012	12/9/2012
565	12	13345		7	m	4	3	5/9/2012	27/9/2012	17/9/2012
566	12	13362		3	f	0	6	6/9/2012	22/10/2012	22/9/2012
567	12	13397	12		m	0	1	7/9/2012	28/9/2012	24/9/2012
568	12	13432	17		f	0	3	10/9/2012	5/10/2012	27/9/2012
569	12	13649		3	f	0	3	12/9/2012	25/9/2012	19/9/2012
570	12	13698	28		f	0	2	12/9/2012	27/9/2012	19/9/2012
571	12	13848	30		m	0	2	14/9/2012	2/10/2012	21/9/2012
572	12	13943		21	m	15	2	17/9/2012	16/10/2012	2/10/2012
573	12	14026		21	f	2	2	17/9/2012	1/10/2012	24/9/2012
574	12	14490	18		m	0	1	26/9/2012	12/10/2012	3/10/2012
575	12	14607		52	f	1	2	28/9/2012	25/10/2012	8/10/2012
576	12	14848		40	f	1	2	2/10/2012	23/10/2012	10/10/2012
577	12	14906		4	m	0	2	2/10/2012	17/10/2012	5/10/2012
578	12	14987	4		f	0	1	2/10/2012	16/10/2012	10/10/2012
579	12	15139	48		m	0	2	8/10/2012	23/10/2012	15/10/2012

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580	12	15261		9	m	4	3	8/10/2012	23/10/2012	17/10/2012
581	12	15387		3	m	0	3	10/10/2012	20/11/2012	15/10/2012
582	12	15681	11		f	0	1	16/10/2012	6/11/2012	29/10/2012
583	12	16133	13		f	0	2	23/10/2012	20/11/2012	7/11/2012
584	12	16187	16		m	0	3	23/10/2012	20/11/2012	5/11/2012
585	12	16194		17	m	4	3	24/10/2012	6/11/2012	29/10/2012
586	12	16237	16		m	0	2	24/10/2012	6/11/2012	31/10/2012
587	12	16280	12		f	0	2	24/10/2012	5/11/2012	1/11/2012
588	12	16296		20	m	4	2	25/10/2012	15/11/2012	6/11/2012
589	12	16411	11		f	0	2	29/10/2012	13/11/2012	7/11/2012
590	12	16575	18		f	0	2	30/10/2012	13/11/2012	7/11/2012
591	12	16581		12	m	4	2	30/10/2012	15/11/2012	5/11/2012
592	12	16643	31		f	0	2	31/10/2012	13/11/2012	5/11/2012
593	12	16676	10		m	0	3	21/10/2012	13/11/2012	5/11/2012
594	12	16740		25	f	0	2	1/11/2012	20/11/2012	14/11/2012
595	12	16823		18	m	4	3	5/11/2012	20/11/2012	12/11/2012
596	12	16888	14		m	0	2	5/11/2012	20/11/2012	12/11/2012
597	12	17010	11		m	0	1	6/11/2012	20/11/2012	14/11/2012
598	12	17154	37		f	0	1	8/11/2012	20/11/2012	12/11/2012
599	12	17284	9		f	0	3	10/11/2012	6/12/2012	21/11/2012
600	12	17522		6	m	0	3	14/11/2012	7/12/2012	20/11/2012
601	12	17582		34	f	1	3	15/11/2012	6/12/2012	19/11/2012
602	12	17646	20		f	0	3	16/11/2012	6/12/2012	21/11/2012
603	12	17683		12	m	4	3	19/11/2012	6/12/2012	26/11/2012
604	12	17741	47		m	0	1	19/11/2012	6/12/2012	26/11/2012
605	12	17856		9	m	0	3	20/11/2012	6/12/2012	26/11/2012
606	12	17905		5	m	0	3	21/11/2012	13/12/2012	26/11/2012
607	12	17910		5	f	0	2	21/11/2012	13/12/2012	7/12/2012
608	12	18031		9	f	4	3	23/11/2012	13/12/2012	3/12/2012

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609	12	18124		43	f	1	2	26/11/2012	18/12/2012	12/12/2012
610	12	18339		25	f	2	2	27/11/2012	11/12/2012	3/12/2012
611	12	18372		11	m	4	2	28/11/2012	13/12/2012	6/12/2012
612	12	18580	10		m	0	2	3/12/2012	13/12/2012	7/12/2012
613	12	18721	13		f	0	2	4/12/2012	18/12/2012	10/12/2012
614	12	18774		16	m	4	2	1/12/2012	26/12/2012	17/12/2012
615	12	18776		12	f	4	2	5/12/2012	17/12/2012	10/12/2012
616	12	18836	15		m	0	1	5/12/2012	18/12/2012	11/12/2012
617	12	18917	20		f	0	2	7/12/2012	3/1/2013	24/12/2012
618	12	19039	2		f	0	1	10/12/2012	25/12/2012	19/12/2012
619	12	19443	16		m	0	1	17/12/2012	4/1/2013	25/12/2012
620	12	19445	12		f	0	2	17/12/2012	4/1/2013	26/12/2012
621	12	19450	13		f	0	2	17/12/2012	11/1/2013	3/1/2013
622	12	19492	15		m	0	2	17/12/2012	5/1/2013	26/12/2012
623	12	19634	12		f	0	2	19/12/2012	8/1/2013	2/1/2013
624	12	19695	17		f	0	1	20/12/2012	3/1/2013	26/12/2012
625	12	19969		41	m	7	1	25/12/2012	16/1/2013	2/1/2013
626	13	2	12		f	0	2	2/1/2013	15/1/2013	7/1/2013
627	13	3		10	m	7	2	3/1/2013	18/1/2013	9/1/2013
628	13	5	35		f	0	2	3/1/2013	15/1/2013	7/1/2013
629	13	8		9	f	4	10	7/1/2013	19/1/2013	11/1/2013
630	13	11	19		m	0	1	8/1/2013	29/1/2013	18/1/2013
631	13	12	5		f	0	2	9/1/2013	24/1/2013	14/1/2013
632	13	18	13		f	0	1	17/1/2013	6/2/2013	28/1/2013
633	13	19		45	f	0	3	17/1/2013	29/1/2013	23/1/2013
634	13	22		3	f	0	2	22/1/2013	8/2/2013	29/1/2013
635	13	28	11		m	0	3	26/1/2013	19/2/2013	6/2/2013
636	13	31	5		f	0	1	30/1/2013	7/2/2013	1/2/2013
637	13	44	7		f	0	1	21/2/2013	15/3/2013	7/3/2013

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638	13	45		20	f	4	1	21/2/2013	20/3/2013	12/3/2013
639	13	47	13		m	0	2	23/2/2013	12/3/2013	4/3/2013
640	13	51		4	f	0	2	28/2/2013	21/3/2013	14/3/2013
641	13	52	28		f	0	2	1/3/2013	25/3/2013	15/3/2013
642	13	53	1		f	0	2	1/3/2013	29/3/2013	13/3/2013
643	13	55		5	m	0	2	1/3/2013	12/3/2013	6/3/2013
644	13	58		47	f	7	2	5/3/2013	5/4/2013	28/3/2013
645	13	62	5		m	0	1	5/3/2013	19/3/2013	11/3/2013
646	13	63		26	m	1	2	7/3/2013	19/3/2013	11/3/2013
647	13	64		22	m	7	2	7/3/2013	27/3/2013	19/3/2013
648	13	67		21	f	0	1	11/3/2013	26/3/2013	18/3/2013
649	13	68		12	f	4	2	11/3/2013	29/3/2013	21/3/2013
650	13	69	30		f	0	2	11/3/2013	2/4/2013	27/3/2013
651	13	71	16		f	0	2	11/3/2013	6/4/2013	25/3/2013
652	13	75	20		f	0	3	13/3/2013	3/4/2013	27/3/2013
653	13	76		43	f	2	1	13/3/2013	26/3/2013	20/3/2013
654	13	77	4		m	0	1	13/3/2013	2/4/2013	27/3/2013
655	13	79	16		f	0	2	15/3/2013	2/4/2013	25/3/2013
656	13	80		42	m	7	3	19/3/2013	2/4/2013	25/3/2013
657	13	83		7	f	4	2	19/3/2013	3/4/2013	26/3/2013
658	13	87	13		f	0	1	22/3/2013	2/4/2013	28/3/2013
659	13	90	13		f	0	3	26/3/2013	2/4/2013	29/3/2013
660	13	93	13		m	0	3	26/3/2013	24/4/2013	16/4/2013
661	13	95	4		m	0	2	27/3/2013	16/4/2013	10/4/2013
662	13	98	5		m	0	2	28/3/2013	5/4/2013	29/3/2013
663	13	99		61	m	7	1	28/3/2013	4/4/2013	29/3/2013
664	13	102	13		m	0	1	1/4/2013	18/4/2013	11/4/2013
665	13	103		33	f	10	1	1/4/2013	14/5/2013	18/4/2013
666	13	104	7		f	0	3	1/4/2013	18/4/2013	8/4/2013

Num ber	Year	ID	Age month	Age year	Sex	Job	Address	In-hospital day	Out-hospital day	Surgical / transcatheter closure day
667	13	105		14	f	4	3	1/4/2013	16/4/2013	8/4/2013
668	13	110	24		f	0	2	8/4/2013	25/4/2013	17/4/2013
669	13	111		56	f	1	2	8/4/2013	23/4/2013	15/4/2013
670	13	113	18		m	0	2	8/4/2013	25/4/2013	18/4/2013
671	13	114	18		m	0	2	9/4/2013	26/4/2013	15/4/2013
672	13	119		48	f	1	2	16/4/2013	26/4/2013	22/4/2013
673	13	121	17		m	0	1	16/4/2013	4/5/2013	24/4/2013
674	13	123		1	m	0	1	17/4/2013	2/5/2013	24/4/2013
675	13	124		2	m	0	1	17/4/2013	19/5/2013	25/4/2013
676	13	126	22		m	0	2	17/4/2013	2/5/2013	26/4/2013
677	13	127	27		f	0	1	18/4/2013	9/5/2013	3/5/2013
678	13	128	34		f	0	4	17/4/2013	3/5/2013	24/4/2013
679	13	131	18		f	0	2	23/4/2013	14/5/2013	6/5/2013
680	13	134		55	f	0	1	2/5/2013	14/5/2013	8/5/2013
681	13	137		36	f	2	1	3/5/2013	23/5/2013	13/5/2013
682	13	144		6	f	0	1	8/5/2013	23/5/2013	15/5/2013
683	13	149		2	f	0	1	13/5/2013	6/6/2013	28/5/2013
684	13	150		40	f	0	1	13/5/2013	19/6/2013	12/6/2013
685	13	151	1		f	0	1	13/5/2013	23/5/2013	17/5/2013
686	13	156		5	f	0	2	14/5/2013	29/5/2013	24/5/2013
687	13	157	4		f	0	2	15/5/2013	11/6/2013	31/5/2013
688	13	158	18		m	0	2	15/5/2013	11/6/2013	31/5/2013
689	13	163		5	f	0	4	14/5/2013	27/5/2013	22/5/2013
690	13	166		43	f	7	2	24/5/2013	11/6/2013	3/6/2013
691	13	162		5	f	0	4	15/5/2013	4/6/2013	24/5/2013
692	13	169		1	f	0	2	28/5/2013	11/6/2013	3/6/2013
693	13	173		24	f	6	9	31/5/2013	18/6/2013	10/6/2013
694	13	175		21	f	1	3	3/6/2013	24/6/2013	19/6/2013
695	13	176	11		m	0	3	3/6/2013	18/6/2013	10/6/2013

Number	Year	ID	Age month	Age year	Sex	Job	Address	In-hospital day	Out-hospital day	Surgical / transcatheter closure day
696	13	177	9		m	0	3	3/6/2013	27/6/2013	21/6/2013
697	13	178		8	f	0	1	3/6/2013	18/6/2013	10/6/2013
698	13	179	25		f	0	3	3/6/2013	20/6/2013	14/6/2013
699	13	181		2	f	0	3	4/6/2013	28/6/2013	21/6/2013
700	13	182		12	m	4	3	4/6/2013	18/6/2013	12/6/2013
701	13	183		4	m	0	3	1/6/2013	21/6/2013	12/6/2013
702	13	184		12	f	4	3	4/6/2013	20/6/2013	14/6/2013
703	13	185		18	m	4	3	4/6/2013	20/6/2013	12/6/2013
704	13	186	12		f	0	3	4/6/2013	5/7/2013	28/6/2013
705	13	187	18		m	0	3	6/6/2013	28/6/2013	24/6/2013
706	13	190		12	f	4	2	3/6/2013	13/6/2013	7/6/2013
707	13	191	7		f	0	2	6/6/2013	2/7/2013	24/6/2013
708	13	192	20		f	0	2	7/6/2013	2/7/2013	26/6/2013
709	13	193		2	f	0	1	10/6/2013	21/6/2013	17/6/2013
710	13	196		23	f	10	2	10/6/2013	28/6/2013	24/6/2013
711	13	197	2		f	0	1	10/6/2013	25/6/2013	10/6/2013
712	13	200		30	f	6	2	11/6/2013	21/6/2013	17/6/2013
713	13	203	24		m	0	2	11/6/2013	1/7/2013	19/6/2013
714	13	206	2		m	0	2	13/6/2013	20/6/2013	17/6/2013
715	13	207	6		m	0	1	17/6/2013	5/7/2013	26/6/2013
716	13	209		1	f	0	2	17/6/2013	2/7/2013	28/6/2013
717	13	212	31		f	0	1	18/6/2013	10/7/2013	3/7/2013
718	13	213		4	m	0	1	19/6/2013	9/7/2013	1/7/2013
719	13	216		7	m	4	2	20/6/2013	15/7/2013	8/7/2013
720	13	218		23	f	4	2	21/6/2013	9/7/2013	3/7/2013
721	13	219	11		m	0	2	24/6/2013	9/7/2013	3/7/2013
722	13	221		45	m	13	1	25/6/2013	5/7/2013	1/7/2013
723	13	222		24	m	2	2	25/6/2013	5/7/2013	1/7/2013
724	13	223		8	m	4	2	26/6/2013	5/7/2013	1/7/2013

Num ber	Year	ID	Age month	Age year	Sex	Job	Address	In-hospital day	Out-hospital day	Surgical / transcatheter closure day
725	13	225	21		f	0	1	27/6/2013	9/7/2013	3/7/2013
726	13	230	26		m	0	2	1/7/2013	18/7/2013	12/7/2013
727	13	231		7	f	0	1	1/7/2013	16/7/2013	10/7/2013
728	13	233		19	m	2	1	3/7/2013	23/7/2013	16/7/2013
729	13	234		8	f	4	2	3/7/2013	16/7/2013	10/7/2013
730	13	236		18	f	7	3	3/7/2013	30/7/2013	18/7/2013
731	13	238		18	m	4	3	3/7/2013	19/7/2013	15/7/2013
732	13	240	25		m	0	3	5/7/2013	23/7/2013	17/7/2013
733	13	243	33		f	0	3	8/7/2013	23/7/2013	18/7/2013
734	13	244		39	f	5	1	9/7/2013	30/7/2013	22/7/2013
735	13	245		41	f	7	1	9/7/2013	19/7/2013	15/7/2013
736	13	246		1	f	0	1	9/7/2013	16/8/2013	31/7/2013
737	13	247	14		f	0	2	9/7/2013	26/7/2013	19/7/2013
738	13	248	8		f	0	2	9/7/2013	30/7/2013	22/7/2013
739	13	249	6		f	0	1	9/7/2013	25/7/2013	15/7/2013
740	13	250	5		f	0	3	9/7/2013	23/7/2013	17/7/2013
741	13	252	21		m	0	4	9/7/2013	19/7/2013	15/7/2013
742	13	255	22		m	0	2	11/7/2013	25/7/2013	17/7/2013
743	13	259		9	m	4	2	12/7/2013	2/8/2013	29/7/2013
744	13	260	5		f	0	1	15/7/2013	30/7/2013	22/7/2013
745	13	261	14		f	0	1	15/7/2013	31/7/2013	23/7/2013
746	13	263	46		m	0	1	15/7/2013	30/7/2013	26/7/2013
747	13	267	10		m	0	3	17/7/2013	2/8/2013	24/7/2013
748	13	268	39		m	0	3	11/7/2013	12/8/2013	2/8/2013
749	13	269	67		f	0	3	17/7/2013	6/8/2013	2/8/2013
750	13	278		17	f	4	2	22/7/2013	6/8/2013	30/7/2013
751	13	279		32	f	6	1	22/7/2013	5/8/2013	29/7/2013
752	13	280	7		f	0	2	23/7/2013	9/8/2013	2/8/2013
753	13	282	7		f	0	1	23/7/2013	7/8/2013	2/8/2013

Number	Year	ID	Age month	Age year	Sex	Job	Address	In-hospital day	Out-hospital day	Surgical / transcatheter closure day
754	13	289	22		f	0	2	26/7/2013	19/8/2013	14/8/2013
755	13	291	47		m	0	1	29/7/2013	19/8/2013	14/8/2013
756	13	292		25	f	1	1	29/7/2013	13/8/2013	9/8/2013
757	13	295	12		m	0	2	30/7/2013	20/8/2013	12/8/2013
758	13	296		29	f	1	2	31/7/2013	20/9/2013	14/8/2013
759	13	297		37	f	6	1	3/7/2013	20/8/2013	14/8/2013
760	13	298		10	m	0	3	17/7/2013	5/8/2013	31/7/2013
761	13	301		3	f	0	4	31/7/2013	21/8/2013	5/8/2013
762	13	302		25	f	7	1	31/7/2013	13/8/2013	7/8/2013
763	13	303	23		f	0	2	5/8/2013	20/8/2013	15/8/2013
764	13	305	20		m	0	2	5/8/2013	20/8/2013	15/8/2013
765	13	310	24		m	0	2	6/8/2013	27/8/2013	19/8/2013
766	13	311		58	f	5	2	7/8/2013	26/8/2013	21/8/2013
767	13	313	13		m	0	3	7/8/2013	20/8/2013	15/8/2013
768	13	319	17		m	0	2	12/8/2013	26/8/2013	21/8/2013
769	13	325		8	f	4	2	14/8/2013	26/8/2013	19/8/2013
770	13	327	9		f	0	2	14/8/2013	29/8/2013	23/8/2013
771	13	330	3		m	0	1	14/8/2013	4/9/2013	14/8/2013
772	13	333	6		f	0	1	15/8/2013	4/9/2013	27/8/2013
773	13	335		4	f	0	2	20/8/2013	3/9/2013	27/8/2013
774	13	340	15		m	0	2	26/8/2013	10/9/2013	3/9/2013
775	13	341		18	f	4	2	26/8/2013	9/9/2013	3/9/2013
776	13	342		21	f	4	2	26/8/2013	12/9/2013	3/9/2013
777	13	344		49	m	7	1	27/8/2013	10/9/2013	3/9/2013
778	13	347	11		f	0	1	27/8/2013	13/9/2013	9/9/2013
779	13	351	3		m	0	1	27/8/2013	21/9/2013	27/8/2013
780	13	357		9	f	4	1	4/9/2013	17/9/2013	10/9/2013
781	13	358	9		f	0	1	7/9/2013	16/9/2013	9/9/2013
782	13	359		8	m	4	2	3/9/2013	26/9/2013	19/9/2013

Number	Year	ID	Age month	Age year	Sex	Job	Address	In-hospital day	Out-hospital day	Surgical / transcatheter closure day
783	13	360	8		f	0	2	4/9/2013	24/9/2013	13/9/2013
784	13	361	13		f	0	1	4/9/2013	23/9/2013	13/9/2013
785	13	362		16	f	4	1	4/9/2013	18/9/2013	11/9/2013
786	13	363		38	m	1	3	5/9/2013	19/9/2013	12/9/2013
787	13	364	21		m	0	1	1/9/2013	20/9/2013	13/9/2013
788	13	371	5		m	0	3	9/9/2013	23/9/2013	17/9/2013
789	13	373	25		m	0	1	10/9/2013	17/9/2013	16/9/2013
790	13	378	40		f	0	3	11/9/2013	24/9/2013	19/9/2013
791	13	379	55		f	0	3	11/9/2013	27/9/2013	16/9/2013
792	13	380		23	f	3	1	11/9/2013	23/9/2013	16/9/2013
793	13	382	55		m	0	3	11/9/2013	24/9/2013	19/9/2013
794	13	393		45	f	5	1	17/9/2013	30/9/2013	25/9/2013
795	13	396	50		m	0	2	20/9/2013	29/10/2013	23/10/2013
796	13	397	18		f	0	2	20/9/2013	5/11/2013	30/10/2013
797	13	398	15		m	0	2	23/9/2013	24/10/2013	14/10/2013
798	13	399	38		f	0	1	23/9/2013	10/10/2013	4/10/2013
799	13	401	14		m	0	2	24/9/2013	25/10/2013	21/10/2013
800	13	403	45		m	0	1	15/9/2013	7/10/2013	2/10/2013
801	13	407	32		f	0	2	26/9/2013	17/10/2013	8/10/2013
802	13	412	22		f	0	3	27/9/2013	28/10/2013	14/10/2013
803	13	413	12		f	0	3	27/9/2013	30/10/2013	22/10/2013
804	13	414		15	m	0	3	30/9/2013	14/10/2013	9/10/2013
805	13	416	22		m	0	3	1/10/2013	25/10/2013	17/10/2013
806	13	417	26		f	0	2	1/10/2013	21/10/2013	14/10/2013
807	13	420	9		m	0	3	1/10/2013	20/10/2013	17/10/2013
808	13	421	20		f	0	3	1/10/2013	11/11/2013	28/10/2013
809	13	422	13		m	0	1	2/10/2013	22/10/2013	17/10/2013
810	13	426	7		f	0	1	4/10/2013	30/10/2013	25/10/2013
811	13	427		52	f	12	1	7/10/2013	28/10/2013	23/10/2013

Number	Year	ID	Age month	Age year	Sex	Job	Address	In-hospital day	Out-hospital day	Surgical / transcatheter closure day
812	13	428	17		f	0	1	7/10/2013	29/10/2013	21/10/2013
813	13	431	17		m	0	2	9/10/2013	29/10/2013	18/10/2013
814	13	435	38		f	0	5	9/10/2013	25/10/2013	21/10/2013
815	13	439	34		f	0	2	14/10/2013	1/11/2013	28/10/2013
816	13	440	5		f	0	1	14/10/2013	24/10/2013	19/10/2013
817	13	447		61	m	7	2	18/10/2013	31/10/2013	22/10/2013
818	13	452	23		f	0	2	22/10/2013	1/11/2013	28/10/2013
819	13	453		39	f	1	2	22/10/2013	4/11/2013	30/10/2013
820	13	455	26		m	0	1	23/10/2013	4/11/2013	30/10/2013
821	13	458	11		m	0	2	24/10/2013	27/11/2013	21/11/2013
822	13	460	19		f	0	2	24/10/2013	27/11/2013	22/11/2013
823	13	463	60		m	0	1	25/10/2013	8/11/2013	31/10/2013
824	13	468	19		f	0	1	28/10/2013	27/11/2013	21/11/2013
825	13	469	23		f	0	1	29/10/2013	18/11/2013	11/11/2013
826	13	473	12		m	0	1	30/10/2013	14/11/2013	7/11/2013
827	13	474		60	m	7	1	30/10/2013	29/11/2013	18/11/2013
828	13	476		7	f	4	2	30/10/2013	26/11/2013	19/11/2013
829	13	483		25	f	5	2	5/11/2013	18/11/2013	13/11/2013
830	13	487	9		f	0	3	6/11/2013	27/11/2013	22/11/2013
831	13	491		35	f	1	4	11/11/2013	22/1/2014	6/1/2014
832	13	493		23	f	5	2	11/11/2013	29/11/2013	18/11/2013
833	13	495		12	f	14	1	11/11/2013	2/12/2013	25/11/2013
834	13	498	13		f	0	2	12/11/2013	22/11/2013	15/11/2013
835	13	500	66		f	0	2	12/11/2013	19/11/2013	18/11/2013
836	13	505		26	m	7	1	13/11/2013	29/11/2013	21/11/2013
837	13	506	35		m	0	2	13/11/2013	26/11/2013	20/11/2013
838	13	508	25		m	0	4	13/11/2013	4/12/2013	19/11/2013
839	13	509	12		m	0	2	14/10/2013	3/12/2013	20/11/2013
840	13	510	21		m	0	2	14/11/2013	14/1/2014	6/1/2014

Number	Year	ID	Age month	Age year	Sex	Job	Address	In-hospital day	Out-hospital day	Surgical / transcatheter closure day
841	13	523	27		m	0	4	20/11/2013	14/1/2014	3/1/2014
842	13	524	11		m	0	2	20/11/2013	6/12/2013	28/11/2013
843	13	525	9		f	0	2	21/11/2013	25/12/2013	18/12/2013
844	13	529	9		f	0	1	28/11/2013	23/12/2013	16/12/2013
845	13	532		51	f	7	1	29/11/2013	23/12/2013	16/12/2013
846	13	536		53	f	1	2	2/12/2013	6/1/2014	31/12/2013
847	13	537		26	f	2	1	2/12/2013	23/12/2013	16/12/2013
848	13	544	12		f	0	1	9/12/2013	25/12/2013	18/12/2013
849	13	546	12		f	0	2	10/12/2013	30/12/2013	17/12/2013
850	13	551	28		f	0	1	11/12/2013	22/12/2013	16/12/2013
851	13	552	32		f	0	2	12/12/2013	23/1/2014	15/1/2014
852	13	555	48		m	0	1	12/12/2013	14/1/2014	3/1/2014
853	13	557	23		m	0	2	16/12/2013	15/1/2014	3/1/2014
854	13	561	11		m	0	1	18/12/2013	20/1/2014	13/1/2014
855	13	562		23	f	1	2	18/12/2013	3/1/2014	26/12/2013
856	13	563	24		f	0	2	19/12/2013	20/1/2014	13/1/2014
857	13	569	12		m	0	1	24/12/2013	7/1/2014	30/12/2013
858	14	2	9		f	0	1	2/1/2014	20/1/2014	15/1/2014
859	14	6	14		m	0	2	7/1/2014	1/2/2014	8/1/2014
860	14	8		11	m	4	1	13/1/2014	22/1/2014	16/1/2014
861	14	10		24	f	3	1	14/1/2014	25/1/2014	21/1/2014
862	14	19	4		m	0	2	25/1/2014	7/2/2014	25/1/2014
863	14	20	7		f	0	2	6/2/2014	17/2/2014	10/2/2014
864	14	24	13		f	0	3	10/2/2014	27/2/2014	20/2/2014
865	14	28	8		m	0	1	13/2/2014	5/3/2014	25/2/2014
866	14	29		35	f	2	2	14/2/2014	24/2/2014	19/2/2014
867	14	32	37		f	0	2	17/2/2014	5/3/2014	24/2/2014
868	14	33		11	f	0	2	17/2/2014	26/2/2014	21/2/2014
869	14	37		10	m	4	2	18/2/2014	27/2/2014	22/2/2014

Number	Year	ID	Age month	Age year	Sex	Job	Address	In-hospital day	Out-hospital day	Surgical / transcatheter closure day
870	14	39		7	f	4	2	18/2/2014	5/3/2014	24/2/2014
871	14	40	3		f	0	2	19/2/2014	18/3/2014	13/3/2014
872	14	41	62		f	0	2	19/2/2014	27/2/2014	22/2/2014
873	14	42	34		f	0	2	19/2/2014	13/3/2014	13/3/2014
874	14	43		15	m	4	2	19/2/2014	26/2/2014	21/2/2014
875	14	44	29		m	0	2	19/2/2014	18/3/2014	10/3/2014
876	14	48	38		f	0	2	20/2/2014	3/3/2014	24/2/2014
877	14	49	9		f	0	2	20/2/2014	17/3/2014	7/3/2014
878	14	50	33		m	0	2	21/2/2014	24/3/2014	19/3/2014
879	14	52	45		f	0	2	21/2/2014	28/3/2014	21/3/2014
880	14	53	9		m	0	2	21/2/2014	18/3/2014	10/3/2014
881	14	54		9	m	4	2	21/2/2014	23/4/2014	17/3/2014
882	14	55		14	f	4	2	21/2/2014	26/3/2014	17/3/2014
883	14	56	58		m	0	2	20/2/2014	12/3/2014	5/3/2014
884	14	57		16	m	0	2	24/2/2014	19/3/2014	14/3/2014
885	14	58	11		f	0	1	26/2/2014	19/3/2014	14/3/2014
886	14	59		39	f	8	2	26/2/2014	10/3/2014	3/3/2014
887	14	60	30		f	0	1	26/2/2014	17/3/2014	10/3/2014
888	14	62	10		m	0	2	3/3/2014	17/3/2014	4/3/2014
889	14	64	45		m	0	2	6/3/2014	5/5/2014	28/4/2014
890	14	66		9	f	0	2	6/3/2014	14/4/2014	7/4/2014
891	14	71	18		m	0	2	10/3/2014	31/3/2014	19/3/2014
892	14	73		38	m	1	2	11/3/2014	8/4/2014	31/3/2014
893	14	75	11		m	0	2	12/3/2014	14/4/2014	18/3/2014
894	14	76		26	f	2	2	12/3/2014	7/4/2014	31/3/2014
895	14	78		36	f	7	2	11/3/2014	27/3/2014	19/3/2014
896	14	79	10		m	0	2	14/3/2014	4/4/2014	26/3/2014
897	14	82		57	m	1	2	17/3/2014	31/3/2014	24/3/2014
898	14	86	40		f	0	10	18/3/2014	10/4/2014	4/4/2014

Number	Year	ID	Age month	Age year	Sex	Job	Address	In-hospital day	Out-hospital day	Surgical / transcatheter closure day
899	14	87	16		m	0	1	20/3/2014	8/4/2014	1/4/2014
900	14	88	18		f	0	3	20/3/2014	14/4/2014	7/4/2014
901	14	93	14		m	0	1	25/3/2014	8/4/2014	8/4/2014
902	14	94	17		f	0	2	25/3/2014	10/4/2014	4/4/2014
903	14	96	14		f	0	2	26/3/2014	14/4/2014	3/4/2014
904	14	99	4		m	0	1	28/3/2014	14/4/2014	8/4/2014
905	14	100	7		f	0	1	31/3/2014	14/4/2014	2/4/2014
906	14	103	10		f	0	1	1/4/2014	26/4/2014	18/4/2014
907	14	106	9		f	0	1	1/4/2014	16/4/2014	4/4/2014
908	14	112	28		m	0	1	3/4/2014	25/4/2014	17/4/2014
909	14	113		56	f	0	2	3/4/2014	24/4/2014	16/4/2014
910	14	115	5		m	0	1	4/4/2014	5/5/2014	29/4/2014
911	14	120	4		m	0	2	8/4/2014	29/4/2014	24/4/2014
912	14	127		23	m	1	3	16/4/2014	29/4/2014	24/4/2014
913	14	131	8		f	0	2	22/4/2014	6/5/2014	29/4/2014
914	14	134	32		m	0	1	24/4/2014	19/5/2014	12/5/2014
915	14	135	31		f	0	2	25/4/2014	12/5/2014	6/5/2014
916	14	138		6	f	0	2	28/4/2014	29/5/2014	24/5/2014
917	14	141	6		f	0	1	28/4/2014	23/5/2014	5/5/2014
918	14	144		32	f	9	2	6/5/2014	19/5/2014	12/5/2014
919	14	146	5		m	0	2	6/5/2014	23/6/2014	13/6/2014
920	14	147		47	f	1	2	6/5/2014	16/6/2014	11/6/2014
921	14	149		6	f	0	1	19/5/2014	10/6/2014	5/6/2014
922	14	153	12		f	0	3	12/5/2014	2/6/2014	23/5/2014
923	14	155		21	f	0	1	12/5/2014	30/5/2014	24/5/2014
924	14	157		55	f	1	2	13/5/2014	4/6/2014	30/5/2014
925	14	159		2	m	0	2	13/5/2014	28/5/2014	20/5/2014
926	14	160	44		f	0	2	14/5/2014	12/6/2014	6/6/2014
927	14	162		56	f	7	1	14/5/2014	2/6/2014	28/5/2014

Number	Year	ID	Age month	Age year	Sex	Job	Address	In-hospital day	Out-hospital day	Surgical / transcatheter closure day
928	14	168	32		m	0	2	20/5/2014	4/6/2014	26/5/2014
929	14	173	68		f	0	3	26/5/2014	10/6/2014	5/6/2014
930	14	174		16	f	4	1	26/5/2014	16/6/2014	9/6/2014
931	14	177	56		m	0	1	27/5/2014	23/6/2014	17/6/2014
932	14	186	33		m	0	2	5/6/2014	18/6/2014	13/6/2014
933	14	187	13		m	0	2	5/6/2014	20/6/2014	13/6/2014
934	14	192		24	f	7	3	10/6/2014	30/6/2014	17/6/2014
935	14	193		10	f	4	1	11/6/2014	30/6/2014	18/6/2014
936	14	198		2	f	0	3	12/6/2014	7/7/2014	2/7/2014
937	14	199		9	f	4	3	12/6/2014	2/7/2014	26/6/2014
938	14	201	36		f	0	3	12/6/2014	1/7/2014	27/6/2014
939	14	203		5	m	0	2	12/6/2014	30/6/2014	23/6/2014
940	14	204		10	f	4	3	12/6/2014	30/6/2014	24/6/2014
941	14	205		17	m	4	3	12/6/2014	4/7/2014	24/6/2014
942	14	207		9	m	4	3	12/6/2014	7/7/2014	25/6/2014
943	14	208		41	f	6	2	13/6/2014	9/7/2014	1/7/2014
944	14	213		16	f	4	2	17/6/2014	14/7/2014	8/7/2014
945	14	215		11	f	4	2	18/6/2014	7/7/2014	30/6/2014
946	14	216	7		f	0	2	17/6/2014	8/7/2014	23/6/2014
947	14	217		17	m	0	3	19/6/2014	7/7/2014	30/6/2014
948	14	219		10	f	4	1	20/6/2014	16/7/2014	8/7/2014
949	14	226		31	f	6	1	30/6/2014	21/7/2014	11/7/2014
950	14	228		12	f	4	1	2/7/2014	14/7/2014	8/7/2014
951	14	230	12		m	0	1	2/7/2014	17/7/2014	9/7/2014
952	14	232		2	m	0	1	2/7/2014	16/7/2014	11/7/2014
953	14	235	52		f	0	3	4/7/2014	21/7/2014	14/7/2014
954	14	236	33		m	0	3	4/7/2014	21/7/2014	14/7/2014
955	14	240	8		f	0	3	4/7/2014	21/7/2014	16/7/2014
956	14	241	31		f	0	3	4/7/2014	22/7/2014	17/7/2014

Number	Year	ID	Age month	Age year	Sex	Job	Address	In-hospital day	Out-hospital day	Surgical / transcatheter closure day
957	14	242	16		m	0	3	4/7/2014	23/7/2014	15/7/2014
958	14	248		12	m	0	2	8/7/2014	13/8/2014	5/8/2014
959	14	249		34	f	1	3	8/7/2014	24/7/2014	16/7/2014
960	14	253		9	f	4	3	8/7/2014	21/7/2014	15/7/2014
961	14	254		10	f	4	3	8/7/2014	22/7/2014	17/7/2014
962	14	256		13	m	0	1	8/7/2014	21/7/2014	14/7/2014
963	14	261		14	f	4	2	9/7/2014	23/7/2014	17/7/2014
964	14	266		26	m	2	1	14/7/2014	27/7/2014	17/7/2014
965	14	267	15		m	0	3	16/7/2014	4/8/2014	24/7/2014
966	14	272	24		f	0	2	16/7/2014	22/8/2014	25/7/2014
967	14	273		6	f	0	1	16/7/2014	6/8/2014	29/7/2014
968	14	276		15	m	4	1	17/7/2014	11/8/2014	4/8/2014
969	14	279	3		m	0	2	17/7/2014	6/8/2014	24/7/2014
970	14	281		72	f	1	2	21/7/2014	11/8/2014	6/8/2014
971	14	285		46	f	1	2	24/7/2014	13/8/2014	8/8/2014
972	14	288		9	f	4	2	29/7/2014	11/8/2014	6/8/2014
973	14	291	14		m	0	1	30/7/2014	15/8/2014	8/8/2014
974	14	295	11		f	0	1	5/8/2014	20/8/2014	11/8/2014
975	14	296		30	f	6	1	5/8/2014	13/8/2014	8/8/2014
976	14	298		18	m	4	2	5/8/2014	22/8/2014	14/8/2014
977	14	302	26		f	0	2	11/8/2014	3/9/2014	25/8/2014
978	14	306	15		m	0	1	12/8/2014	11/9/2014	25/8/2014
979	14	309		3	f	0	3	15/8/2014	29/8/2014	25/8/2014
980	14	315		22	m	2	1	21/8/2014	10/9/2014	5/9/2014
981	14	318	15		m	0	1	22/8/2014	16/9/2014	4/9/2014
982	14	322	38		f	0	2	26/8/2014	8/9/2014	3/9/2014
983	14	326	2		f	0	1	27/8/2014	8/9/2014	3/9/2014
984	14	328	1		m	0	1	28/8/2014	3/10/2014	23/9/2014
985	14	331	7		m	0	1	29/8/2014	29/9/2014	11/9/2014

Num ber	Year	ID	Age month	Age year	Sex	Job	Address	In-hospital day	Out-hospital day	Surgical / transcatheter closure day
986	14	336	25		f	0	2	3/9/2014	17/9/2014	8/9/2014
987	14	338	3		m	0	2	4/9/2014	1/10/2014	23/9/2014
988	14	339		2	f	0	1	4/9/2014	16/9/2014	10/9/2014
989	14	342	27		m	0	2	5/9/2014	16/10/2014	7/10/2014
990	14	343		12	m	4	2	5/9/2014	29/9/2014	24/9/2014
991	14	345		9	m	7	2	8/9/2014	6/10/2014	26/9/2014
992	14	349		12	f	4	2	8/9/2014	22/9/2014	17/9/2014
993	14	352		7	m	4	2	9/9/2014	22/9/2014	16/9/2014
994	14	356		8	f	4	2	10/9/2014	25/9/2014	18/9/2014
995	14	357		15	f	4	2	10/9/2014	22/9/2014	17/9/2014
996	14	359		24	m	0	2	11/9/2014	16/10/2014	9/10/2014
997	14	362	16		m	0	2	15/9/2014	8/10/2014	22/9/2014
998	14	363	9		m	0	1	5/9/2014	6/10/2014	26/9/2014
999	14	370	23		f	0	8	7/9/2014	29/9/2014	23/9/2014
1000	14	373	13		m	4	2	22/9/2014	6/10/2014	1/10/2014
1001	14	374	6		m	0	3	22/9/2014	20/10/2014	10/10/2014
1002	14	376	12		m	0	2	23/9/2014	17/10/2014	8/10/2014
1003	14	378	17		f	0	2	23/9/2014	13/10/2014	1/10/2014
1004	14	383	4		f	0	1	25/9/2014	29/10/2014	12/10/2014
1005	14	385	7		f	4	1	26/9/2014	19/10/2014	6/10/2014
1006	14	387	12		f	0	2	30/9/2014	20/10/2014	9/10/2014
1007	14	390		5	f	0	3	1/10/2014	22/10/2014	16/10/2014
1008	14	392		1	f	0	3	1/10/2014	13/10/2014	6/10/2014
1009	14	394	12		m	0	2	1/10/2014	22/10/2014	17/10/2014
1010	14	395	40		f	0	3	1/10/2014	28/10/2014	23/10/2014
1011	14	397		9	f	4	3	1/10/2014	14/10/2014	8/10/2014
1012	14	398		8	m	4	3	1/10/2014	13/10/2014	7/10/2014
1013	14	400		67	f	1	2	2/10/2014	27/10/2014	22/10/2014
1014	14	401		8	f	4	3	2/10/2014	20/10/2014	13/10/2014

Number	Year	ID	Age month	Age year	Sex	Job	Address	In-hospital day	Out-hospital day	Surgical / transcatheter closure day
1015	14	402		1	m	0	2	2/10/2014	24/10/2014	17/10/2014
1016	14	403	9		f	0	1	3/10/2014	15/10/2014	7/10/2014
1017	14	408	2		f	0	2	6/10/2014	28/10/2014	23/10/2014
1018	14	416		38	f	7	2	9/10/2014	11/12/2014	23/10/2014
1019	14	417		8	f	4	7	9/10/2014	20/10/2014	14/10/2014
1020	14	424		19	f	2	2	14/10/2014	7/11/2014	28/10/2014
1021	14	427		30	f	5	1	20/10/2014	7/11/2014	31/10/2014
1022	14	433	10		f	0	2	23/10/2014	12/11/2014	31/10/2014
1023	14	436		5	f	0	1	27/10/2014	24/11/2014	12/11/2014
1024	14	437		16	f	0	1	17/10/2014	10/11/2014	4/11/2014
1025	14	438		10	f	0	2	27/10/2014	12/11/2014	7/11/2014
1026	14	439	8		f	0	3	29/10/2014	12/11/2014	4/11/2014
1027	14	442	3		m	0	1	30/10/2014	3/12/2014	28/11/2014
1028	14	445		21	f	5	1	4/11/2014	12/12/2014	3/12/2014
1029	14	446	11		m	0	1	5/11/2014	1/12/2014	26/11/2014
1030	14	447	30		m	0	1	10/11/2014	1/12/2014	25/11/2014
1031	14	453		16	m	4	1	17/11/2014	5/12/2014	28/11/2014
1032	14	456		59	f	0	2	18/11/2014	8/12/2014	1/12/2014
1033	14	459	41		m	0	1	20/11/2014	8/12/2014	1/12/2014
1034	14	459	4		m	0	2	19/11/2014	12/12/2014	1/12/2014
1035	14	460	5		f	0	2	24/11/2014	10/12/2014	4/12/2014
1036	14	463		41	f	0	1	27/11/2014	15/12/2014	8/12/2014
1037	14	468		19	f	7	1	3/12/2014	31/12/2014	25/12/2014
1038	14	470	26		m	0	2	4/12/2014	1/2/2015	27/1/2015
1039	14	472		9	f	4	2	4/12/2014	12/2/2015	27/1/2015
1040	14	475	9		m	0	1	4/12/2014	23/12/2014	7/12/2014
1041	14	474	9		f	0	2	5/12/2014	5/1/2015	27/12/2014
1042	14	476	5		f	0	2	5/12/2014	21/12/2014	17/12/2014
1043	14	477		8	m	4	2	5/12/2014	23/12/2014	18/12/2014

Num ber	Year	ID	Age month	Age year	Sex	Job	Address	In-hospital day	Out-hospital day	Surgical / transcatheter closure day
1044	14	478	20		f	0	2	5/12/2014	24/12/2014	9/12/2014
1045	14	479		3	f	0	2	5/12/2014	24/12/2014	19/12/2014
1046	14	480		6	m	0	2	5/12/2014	30/12/2014	25/12/2014
1047	14	481	68		m	0	2	8/12/2014	13/1/2015	8/1/2015
1048	14	482	6		f	0	2	8/12/2014	27/1/2015	22/1/2015
1049	14	483		17	f	4	2	8/12/2014	16/1/2015	9/1/2015
1050	14	485	6		m	0	2	8/12/2014	23/12/2014	18/12/2014
1051	14	486		2	F	0	2	8/12/2014	12/1/2015	5/1/2015
1052	14	487	26		m	0	2	8/12/2014	27/12/2014	19/12/2014
1053	14	490		6	f	4	2	9/12/2014	27/12/2014	22/12/2014
1054	14	491		8	m	4	2	9/12/2014	29/12/2014	24/12/2014
1055	14	493	65		m	0	4	10/12/2014	5/1/2015	26/12/2014
1056	14	494	18		f	0	2	11/12/2014	19/1/2015	7/1/2015
1057	14	495	9		f	0	1	11/12/2014	22/12/2014	16/12/2014
1058	14	497	15		m	0	1	12/12/2014	29/12/2014	17/12/2014
1059	14	499	4		f	0	2	11/12/2014	13/1/2015	8/1/2015
1060	14	502	59		f	0	3	16/12/2014	19/1/2015	12/1/2015
1061	14	510		1	f	0	1	27/12/2014	12/1/2015	5/1/2015
1062	15	2	3		m	0	2	5/1/2015	28/1/2015	20/1/2015
1063	15	3		49	f	0	1	5/1/2015	9/2/2015	14/1/2015
1064	15	5	3		f	0	2	6/1/2015	5/2/2015	22/1/2015
1065	15	6	20		m	0	2	5/1/2015	26/1/2015	20/1/2015
1066	15	10	1		m	0	2	5/1/2015	6/1/2015	5/1/2015
1067	15	11	2		f	0	1	7/1/2015	26/1/2015	20/1/2015
1068	15	25		1	f	0	2	29/1/2015	9/2/2015	3/2/2015
1069	15	33		48	f	0	1	5/2/2015	12/2/2015	6/2/2015
1070	15	42	4		m	0	1	26/2/2015	20/3/2015	4/3/2015
1071	15	43		43	f	1	2	26/2/2015	10/3/2015	3/3/2015
1072	15	45		2	f	0	1	3/3/2015	30/3/2015	10/3/2015

Number	Year	ID	Age month	Age year	Sex	Job	Address	In-hospital day	Out-hospital day	Surgical / transcatheter closure day
1073	15	46	12		m	0	1	4/3/2015	26/3/2015	11/3/2015
1074	15	54	7		m	0	1	10/3/2015	23/3/2015	18/3/2015
1075	15	55		17	f	4	2	11/3/2015	24/3/2015	17/3/2015
1076	15	56	11		f	0	3	12/3/2015	31/3/2015	19/3/2015
1077	15	58	4		m	0	1	12/3/2015	10/4/2015	31/3/2015
1078	15	60	4		m	0	2	12/3/2015	6/4/2015	19/3/2015
1079	15	61	4		m	0	2	12/3/2015	6/4/2015	30/3/2015
1080	15	62		25	f	2	2	16/3/2015	13/4/2015	30/3/2015
1081	15	68	5		m	0	2	16/3/2015	22/5/2015	24/4/2015
1082	15	71		12	m	4	2	18/3/2015	27/3/2015	23/3/2015
1083	15	76	8		m	0	1	18/3/2015	23/4/2015	6/4/2015
1084	15	80	15		f	0	1	20/3/2015	8/4/2015	25/3/2015
1085	15	82	12		f	0	3	23/3/2015	13/4/2015	8/4/2015
1086	15	91	19		m	0	2	26/3/2015	23/4/2015	8/4/2015
1087	15	95		17	f	0	1	31/3/2015	28/4/2015	20/4/2015
1088	15	96		7	f	4	2	2/4/2014	13/4/2014	8/4/2014
1089	15	97	28		f	0	2	2/4/2015	17/4/2015	9/4/2015
1090	15	98		1	m	0	1	6/4/2015	20/4/2015	13/4/2015
1091	15	99	62		m	0	1	6/4/2015	23/4/2015	15/4/2015
1092	15	101	40		m	0	1	6/4/2015	19/5/2015	12/5/2015
1093	15	104	8		f	0	2	6/4/2015	21/4/2015	16/4/2015
1094	15	105	7		f	0	2	7/4/2015	21/4/2015	16/4/2015
1095	15	106	10		m	0	1	7/4/2015	4/5/2015	21/4/2015
1096	15	109	3		m	0	2	10/4/2015	21/4/2015	15/4/2015
1097	15	119	45		f	0	2	14/4/2015	27/4/2015	20/4/2015
1098	15	120		52	f	1	2	14/4/2015	27/4/2015	21/4/2015
1099	15	123	12		m	0	2	16/4/2015	11/5/2015	5/5/2015
1100	15	133	5		f	0	2	27/4/2015	20/5/2015	27/4/2015
1101	15	137	9		f	0	2	4/5/2015	15/6/2015	1/6/2015

Number	Year	ID	Age month	Age year	Sex	Job	Address	In-hospital day	Out-hospital day	Surgical / transcatheter closure day
1102	15	141	3		f	0	1	5/5/2015	8/6/2015	18/5/2015
1103	15	143		1	f	0	1	6/5/2015	29/6/2015	19/5/2015
1104	15	163		19	f	4	1	12/5/2015	26/5/2015	18/5/2015
1105	15	169		37	f	5	1	14/5/2015	8/6/2015	3/6/2015
1106	15	172	6		f	0	1	15/5/2015	24/6/2015	5/6/2015
1107	15	179		11	f	4	1	20/5/2015	9/6/2015	3/6/2015
1108	15	181	8		f	0	2	20/5/2015	3/6/2015	29/5/2015
1109	15	194	7		f	0	2	1/6/2015	6/7/2015	17/6/2015
1110	15	209		13	f	4	2	9/6/2015	30/6/2015	25/6/2015
1111	15	210	14		m	0	1	10/6/2015	31/7/2015	24/7/2015
1112	15	211		37	f	0	1	9/6/2015	30/6/2015	24/6/2015
1113	15	215		19	f	4	3	15/6/2015	1/7/2015	26/6/2015
1114	15	216		51	f	0	3	15/6/2015	7/7/2015	26/6/2015
1115	15	222	3		m	0	2	16/6/2015	10/8/2015	27/7/2015
1116	15	225	18		m	0	1	17/6/2015	22/7/2015	22/6/2015
1117	15	228		3	m	0	1	19/6/2015	27/7/2015	7/7/2015
1118	15	234		55	f	0	1	23/6/2015	6/7/2015	29/6/2015
1119	15	238	6		f	0	2	25/6/2015	7/7/2015	30/6/2015
1120	15	240		20	m	4	1	30/6/2015	13/7/2015	6/7/2015
1121	15	250		30	f	1	1	6/7/2015	20/7/2015	13/7/2015
1122	15	255	8		m	0	1	7/7/2015	11/8/2015	31/7/2015
1123	15	256	17		m	0	1	7/7/2015	11/8/2015	29/7/2015
1124	15	257	3		f	0	1	7/7/2015	20/7/2015	13/7/2015
1125	15	260	8		f	0	1	8/7/2015	3/8/2015	28/7/2015
1126	15	266	23		f	0	1	9/7/2015	14/8/2015	28/7/2015
1127	15	267		10	m	0	2	9/7/2015	14/8/2015	7/8/2015
1128	15	268		7	f	4	2	9/7/2015	20/7/2015	15/7/2015
1129	15	269		10	f	4	2	9/7/2015	24/7/2015	20/7/2015
1130	15	270		17	m	4	2	9/7/2015	20/7/2015	15/7/2015

Number	Year	ID	Age month	Age year	Sex	Job	Address	In-hospital day	Out-hospital day	Surgical / transcatheter closure day
1131	15	276		4	m	0	1	13/7/2015	24/7/2015	20/7/2015
1132	15	277		8	m	4	1	13/7/2015	14/8/2015	6/8/2015
1133	15	283	24		f	0	2	13/7/2015	31/7/2015	27/7/2015
1134	15	289	42		f	0	3	14/7/2015	24/7/2015	20/7/2015
1135	15	290	19		f	0	3	14/7/2015	24/7/2015	20/7/2015
1136	15	291		11	f	4	1	14/7/2015	24/7/2015	20/7/2015
1137	15	293	13		f	0	1	17/7/2015	10/8/2015	30/7/2015
1138	15	297		9	m	0	1	20/7/2015	3/8/2015	28/7/2015
1139	15	298	14		m	0	2	20/7/2015	3/8/2015	27/7/2015
1140	15	300	10		f	0	1	21/7/2015	17/8/2015	10/8/2015
1141	15	302	21		f	0	3	23/7/2015	31/7/2015	27/7/2015
1142	15	303	4		f	0	3	23/7/2015	17/8/2015	10/8/2015
1143	15	304	8		f	0	3	23/7/2015	3/8/2015	29/7/2015
1144	15	305	57		f	0	3	23/7/2015	11/8/2015	5/8/2015
1145	15	306		1	m	0	3	23/7/2015	4/8/2015	30/7/2015
1146	15	307	22		f	0	3	23/7/2015	12/8/2015	7/8/2015
1147	15	308		7	f	0	3	23/7/2015	3/8/2015	29/7/2015
1148	15	309	20		m	0	3	23/7/2015	11/8/2015	5/8/2015
1149	15	312		1	m	0	3	23/7/2015	17/8/2015	7/8/2015
1150	15	313	20		f	0	2	27/7/2015	24/8/2015	19/8/2015
1151	15	314	23		f	0	2	27/7/2015	11/8/2015	7/8/2015
1152	15	317		52	f	1	2	31/7/2015	24/8/2015	19/8/2015
1153	15	318	48		m	0	1	3/8/2015	24/8/2015	17/8/2015
1154	15	320	41		f	0	1	3/8/2015	24/8/2015	18/8/2015
1155	15	325		10	f	4	1	4/8/2015	1/9/2015	24/8/2015
1156	15	330	9		m	0	1	6/8/2015	3/9/2015	13/8/2015
1157	15	331		21	f	2	2	6/8/2015	26/8/2015	21/8/2015
1158	15	332	11		m	0	2	6/8/2015	31/8/2015	14/8/2015
1159	15	339		27	f	3	1	12/8/2015	24/8/2015	19/8/2015

Number	Year	ID	Age month	Age year	Sex	Job	Address	In-hospital day	Out-hospital day	Surgical / transcatheter closure day
1160	15	345		17	m	4	1	13/8/2015	24/8/2015	19/8/2015
1161	15	348		1	f	0	1	14/8/2015	25/8/2015	20/8/2015
1162	15	349		7	m	4	3	17/8/2015	26/8/2015	21/8/2015
1163	15	352		31	f	5	1	17/8/2015	26/8/2015	21/8/2015
1164	15	353		4	f	0	3	17/8/2015	26/8/2015	21/8/2015
1165	15	354	68		m	0	1	17/8/2015	14/9/2015	4/9/2015
1166	15	356	14		m	0	2	17/8/2015	15/9/2015	7/9/2015
1167	15	360		7	f	4	2	19/8/2015	17/9/2015	8/9/2015
1168	15	362	26		f	0	1	19/8/2015	26/8/2015	21/8/2015
1169	15	364	4		f	0	2	21/8/2015	7/10/2015	1/9/2015
1170	15	365		7	m	0	1	21/8/2015	4/9/2015	25/8/2015
1171	15	366	11		m	0	1	20/8/2015	21/9/2015	14/9/2015
1172	15	370	12		f	0	2	26/8/2015	7/9/2015	31/8/2015
1173	15	373	10		m	0	2	27/8/2015	10/9/2015	3/9/2015
1174	15	374		35	m	3	2	1/9/2015	28/9/2015	15/9/2015
1175	15	375	5		f	0	1	7/9/2015	20/10/2015	13/10/2015
1176	15	378	9		m	0	2	7/9/2015	30/9/2015	16/9/2015
1177	15	379		50	f	6	2	8/9/2015	21/9/2015	15/9/2015
1178	15	388	11		f	0	2	21/9/2015	4/11/2015	18/10/2015
1179	15	392	5		f	0	2	22/9/2015	25/11/2015	4/11/2015
1180	15	394	12		m	0	1	23/9/2015	6/10/2015	28/9/2015
1181	15	398		25	f	3	5	28/9/2015	12/10/2015	6/10/2015
1182	15	399	2		m	0	1	28/9/2015	24/11/2015	29/9/2015
1183	15	404	29		f	0	2	29/9/2015	12/10/2015	6/10/2015
1184	15	406	13		f	0	2	30/9/2015	21/10/2015	15/10/2015
1185	15	414	18		f	0	3	5/10/2015	19/10/2015	12/10/2015
1186	15	416		5	f	0	3	5/10/2015	19/10/2015	14/10/2015
1187	15	418		15	f	4	3	5/10/2015	26/10/2015	19/10/2015
1188	15	419	10		f	0	3	5/10/2015	24/11/2015	13/11/2015

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1189	15	423		7	m	4	3	6/10/2015	11/11/2015	2/11/2015
1190	15	431		10	f	4	3	7/10/2015	19/10/2015	14/10/2015
1191	15	432		6	f	4	3	7/10/2015	19/10/2015	12/10/2015
1192	15	433		44	f	1	2	7/10/2015	21/10/2015	15/10/2015
1193	15	446		21	f	0	2	14/10/2015	9/11/2015	2/11/2015
1194	15	450	25		f	0	6	16/10/2015	6/11/2015	26/10/2015
1195	15	451	47		m	0	4	16/10/2015	18/12/2015	1/12/2015
1196	15	453	60		m	0	6	16/10/2015	21/12/2015	11/12/2015
1197	15	458		4	f	0	6	19/10/2015	20/11/2015	2/11/2015
1198	15	461	21		m	0	2	19/10/2015	2/11/2015	26/10/2015
1199	15	462	7		f	0	2	19/10/2015	10/11/2015	28/10/2015
1200	15	463	9		m	0	2	19/10/2015	17/11/2015	10/11/2015
1201	15	473	5		m	0	2	22/10/2015	21/1/2016	10/12/2015
1202	15	482		29	f	3	1	28/10/2015	9/11/2015	4/11/2015
1203	15	490		11	f	4	2	2/11/2015	16/11/2015	9/11/2015
1204	15	495	4		f	0	1	6/11/2015	27/11/2015	12/11/2015
1205	15	498		21	m	0	1	9/11/2015	25/11/2015	17/11/2015
1206	15	510	13		m	0	2	13/11/2015	22/2/2016	27/1/2016
1207	15	513		49	f	1	2	13/11/2015	2/12/2015	23/11/2015
1208	15	514		10	m	4	6	13/11/2015	22/1/2016	6/1/2016
1209	15	515		18	f	4	2	16/11/2015	16/2/2016	19/1/2016
1210	15	516	1		m	0	1	13/11/2015	16/12/2015	1/12/2015
1211	15	527	13		f	0	2	23/11/2015	14/12/2015	7/12/2015
1212	15	531	15		m	0	1	27/11/2015	14/12/2015	8/12/2015
1213	15	536		45	f	1	2	1/12/2015	18/12/2015	8/12/2015
1214	15	538		4	f	0	2	3/12/2015	11/1/2016	30/12/2015
1215	15	541		16	f	4	1	7/12/2015	5/1/2016	31/12/2015
1216	15	542	2		m	0	1	7/12/2015	14/1/2016	22/12/2015
1217	15	545	5		f	0	2	9/12/2015	25/1/2016	8/1/2016

Number	Year	ID	Age month	Age year	Sex	Job	Address	In-hospital day	Out-hospital day	Surgical / transcatheter closure day
1218	15	552		51	f	0	2	16/12/2015	15/1/2016	4/1/2016
1219	15	555	7		f	0	2	21/12/2015	11/1/2016	6/1/2016
1220	15	567	4		m	0	2	31/12/2015	5/2/2016	12/1/2016