

Heart failure in China: epidemiology and current management

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ABSTRACT The *Annual Report on Cardiovascular Health and Diseases in China* (2022) intricate landscape of cardiovascular health in China. In connection with the previous section, this sixth section of the report offers a comprehensive analysis of heart failure (HF) in China. HF is one of the most important cardiovascular disease in the 21st century. Its mortality is equivalent to that of cancer. It is an important public health problem that seriously affects the health of Chinese residents. In recent years, with the deepening of understanding, the change of treatment principles, the innovation of treatment methods and the update of treatment guidelines, the in-hospital mortality of HF patients has declined, and the long-term prognosis is also improving. However, there are still differences in the management level of HF among different hospitals in China. How to improve the standardized diagnosis and treatment level of HF in China remains an important challenge.

PREVALENCE OF HEART FAILURE

A survey involving 15,518 people from 20 urban and rural areas in 10 provincial administrative units in China found that the prevalence of chronic heart failure (HF) among Chinese population aged 35–74 years was 0.9% in 2000.^[1] It was conservatively estimated that there were 4 million chronic HF patients in China. The prevalence of HF increased significantly with age.

CHS analysis of 22,158 participants during 2012–2015 showed that the prevalence of HF was 1.3% among adults aged 35 years or older, it is estimated that there were 8.9 million patients with HF in China, and the prevalence was similar in urban and rural residents (1.6% vs. 1.1%, $P = 0.266$).^[2] The prevalence of left ventricular systolic dysfunction (LVEF < 50%) was 1.4%, and the prevalence of moderate/severe diastolic dysfunction was 2.7%. The prevalence of HF in different studies was shown in Table 1.

MORTALITY OF HF

In-hospital Mortality

With the improvement of medical care level in China, the in-hospital mortality of HF patients has decreased significantly. A retrospective investigation of 10,714 HF inpatients from 42 domestic hospitals and a retrospective study of chronic HF inpatients in Beijing PLA General Hospital for 15 years all demonstrated a significant downward trend of the in-hospital mortality in patients with HF.^[4,5] China-HF Registry study among 13,678 HF patients from 132 hospitals during January 2012 to September 2015 showed that the in-hospital mortality was 4.1%.^[6] China Heart Failure Medical Quality Control Report 2020 (hereinafter referred to as HF QC Report) analysis of 33,413 HF patients from 113 hospitals in China during January 2017 to October 2020 showed that the in-hospital mortality of HF inpatients was 2.8% (Table 2).^[7]

Table 1 The prevalence of HF by different study in China.

Study	Year	Age, yrs	Numbers, cases	Prevalence in men	Prevalence in women	Total
10 provincial administrative units ^[1]	2000	35–74	15,518	0.7%	1.0%	0.9%
China hypertension survey ^[2]	2012–2015	≥ 35	22,158	1.4%	1.2%	1.3%
6 provincial administrative units ^[3]	2017	≥ 25	50 million	1.1%	1.1%	1.1%

HF: heart failure.

Table 2 In-hospital mortality of HF inpatients in different studies in China.

Study	Year	Numbers, cases	Age, yrs	Male	In-hospital mortality
42 domestic hospitals ^[4]	1980	1756	68 ± 17	55.6%	15.4%
	1990	2181	64 ± 22	59.6%	12.3%
	2000	6777	63 ± 16	55.1%	6.2%
Beijing PLA General Hospital ^[5]	1993–1997	1623	56 ± 18	62.6%	7.0%
	1998–2002	2444	58 ± 18	60.4%	4.5%
	2003–2007	3252	63 ± 16	63.1%	5.1%
China-HF ^[6]	2012–2015	13,687	65 ± 15	59.1%	4.1%
HF QC Report ^[7]	2017–2020	33,413	67 ± 14	60.8%	2.8%

HF: heart failure.

Mortality of Patients with Acute HF

A retrospective study analyzed 1198 acute HF (AHF) patients rescued in emergency room during 2005 to 2011.^[8] 115 patients (9.6%) died in emergency room, of which 73 patients (63.5%) died within 24 h, and 93 patients (80.9%) died within 48 h. Another study analyzed 1190 emergency AHF patients during 2011–2013. It was found that patients with main causes of senile valvular disease, cardiomyopathy and congenital heart disease had a higher mortality, all above 10%, while the mortality in HF patients with etiologies of hypertension, pericardial effusion and pulmonary heart disease was about 5%.^[9] The Heart Failure Registry of Patient Outcomes (HERO) study showed that 20.4% of the 4244 AHF patients enrolled from 2017 to 2018 died during a median follow-up of 12.4 months.^[10] During January 2011 to September 2012, 3335 emergency AHF patients in 14 hospitals in Beijing were followed up for 5 years. It was found that the 5-year all-cause mortality was 55.4%, the cardiovascular mortality was 49.6%, and the median survival time was 34 months.^[11]

ETIOLOGICAL AND PRECIPITATING FACTORS OF HF

A number of studies have shown that the average age of HF patients in China is on the rise. In the HF QC Report 2020,^[7] the average age of HF patients was 67 ± 14 years old, and male patients accounted for 60.8%. The main etiologies of HF have changed: the proportion of valvular diseases in the cause of HF decreased year by year, whereas hypertension (56.3%) and coronary arteriosclerosis disease (48.3%) have become the main etiologies of HF patients in China (Table 3).

According to the HF QC Report 2020, HF with reduced ejection fraction (HFrEF), HF with midrange ejection fraction (HFmrEF) and HF with preserved ejection frac-

tion (HFpEF) accounted for 40.2%, 21.8% and 38.0% respectively.^[7] See Figure 1 for the comparison of etiologies and complications of different types of HF.

Results of the China-HF Registry showed that infection, myocardial ischemia and exertion were the three main leading cause for the onset of HF (Figure 2).^[6] Results from the China Cardiovascular Association (CCA) Database-Heart Failure Center Registry, showed that the three most common causes for hospitalization of HFpEF patients were ischemia (26.6%), infection (14.4%) and arrhythmia (10.5%).^[16]

TREATMENT OF HF

Drug Therapy

The results of studies like HF QC Report 2020 showed that the overall usage rate of diuretics in hospitalized HF patients in China did not change significantly.^[7] The usage rate of digoxin showed a downward trend due to the influence of international clinical studies. The usage rate of aldosterone receptor antagonists and beta-blockers increased. The usage of renin-angiotensin system inhibitors was on the rise, but that of angiotensin-converting enzyme inhibitors and angiotensin II receptor blockers decreased with the advent of angiotensin receptor neprilysin inhibitor (Table 4).

The effect of beta-blockers in patients with HF was further affirmed. The study of 10,239 ST-segment elevation myocardial infarction patients complicated with moderate to severe acute HF by CCC-ACS registration project showed that early oral beta-blocker therapy (within 24 h after admission), compared with those who did not take beta-blockers early, could significantly improve the in-hospital outcome (all-cause death, cardiopulmonary resuscitation after cardiac arrest and cardiogenic shock com-



Table 3 The population characteristics in different HF studies in China.

Study	Year	Numbers, cases	Population	Age, yrs	Male	Coronary artery disease	Hypertension	Diabetes mellitus	Valvular heart disease	Atrial fibrillation
A study in 42 hospitals in China ^[4]	1980	1756	Chronic HF	68 ± 17	55.6%	36.8%	8.0%	-	34.4% ^a	-
	1990	2181		64 ± 22	59.6%	33.8%	10.4%	-	34.3% ^a	-
	2000	6777		63 ± 16	55.1%	45.6%	12.9%	-	18.6% ^a	-
Beijing PLA General Hospital ^[5]	1993–1997	1623	Chronic HF	56 ± 18	62.6%	37.2%	23.3%	12.3%	35.2% ^a	23.2%
	1998–2002	2444		58 ± 18	60.4%	40.9%	32.3%	15.9%	32.7% ^a	23.0%
	2003–2007	3252		63 ± 16	63.1%	46.8%	46.7%	21.1%	16.6% ^a	20.6%
A study in 10 hospitals ^[12]	2005–2009	2154	HF with reduced ejection fraction	64 ± 13	78.6%	64.4%	56.7%	17.2%	-	15.8%
Hubei area ^[13]	2000–2010	16,681	Chronic HF	63 ± 11	59.3%	-	47.6%	16.2%	-	40.81%
Xinjiang area ^[14]	2011–2012	5357	Chronic HF	65 ± 13	65.3%	50.8%	31.8%	21.7%	2.3% ^a	-
China-HF ^[6]	2012–2015	13,687	HF	65 ± 15	59.1%	49.6%	50.9%	21.0%	15.5%	24.4%
HF QC Report ^[7]	2017–2020	33,413	HF	67 ± 14	60.8%	48.3%	56.3%	31.5%	18.7%	17.6%
6 provincial administrative units ^[8]	2017	427,878	Basic medical insurance covered people ≥ 25 years old	65 ± 15	51.0%	52.5%	43.8%	17.3%	-	-
China Medica University ^[15]	2013–2018	8887	HF	69 ± 13	53.8%	66.5%	61.9%	33.4%	-	32.7%
CCA Database-HF Center Registry ^[16]	2017–2021	41,708	Heart failure with preserved ejection fraction	72 ± 16	50.7%	60.3%	65.2%	28.5%	-	41.2%

^aReference to rheumatic valvular disease. HF: heart failure.

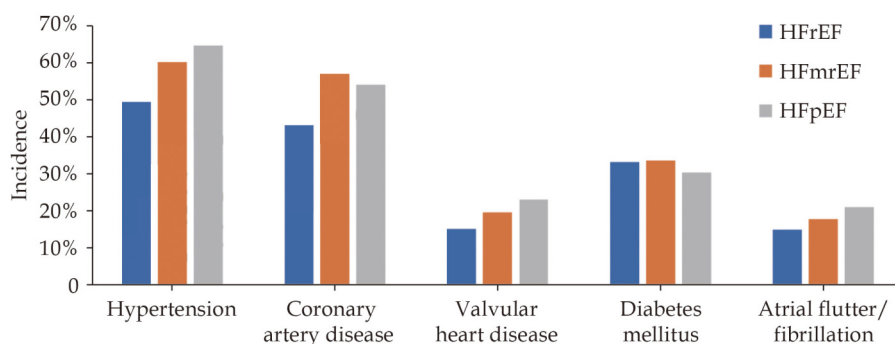


Figure 1 Comparison of etiologies and complications of different types of HF. HF: heart failure; HFmrEF: HF with midrange ejection fraction; HFpEF: HF with preserved ejection fraction; HFrEF: HF with reduced ejection fraction.

plex event) (HR = 0.665, 95% CI: 0.496–0.894, $P = 0.007$).^[18]

China PEACE Heart Failure Study analyzed the relationship between beta-blockers and mortality. The study included 1035 patients with HFmrEF admitted to 52 hospitals in China from 2016 to 2018 due to HF. The average age was 65.5 ± 12.7 years. Women accounted for 36.4%. The median value of LVEF was 44% (interquartile range: 42%–47%). 63.8% of the patients took beta-blockers. Compared with non-users, the 1-year all-cause mortality was significantly reduced (HR = 0.70, 95% CI: 0.51–0.96, $P =$

0.03).^[19]

Another randomized controlled study showed that compared with placebo, after 32 weeks of treatment, slow-release ivabradine could improve left ventricular end-diastolic volume index, LVEF, resting heart rate, Kansas City Cardiomyopathy Questionnaire score and hospitalization due to HF deterioration and cardiovascular disease in patients with HFrEF.^[20] A single-center retrospective study of 274 HFrEF patients with an average of 19.4 months followed-up showed that compared with angiotensin-

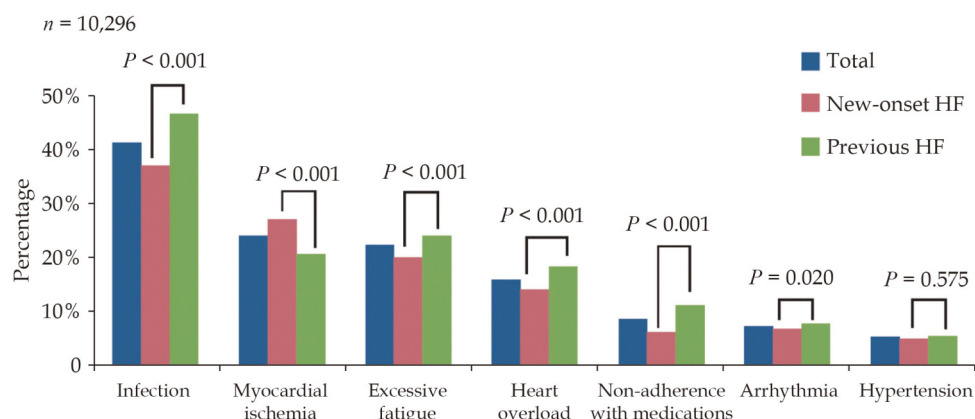


Figure 2 Precipitating factors of HF. HF: heart failure.

Table 4 Drug use in patients with HF.

Study	Year	Numbers, cases	Therapeutic drugs								
			Nitrates	Diuretics	Digitalis	Angiotensin II receptor blockers	Angiotensin-converting enzyme inhibitors	Angiotensin receptor neprilysin inhibitor	Mineralocorticoid receptor antagonist	Beta-blockers	Calcium-channel blocker
42 hospitals in China ^[4]	1980	1756	44.7%	63.7%	51.7%	0.4%	14.0%	-	10.0%	8.5%	6.1%
	1990	2181	36.0%	70.2%	45.5%	1.4%	26.4%	-	8.4%	9.5%	16.4%
	2000	6777	53.0%	48.6%	40.3%	4.5%	40.4%	-	20.0%	19.0%	10.5%
Hubei ^[12]	2000–2010	16,681	-	69.1%	46.2%	18.7%	51.6%	-	-	46.6%	-
10 hospitals ^[11]	2005–2009	2154	53.2%	74.4%	57.6%	Total 66.0%		-	74.6%	68.3%	46.1%
Kunming ^[17]	2008–2012	2106	-	84.8%	28.2%	Total 82.8%		-	76.6%	72.2%	-
Xinjiang ^[14]	2011–2012	5357	-	45.5%	26.8%	Total 72.8%		-	46.6%	66.8%	-
China-HF ^[6]	2012–2015	13,687	41.4% ^a	72.2% ^b	20.6% ^a	28.8% ^b	71.7% ^b	-	74.1% ^b	70.0% ^b	-
			46.9% ^c	46.9% ^c	51.3% ^c	51.3% ^c	49.4% ^c	-	48.7% ^c	52.2% ^c	-
HF QC Report ^[7]	2017–2020	33,413	-	75%	29.3%	15.2%	28.8%	36.9%	87.8%	82.2%	-
CCA Database-Heart Failure Center Registry ^[16]	2017–2021	41,708	29.1%	67.8%	13.0%	Total 56.8%		8.7%	63.1%	71.3%	22.8%

^aReference to intravenous medication during hospitalization. ^bReference to oral drugs used in patients with HF with reduced ejection fraction after discharge. ^cReference to oral drugs used in patients with HF with preserved ejection fraction after discharge. HF: heart failure.

converting enzyme inhibitors/angiotensin II receptor blockers, angiotensin receptor neprilysin inhibitor could further improve the left atrial reverse remodeling in HF-rEF patients and improve the prognosis of patients.^[21]

In the treatment by traditional Chinese medicine, the clinical assessment of complementary treatment with dripping pills on ischemic HF (CACT-IHF) study confirmed that Qishen yiqi dropping pills could significantly improve the exercise tolerance of patients with ischemic HF, and had good safety and effectiveness.^[22]

Device Treatment

According to statistics of online registration data of the

National Health Commission and the data reported by the provincial quality control centers, in 2021, the number of cardiac resynchronization therapy (CRT) implantation in China reached 5333, an increase of 37% compared with 2020, and the number of CRT implantation per million people was 3.6 (Figure 3). The proportion of CRT-D increased in recent years and was up to 66% in 2021 (Figure 4).

Although biventricular pacing (BiVP)-CRT has been widely recognized as the first-line treatment for patients with wide QRS dyssynchronous HF, its non-response rate is still up to 30% in medium and long-term follow-ups. In recent years, domestic scholars have been exploring



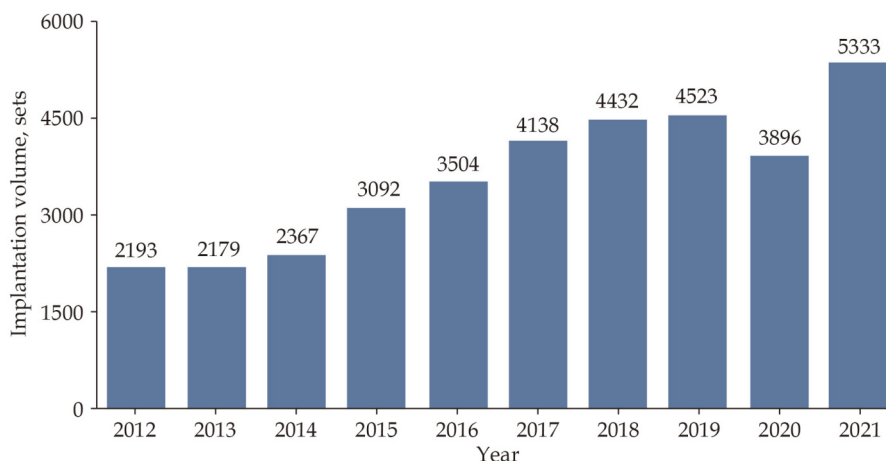


Figure 3 Annual CRT implantation volume in China (2002–2021). CRT: cardiac resynchronization therapy.

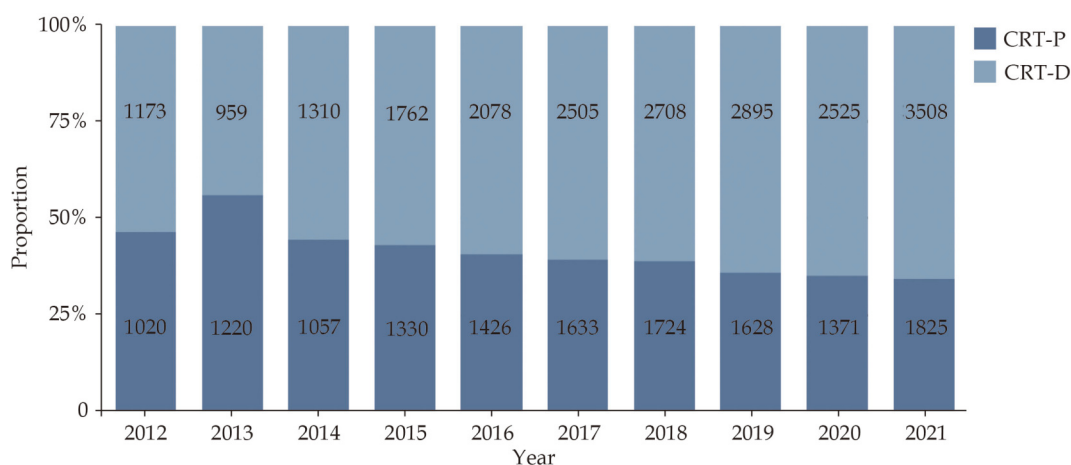


Figure 4 CRT-P/CRT-D implantation proportion in China (2002–2021). CRT: cardiac resynchronization therapy.

how to improve the efficacy of BiVP-CRT. Gated myocardial perfusion single photon emission computed tomography (SPECT) is an important method to evaluate left ventricular systolic synchrony. The existence of myocardial scar makes the synchrony of the whole myocardium unable to effectively predict the mechanical response to CRT. While the synchrony of viable myocardium is a strong predictor of mechanical response to CRT.^[23] Another team found that in patients with non-ischemic dilated cardiomyopathy combined with LBBB, the evaluation of left ventricular synchrony by SPECT could predict super-response and long-term prognosis of CRT.^[24] Echocardiographic pressure-strain loops could evaluate the work parameters of different segments of myocardium. The baseline work efficiency of myocardium in the middle of the ventricular septum was found to be an independent predictor of the response to CRT.^[25] At present,

the international guidelines recommend CRT at different levels with the QRS duration of 150 ms as the boundary. Domestic research points out that for patients with QRS duration of less than 150 ms, the QRS duration adjusted by height is conducive to further improve patient stratification.^[26] Three European pre-implantation risk scores were validated in Asians, and it was found that the SCREEN score was the best in predicting all-cause mortality and heart transplant risk.^[27]

The choice of left ventricular lead positions is also important for the final CRT efficacy. Gated myocardial perfusion SPECT technology could accurately locate the last contracted myocardial segment,^[28,29] and electroanatomical mapping could identify the left bundle branch block level.^[30] Domestic reports have confirmed that it was feasible to use the above two technologies to assist in determining the placement positions of CRT leads. Domestic

scholars have found that nearly half of the patients need different atrioventricular delays to achieve atrioventricular and ventricular resynchronization, and have proposed a new atrioventricular delay optimization algorithm that took into account of both.^[31] Left ventricular Multi-Point pacing (MPP) could provide more options than left ventricular single point pacing. A domestic prospective multi-center study showed that MPP-CRT better improved the acute hemodynamic parameter $\Delta\text{dP}/\text{dt}$ than single left ventricular point pacing, suggesting that MPP together with atrioventricular delay optimization could provide better hemodynamic effects.^[32]

Chinese scholars have actively carried out clinical research on the application of left bundle branch pacing (LBBP) to CRT. The small sample single-arm observational study found that LBBP had the effect of correcting LBBB, improving left ventricular systolic synchrony, and improving cardiac function.^[33,34] The comparative observational study of LBBP and biventricular pacing or His bundle pacing CRT also confirmed that the short-term clinical efficacy of LBBP was even better than that of BiVP-CRT.^[35,36] This year, Chinese scholars published the LBBP-RESYNC study, the first international head-to-head comparison study of LBBP-CRT and traditional BiVP-CRT in the treatment of non-ischemic cardiomyopathy patients with LBBB and HF. The results suggested that LBBP-CRT could significantly improve LVEF, left ventricular end-systolic volume and NT-proBNP levels, and promote left ventricular reverse remodeling compared with BiVP-CRT.^[37] The above results are similar to the results of several observational studies and meta-analysis in the past two years, suggesting that the benefits of LBBP in such patients deserve more attention.^[38-42] For patients of coronary venous lead failure or nonresponse to biventricular pacing, an observational study involving multiple centers in China showed that LBBP-CRT was a feasible rescue option.^[43] For the selection of pacing strategy after ablation of atrioventricular node in patients with HF and atrial fibrillation, the multi-center prospective randomized crossover controlled trial ALTERNATIVE-AF carried out by Chinese scholars showed that HBP could more significantly improve LVEF compared with BiVP, and both could improve left ventricular end-diastolic volume, NYHA cardiac function grade and BNP level, with no significant difference between them.^[44]

CRT is an effective treatment strategy for HF with wide QRS. In recent years, great changes have taken place

in the pacing strategy of CRT. Conduction bundle pacing, including His bundle and LBBP, has been used for CRT along with traditional BiVP-CRT. Chinese scholars have done a lot of research on conduction bundle pacing CRT compared with traditional BiVP-CRT, and confirmed that conduction bundle pacing could be used for CRT of LBBB HF patients and for CRT of post atrial fibrillation AV node ablation patients with HF. These research results provide more pacing patterns for the device implantation treatment, thus offering more effective options for CRT of patients with HF.

Surgical Treatment

Artificial heart

Since the first long-term left ventricular assist devices was carried out in June 2017, up to now, there have been 200 left ventricular assist device implantations in 36 hospitals in China, and only 7 hospitals have completed more than 10 implantations. The National Medical Products Administration has approved 4 registration clinical trials to evaluate the safety and effectiveness of implantable left ventricular assist devices in the treatment of end-stage HF, including EVAHEART I, CH-VAD, CorHeart6, and HeartCon. From January 2018 to October 22, Fuwai Hospital of the Chinese Academy of Medical Sciences took the lead in completing the first three studies. The number of procedures that has been finished was 17 for EVAHEART I, 25 for CH-VAD, and 50 for CorHeart6.

The average age of 17 patients who underwent EVAHEART I implantation was 43 years, all of whom were male. There were 13 cases of dilated cardiomyopathy, 2 cases of ischemic cardiomyopathy, 1 case of valvular heart disease, and 1 case of noncompaction cardiomyopathy. The cardiac function grading before discharge was restored from NYHA cardiac function grade IV to I-II. There were 0 perioperative deaths, 3 patients received heart transplantation on 155, 1124 and 1343 days after operation, and 3 patients died on 412, 610 and 872 days after operation. The 1-year survival rate was 100%, the 2-year survival rate was 94%, and the 3-year survival rate was 88%.

The average age of 25 patients who underwent CH-VAD implantation was 45 years, including 19 males and 6 females. There were 11 cases of dilated cardiomyopathy, 6 cases of ischemic cardiomyopathy, 4 cases of valvular heart disease, 1 case of chemotherapeutic cardiomyopathy, 1 case of perinatal cardiomyopathy, 1 case of terminal hypertrophic cardiomyopathy, and 1 case of Ka-



wasaki disease. Two patients died during perioperative period, 1 received heart transplantation 773 days after operation, and 3 died 329 days, 773 days and 1132 days after operation. The 1-year survival rate was 90.3%, and the 2-year survival rate was 89.3%.

The average age of 50 patients who underwent Cor-Heart6 implantation was 50 years, 41 males and 9 females. There were 38 cases of dilated cardiomyopathy, 10 cases of ischemic cardiomyopathy, and 2 cases of valvular heart disease. Two patients died during perioperative period, and the other 48 patients recovered their cardiac function from preoperative NYHA cardiac function grade IV to I-II. The 3-month follow-up survival rate was 100%.

The fourth trial was to evaluate the HeartCon produced by RochetHeart Technology Co, Ltd. A total of 50 cases have been enrolled.

EVAHEART I, CH-VAD and HeartCon have been officially approved for clinical application in September 2019, December 2021 and July 2022, respectively.

Heart transplantation

Heart transplantation is the most effective and recognized treatment modality for various end-stage cardiomyopathies. According to the data from China Heart Transplant Registry System, as of 2021, 66 medical institutions in China are qualified for performing heart transplantation. From 2015 to 2021, the annual number of heart transplantation implemented and reported by transplantation centers in China was 279, 368, 446, 490, 679, 557 and 738, with a total of 3557 cases in seven years (Figure 5). In 2021, among Chinese patients receiving heart transplantation, nonischemic cardiomyopathy accounted for 75.2%; in pediatric heart recipients, nonischemic cardiomyopathy accounted for 80.3%. In 2021, the in-

hospital survival rate of Chinese heart transplant recipients was 91.0%, and multiple organ failure and transplanted HF accounted for about 40% of early deaths. In 2015–2021, the average postoperative survival rate was 85.4% at 1 year after heart transplantation and 79.9% at 3 years. Of these, the 1- and 3-year survival rates of adult heart transplantation were 85.1% and 79.5%, respectively; 89.7% and 84.8%, respectively, in children.

From 2004 to 2021, a total of 1096 heart transplants were completed in Fuwai Hospital and the overall survival rates in adults and children at 1, 3, 5, and 10 years after transplantation were 94%, 92%, 89%, and 78%, respectively, which are superior to the long-term survival rates of 84% at 1 year, 78% at 3 years and 72% at 5 years reported by the International Society of Heart and Lung Transplantation.

In 2021, 53 hospitals nationwide carried out heart transplantation, and the number of hospitals carrying out heart transplantation increased by 36.8% compared with 2020, providing relatively stable medical access for heart transplant recipients in China. Four heart transplantation centers, Fuwai Hospital of the Chinese Academy of Medical Sciences, Union Hospital affiliated to Tongji Medical College of Huazhong University of Science and Technology, Guangdong Provincial People's Hospital and Zhengzhou Seventh People's Hospital, completed more than 60 transplant cases in 2021, maintaining a high level of medical service capacity.

LONG-TERM PROGNOSIS OF PATIENTS WITH HF

During the median follow-up of 582 days among 1440 HF inpatients in the HF center of Fuwai Hospital from 2009 to 2013, 283 patients (19.7%) died: 169 died from

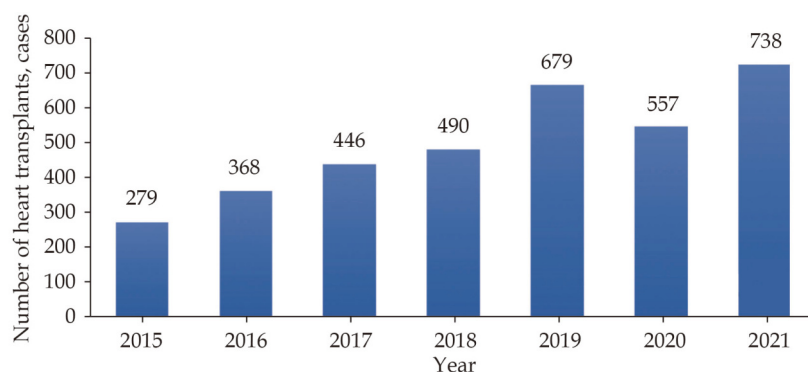


Figure 5 Numbers of heart transplants in China from 2015 to 2021.

progressive HF and 43 were of sudden death.^[45] After a median follow-up of 35 months of 650 patients with non-ischemic HF, 163 patients died.^[46] It was also found that after a median follow-up of 33 months of 465 DCM patients, 128 patients' (28.8%) echocardiographic indexes returned normal. Their LVEF increased significantly from $30.8\% \pm 6.0\%$ at baseline to $55.7\% \pm 4.3\%$, and left ventricular end diastolic diameter decreased significantly from 64.5 ± 5.6 mm to 51.0 ± 3.1 mm.^[47]

The prognosis of chronic HF patients with different clinical types is also different. 41,708 patients with HFpEF HF were followed up in the CCA Database-Heart Failure Center Registry and it was found that their 1-year mortality was 3.1%.^[16] 1035 patients with HFmrEF were analyzed in the China PEACE HF Study, and it was found that the 1-year mortality was as high as 16.3%.^[19] In addition, studies have shown that the 5-year all-cause mortality rates of HFrEF, HFmrEF, and HFpEF patients were 25.2%, 18.1% and 13.4% respectively.^[48] HFmrEF patients are categorized in three different subgroups, each with different clinical outcomes. After a median follow-up of 40 months, 1168 patients with HFmrEF, who visited from September 1, 2015 to December 30, 2019, were found to have a mortality of 17.81%. According to the change of ejection fraction of more than 3 months, the enro-

lled patients were divided into improved group (prior LVEF < 40%), stable group (prior LVEF between 40% and 50%) and deteriorated group (prior LVEF $\geq 50\%$), and their all-cause mortality rates were 11.29%, 16.47% and 22.52% respectively.^[49]

From January 2014 to December 2015, a long-term follow-up of 1250 HF patients in 5 tertiary hospitals and 1413 HF patients in 4 secondary hospitals in Beijing found that the 90-day mortality (10.8% vs. 5.0%, $P = 0.024$) and the 1-year mortality (21.0% vs. 12.1%, $P = 0.039$) of HF patients in secondary hospitals were both higher than those in tertiary hospitals.^[50] The analysis found that the relatively poorer medical quality of secondary hospitals may be related to the higher mortality.

EXPERT CONSENSUSES AND GUIDELINES

In recent years, Chinese experts have summarized the latest research progresses and formulated a number of guidelines and consensuses on HF. These guidelines and consensuses give clear suggestions on standardized diagnosis, treatment, prevention, rehabilitation and other aspects of HF, guiding clinicians' work and improving the diagnosis, treatment and prognosis of HF (Table 5).

Table 5 Guidelines and consensuses on HF issued from 2020 to 2022.

Release time, year	Name
Guidelines	
2021	Guidelines for primary diagnosis and treatment of chronic HF ^[51]
2021	Guidelines for primary diagnosis and treatment of acute HF ^[52]
2022	Clinical guidelines of Chinese patent medicines in the treatment of HF (2021) ^[53]
Consensus	
2020	Treatment of HF inpatients with COVID-19 ^[54]
2020	Expert consensus on diagnosis and treatment of diastolic HF ^[55]
2020	Chinese expert consensus on ion management of HF patients ^[56]
2020	Atrial septal shunt in the treatment of HFpEF: Chinese experts' understanding and suggestions ^[57]
2020	Chinese expert consensus on cardiac rehabilitation of CHF ^[58]
2021	Chinese expert consensus on the diagnosis and treatment of CHF in the elderly (2021) ^[59]
2021	Chinese expert consensus on quality evaluation and control indicators of diagnosis and treatment of HF ^[60]
2021	Chinese expert consensus on cardiac resynchronization therapy for CHF (2021 revision) ^[61]
2021	Chinese expert consensus on the management of HFpEF patients ^[62]
2021	Chinese expert consensus on management of hyperkalemia in HF patients ^[63]
2022	Chinese expert consensus on comprehensive management of exacerbated CHF patients 2022 ^[64]
2022	Chinese expert consensus on the management of female CHF ^[65]
2022	Chinese expert consensus on the application of angiotensin receptor-neprilysin inhibitor in HF patients ^[66]



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