

## Review

Heart failure across Asia: Same healthcare burden but differences in organization of care<sup>☆</sup>

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## ABSTRACT

A gap in the knowledge on the status of heart failure (HF) in Asia versus other regions led to the creation of a working group of Asian experts from 9 countries or regions (Hong Kong, Indonesia, Malaysia, Philippines, Singapore, South Korea, Taiwan, Thailand, and Vietnam). Each expert sought the best available data from local publications, registries, or clinical practice. The prevalence of HF in Asia was generally similar to global values (1% to 3%), but with some outliers. There were substantial variations in healthcare spending, and the average cost of HF hospitalization varied from 813 US\$ in Indonesia to nearly 9000 US\$ in South Korea. Comorbidities were frequent, particularly hypertension, diabetes mellitus, and dyslipidemia. Modifiable risk factors such as smoking were alarmingly common in some countries. Asian HF patients spent between 5 and 12.5 days in hospital, and 3% to 15% were readmitted for HF by 30 days. The pharmacological treatment of Asian patients generally followed international guidelines, including renin–angiotensin–aldosterone system inhibitors (61% to 90%), diuretics (76% to 99%), beta-blockers (32% to 78%), and digoxin (19% to 53%), with some room for improvement in terms of life-saving therapies. Our review supports implementation of a more comprehensive and organized approach to HF care in Asia.

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## 1. Introduction

It is estimated that 38 million people worldwide have heart failure (HF), with most published studies reporting a prevalence of between 1% and 2% of the adult population [1,2]. Data from Europe and North America suggest that 1%–2% of all hospital admissions are related to HF [3], amounting to more than 1 million admissions annually, with 80–90% being due to decompensation of chronic HF [4]. The syndrome still carries a poor prognosis: 5% to 10% of patients die during hospitalization, with a further 15% dying by 3 months, and over half of patients die within 5 years of their first HF hospitalization [5]. Rates of rehospitalization are also high [4,6]. The financial burden of HF, principally due to the cost of hospitalization, is expected to increase substantially in the coming decades due to the aging of the population worldwide [7,8].

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Globally, the etiology of HF varies, but hypertension and coronary artery disease (often associated with obesity and diabetes mellitus) appear to remain important, with valve disease, peripartum cardiomyopathy, infection, and genetic causes being variably important. Published studies suggest that the importance of coronary artery disease as a cause of HF worldwide is increasing [9], and particularly so in Asia [10]. An increase in HF risk factors, such as obesity, hypertension, and diabetes, related to changing lifestyles (“epidemiologic transition”) in Asian countries is likely responsible for the rise in the prevalence of HF [1,11]. However, the availability of data on HF burden and healthcare delivery is limited compared with Europe and North America [12].

This gap in knowledge was the driver for the creation of a working group of Asian experts in HF, whose objectives were to: (i) investigate the current state of HF care in several Asian countries; and (ii) to foster implementation of measures intended to improve the standard of HF care in this region. We describe the currently available data on HF

burden in nine Asian countries, and the current organization of care in those countries, summarizing available data on process and outcome measures for HF care where available. We report data from Hong Kong, Indonesia, Malaysia, Philippines, Singapore, South Korea, Taiwan, Thailand, and Vietnam.

## 2. Methods

Each author contributed the most recently available data on HF care from their own country, using what they considered to be the best available sources – ideally nationally published data or where these were not available data from local or regional registries or audit projects. Where possible, data were subdivided into HF with reduced ejection fraction (HFREF) and other types of HF. Data were sought on the prevalence of HF, the likely etiological factors, deaths, hospitalization duration and mortality, readmission rates, overall cost of HF management, cost of drug therapy, and whether there were local or national guidelines for HF management. In addition, published data on the country characteristics were collected (population, gross domestic product (GDP), growth, healthcare expenditure as percentage of GDP, life expectancy, and cardiologists per country or per capita). For comparison purposes published data from Europe and North America were also collected [2,3,13–26].

Published data were available for Hong Kong, Philippines, Singapore, South Korea, Taiwan, Thailand, and Vietnam. There were two HF registries for Thailand: one registry on all hospitalized HF (HFREF and other HF) [27] and another for HFREF only [28]. The data from the Philippines also included data from five major hospital centers [29], while those from Indonesia include data from one hospital based on experience since 2009. The data from Vietnam were collected at the Hanoi Heart Hospital from August 2014 to February 2015. The data from Malaysia included all admissions due to acute HF registered in the Institut Jantung Negara (the Malaysian National Heart Institute) acute decompensated HF registry since 2009.

## 3. Results

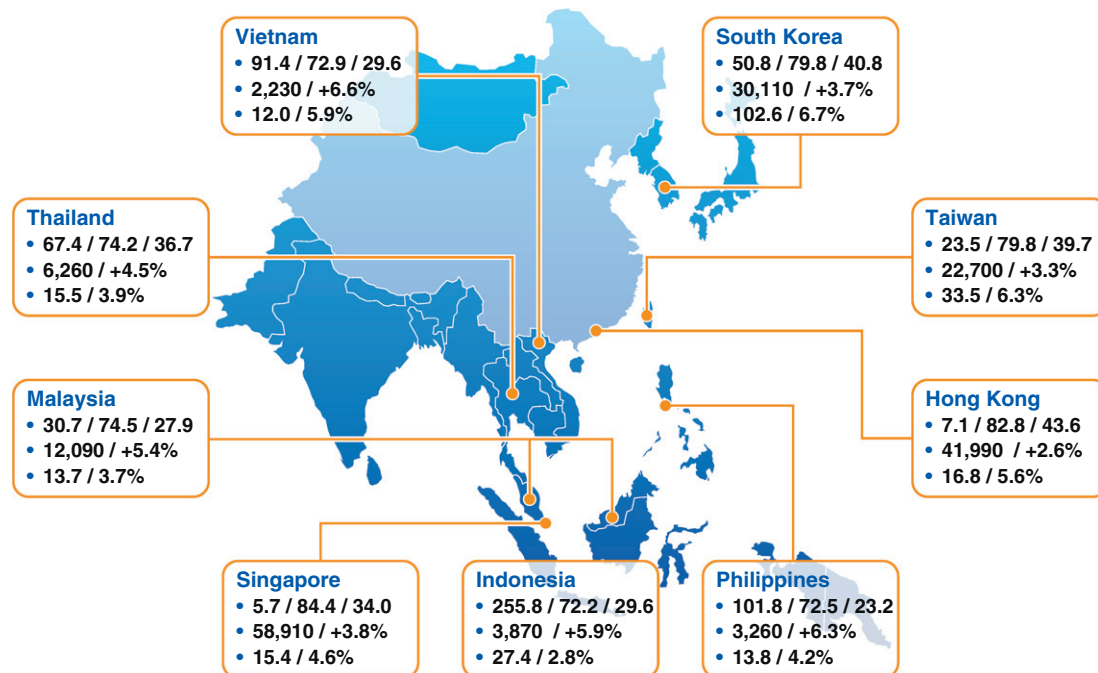
General socioeconomic and health expenditure data for the region are presented in Fig. 1 [13,14,17]. The populations of the nine participating Asian countries varied greatly in size from Singapore (5.7 million) to Indonesia (256 million). The wealth of the countries also varied markedly, ranging from a GDP per capita of 2230 US\$ in Vietnam to 58,910 US\$ in Singapore. As a percentage of GDP, South Korea spent the most

on healthcare (6.7%) though this was still substantially lower than Europe and the USA. Four countries (Indonesia, Vietnam, Thailand, and the Philippines) spent more than 20% of their healthcare budgets on pharmaceuticals. The average published cost of HF hospitalization varied from 813 US\$ in Indonesia to nearly 9000 US\$ in South Korea. The number of cardiologists in each country for which data were available were: Hong Kong 228 (32 per million of population), the Philippines 1400 (14 per million), Singapore 229 (40 per million), Taiwan 1637 (70 per million), Vietnam 2000 (21 per million), and USA 27,076 (84 per million).

Of the countries for which data were available, the prevalence of HF (1% to 3%) was generally similar to values reported for Europe and the literature value of 0.9% in China [30], though values >5% were reported from Indonesia and Taiwan (Table 1) [2,3,20,22–29, 31–34]. The prevalence was reported as higher in men than women, but Asian HF patients appeared to be slightly younger than their European and American counterparts, reflecting the generally younger demographic of these countries. The reported etiologies of HF are also presented in Table 1: ischemic heart disease was the most common cause of HF in all countries except Hong Kong, where hypertensive heart disease was the most common cause (70% versus 29% for ischemic heart disease).

Vascular risk factors such as hypertension, diabetes mellitus, and dyslipidemia were common in HF patients in all countries (Table 1), but particularly so in Malaysia (75%, 67%, and 52%, respectively) and Singapore (69%, 55%, and 65%, respectively). Smoking was frequent, with high reported rates in some countries, most notably the Philippines (54%) and Vietnam (31%). Rates of renal disease ranged from 4% in the Philippines to 31% in Taiwan. Roughly a fifth of patients had concomitant atrial fibrillation and more than a tenth had chronic obstructive pulmonary disease or asthma.

Available data on hospitalizations for HF and associated mortality are presented in Table 2 [3,20,22,23,35–38]. The country with the highest number of HF hospitalizations was Taiwan, with 40,000



Population (million)/life expectancy\*/mean age\* – GDP per capita (USD) / GDP growth (per annum) – Health expenditure total (billion USD) / % of GDP  
\* CIA World Factbook 2015

Fig. 1. National characteristics in nine Asian countries [13,14,17]. GDP, gross domestic product.

**Table 1**

Prevalence of heart failure (HF), demographic characteristics of patients and etiology in 9 Asian countries or regions, and Europe and the USA [2,3,20,22–29,31–34].

Prevalence or characteristic	Asia									Europe	USA
	Hong Kong	Indonesia	Malaysia	Philippines	Singapore	South Korea	Taiwan	Thailand	Vietnam		
Prevalence of HF	2%–3% <sup>a</sup>	5%	–	1%–2%	–	0.6%	6%	0.4%	–	1%–2%	2%
Demographic characteristics of HF patients											
Male	45%	66%	75%	57%	64%	55%	72%	–	59%	61%	53%
Female	55%	34%	26%	43%	36%	45%	28%	–	41%	39%	47%
Mean age at admission (years)	76.8	57.8	61.8	60	66.6	69	64	67	59	70	74
Cardiovascular risk factors											
Ischemic heart disease	29%	35%	68%	52%	37%	37%	44%	45%	32%	54%	46%
Valvular/rheumatic heart disease	6%	18%	29%	20%	–	14%	8%	19%	18%	–	–
Cardiomyopathy (non-ischemic)	1%	2%	28%	11%	–	21%	34%	14%	21%	–	–
Hypertensive heart disease	70%	8%	2%	6%	–	4%	7%	12%	21%	–	23%
Other causes <sup>b</sup>	–	2%	5%	7%	–	11%	7%	–	–	–	–
Hypertension	–	33%	75%	64%	69%	–	33%	31%	–	63%	76%
Current smoking	13%	28%	9%	54%	45%	–	24%	7%	31%	–	–
Diabetes mellitus	36%	37%	67%	41%	55%	–	43%	47%	–	33%	43%
Dyslipidemia	–	31%	52%	38%	65%	–	24%	51%	5%	–	44%
Overweight	–	47%	25%	21%	–	–	–	–	–	–	–
Renal disease	–	24%	31%	4%	–	–	31%	19%	5%	17%	50%
Atrial fibrillation	–	16%	24%	–	21%	–	26%	24%	22%	39%	31%
Coronary heart disease	–	35%	73%	52%	49%	–	43%	47%	–	54%	50%
Cerebrovascular disease	–	2%	7%	0%	15%	–	9%	12%	–	–	–
COPD	–	18%	13%	2%	12%	–	12%	8% <sup>c</sup>	3%	19%	–

Missing data are not available.

<sup>a</sup> In patients aged >85 years.<sup>b</sup> Including tachycardia, congenital heart disease and cardiopulmonary heart disease.<sup>c</sup> COPD or asthma.

hospitalizations annually. In some countries, HF accounted for more than a fifth of total hospitalizations (19% in Thailand). Rates of readmission ranged between 3% and 15% at 30 days. Asian HF patients spent between 5 days (Indonesia) and 12.5 days (Taiwan) in hospital, comparable with the range seen across North America and Europe. The rate of in-hospital mortality was also similar to values reported in Europe and the USA. The reported rates of mortality at 30 days varied from 1% in Malaysia to 17% in Indonesia (though the exact reasons for this discrepancy remain unclear).

The pharmacological treatment of Asian patients with HF followed closely the management strategies laid out in the North American and European guidelines (Table 3) [35,39], which are viewed as sources of professional guidance in all of the countries in our survey. Renin-angiotensin-aldosterone system (RAAS) inhibitors were widely prescribed (from 61% in Taiwan to 90% in Vietnam), more often as ACE inhibitors than angiotensin II receptor blockers. The majority of patients received diuretics (76% to 99%). Beta-blockers (32% to 78%) and digoxin (19% to 53%) were also prescribed, though less frequently. National HF (professional) guidelines for the management of HF were available in most countries: Indonesia, Singapore, Taiwan, Thailand, and Vietnam, and are in preparation in South Korea and the Philippines. Currently,

there are none in Hong Kong. Only Thailand and South Korea had a national society devoted to HF. A national HF registry has been set up in Singapore with metrics to evaluate the management of HF on both the hospital and the national level.

#### 4. Discussion

Although our report includes nine varied Asian countries with a wide range of economic wealth and demographic differences, the available data clearly show that HF is a major healthcare problem across the region. In general the etiological factors appear very similar to those reported in Europe and North America with a high prevalence of HF of ischemic origin, pointing towards a westernization of lifestyle in our countries as it has been documented in China and India [40,41]. Coronary heart disease, dyslipidemia, and diabetes mellitus were frequent in our survey, and are probably related to lifestyle changes characterized by a decrease in physical activity and a higher calorie/fat intake [42]. Hospital practice also appears similar in terms of length of stay and mortality to most published data, and high readmission rate is also noted. In contrast with Europe and North America, there are few national professional societies for HF, and few systematic registries or

**Table 2**

Heart failure (HF) hospitalization and mortality in the 9 Asian countries or regions, and Europe and the USA [3,20,22–24,35–38].

Hospitalization characteristics	Asia									Europe	USA
	Hong Kong	Indonesia	Malaysia	Philippines	Singapore	South Korea	Taiwan	Thailand	Vietnam		
Hospitalizations											
HF hospitalizations per year	18,000	–	–	–	6000	–	40,000	–	–	–	>1M
% of total hospitalizations	–	–	–	9%	–	–	2.2%	19%	15%	–	–
Readmission rate											
By 30 days	–	7%	8%	–	17.6% (90 days)	–	3%–15%	–	7%	–	25%
Hospital stay											
Mean (days)	6–10	5	9.24	10	5.1	–	12.5	7.5	8.7	–	–
Median (range) (days)	–	5	7 (4–11)	7 (1–133)	–	8	8 (1–148)	–	9 (2–30)	8	5
Mortality											
Inpatient	–	3%	6%	7%	1.1%	6.1%	–	6%	7%	6%	4%
Within 30 days of discharge	–	17%	1%	10%	–	–	–	–	2%–3%	–	10%
Annual cost of HF (US\$ million)											
Cost of hospitalization (US\$ per pt)	2916–4860	813	–	–	–	8887	2388	3606	1000	–	23,077

Missing data are not available.

**Table 3**  
Pharmacological treatment of HF in 9 Asian countries or regions, and Europe and the USA [26,28,35,39].

Pharmacological treatment of HF	Asia									Europe	USA
	Hong Kong	Indonesia	Malaysia	Philippines	Singapore	South Korea	Taiwan	Thailand	Vietnam		
RAAS inhibitor	52%	78%	67%	70%	74%	65%	61%	77%	90%	89%	66%
Beta-blocker	39%	32%	72%	38%	65%	44%	57%	78%	41%	87%	81%
Calcium channel blocker	–	–	17%	12%	–	–	12%	–	–	10%	–
Ivabradine	–	–	–	0%	–	–	–	6%	21%	–	–
Diuretic	84%	78%	99%	76%	87%	80%	92%	–	–	83%	–
Digoxin	11%	21%	44%	53%	27%	26%	–	–	19%	21%	–
Lipid-lowering agent	–	–	76%	–	72%	–	–	–	–	54%	62%
Anticoagulant	–	–	25%	26%	12%	–	20%	–	30%	43%	65%

Missing data are not available.

audit studies. Most countries have national guidelines for HF, largely based on international guidelines.

There appears to be much room for improvement in terms of physician adherence to national and international clinical practice guidelines, as shown by the low rate of beta-blockers use in some countries (e.g., Indonesia and the Philippines). Indeed, few patients appear to receive simultaneously all four drugs shown to improve outcome for patients with HFREF (ACE inhibitor, beta-blocker, mineralocorticoid receptor antagonist, and for those in sinus rhythm, ivabradine). Efforts to monitor and improve identification of patients for such therapies are likely to improve patient outcome and also reduce healthcare expenditure (by reducing hospitalization rates) [43].

The authors are aware that post-discharge follow up for HF patients is relatively rare in the countries represented in this survey. Initiatives for patient and family education are also scarce, as shown by the limited number of specialized HF care centers (e.g., in Indonesia, which covers a huge geographical area consisting of many islands). It is likely that efforts to improve transitional care and patient education, as recommended in the most recent North American and European guidelines, would improve readmission rates and long-term compliance with life-saving therapy. This is likely to be a particular challenge in countries with a low GDP per capita, and without a national professional society to lobby for an increased focus on HF at the local and national levels. Delivering care across complex geographies is also likely to be challenging.

The large variation in the sources of collected data is the main limitation of our report. We endeavored to report the best available data based on national or regional surveys, and succeeded to do so in most countries. For Indonesia, Vietnam, and Malaysia, data originate from single hospital center and may not be generalizable to the whole country, especially when they arise from highly specialized center such as the Hanoi Heart Hospital. However, in the absence of national or regional registries in these countries, the reliability of single hospital-based estimates remains difficult to establish. We hope that this publication may help foster such initiatives and highlight the need for good data to drive quality improvement initiatives, such as has been seen in the USA (Get with the Guidelines, American Heart Association) and the UK (National HF Audit and National Institute for Health and Care Excellence Guidelines and Quality Standards) [44–46].

The authors of this report have set up a task force to help foster a more comprehensive and organized approach to HF care in their region. This includes initiatives to optimize prescription of appropriate drug therapies by the introduction of hospital protocols and checklists, improving patient education using a patient passport and a smart phone Application, and upskilling non-cardiologists (including HF nurses) in the follow-up of patients after discharge from hospital. The impact of such initiatives will be reported in a future publication.

### Conflicts of interest

All authors have received honoraria, travel grants, and medical writing assistance from Servier. David Sim has received honorarium and

speaker fees from Novartis and Pfizer. Eugenio Reyes received honoraria, speaker fees, and research grants from AstraZeneca Philippines, E. Merck Philippines, Torrent, Zydus, and Novartis. Martin Cowie received personal fees and research grants from Bayer and ResMed, and personal fees from Novartis, Medtronic, Boston Scientific, St Jude Medical, and Pfizer.

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