Preface

The APHRS was founded in 2008 with the goal to promote the care, education, and research in heart rhythm disorders in Asia-Pacific countries. In pursuit of this goal, the APHRS has developed a White Book in 2010 under the leadership of Prof Shu Zhang, China, to collect basic statistical data and other information on the current status of interventional therapies for cardiac arrhythmia in Asia-Pacific countries. Such data have never been available before.

Interventional therapies for cardiac arrhythmias have developed rapidly in the Asia-Pacific region in recent decades, accompanied by the rapid growth of electrophysiological procedures and use of cardiac implantable electronic devices (CIEDs). However, significant inequalities exist in healthcare across Asia-Pacific countries and regions and in treatment of cardiac arrhythmia specifically, which highlight the importance and the necessity for the healthcare community to share, recognize, and communicate within itself the data and information on the current status of cardiac electrophysiology and arrhythmia treatment. My fellow members and I hope that the annually updated White Book will not only promote scientific, technological, and clinical development for better treatment of cardiac arrhythmias, but also improve healthcare and reduce inequalities in care for patients across Asia-Pacific countries and regions.

The APHRS White Book reports the most updated and comprehensive information on the current situation in the field of arrhythmia treatment, encompassing country demographics, epidemiology of cardiac arrhythmia, usage of CIEDs (pacemakers, implantable cardioverter defibrillators, and cardiac resynchronization therapy), and interventional electrophysiology. Prof Zhang first presented such data from 7 countries in the scientific session of APHRS 2012, and the next year the Society published the first edition of the APHRS White Book during the scientific session of APHRS 2013. Since then, the APHRS White Book has been updated each year. With the continuous efforts of the Society in the past 8 years, the APHRS White Book has gained increasing attention from researchers and clinicians across Asia-Pacific countries and regions.

The current Ninth Edition of the APHRS White Book is much extended. This new edition comprises data from 18 countries and regions. As before, data collection is

mostly the result of voluntary participation of each county or region's representative Society of Pacing and Electrophysiology or Heart Rhythm Society. In some other Asia-Pacific countries, there are currently no registries and data are limited. As such, the APHRS White Book marks the beginnings of an international registry compiled by collaborative efforts between countries, which may also encourage the adoption of a systematic approach to data collection on arrhythmia therapies in each country and region.

May I take this opportunity to thank and congratulate Prof Zhang and his team for putting this excellent job together. I would also like to thank the country representatives and members of individual national HRS working group who have voluntary contributed important data from their countries.

Dr Tachapong Ngarmukos
President of APHRS (2021)

Acknowledgements

As a member of APHRS and the chief editor of this book, I would like to express my great appreciation for all who made possible the publication of the Ninth edition of the APHRS White Book. I owe particular thanks to the the Immediate Past president of APHRS, Professor Chu-Pak LAU, current president of APHRS, professor Tachapond who led the preparation of this edition of the APHRS White Book. I would like to thank our board members for their great support of this work. My deep gratitude also goes to all contributors, the national Societies of Pacing and Electrophysiology and the national Heart Rhythm Societies of 18 member countries or regions of APHRS. Without their voluntary collection of data, this book would never have been completed. In particular, I'd like to thank Mr. Jimmy Yap, and the secretary of APHRS, who helped collect data from member countries and regions. Finally, I would like to express my appreciation to the members of my working group, Dr. Xiaohan Fan and Dr Xiaohui Ning, who performed secondary research to verify and establish the quantitative and qualitative information contained in the book.

Shu Zhang, MD, PhD, FHRS, FESC
Chief Editor of the APHRS White Book 2021

APHRS Board of Trustees

(January 1-December 31, 2020)

Immediate Past President
Chu-Pak Lau
(Hong Kong)

President
Tachapong Ngarmukos
(Thailand)

First Vice President
Wataru Shimizu
(Japan)

Second Vice President
Chen-Chuan Cheng
(Taiwan)

First Secretary General
Hui-Nam Pak
(Korea)

Second Secretary General
Wei Hua
(China)

Scientific Program Chair
Hung-Fat Tse
(Hong Kong)

Treasurer
Kyoko Soejima
(Japan)

Chief Editor of the Official Journal
Shih-Ann Chen
(Taiwan)

Representing Members from Each Country or Region

Australia	Saurabh Kumar
Brunei Darussalam	Sofian Johar
Cambodia	Chandara Mam
Hong Kong	Cheuk-Man Yu
India	Ulhas Pandurangi
Islamic Republic of Pakistan	Aamir Hameed Khan
Japan	Wataru Shimizu
Kingdom of Thailand	Sirin Apiyasawat
Malaysia	Kok Wei Koh
Mongolia	Dosjan Yedilkhan
Myanmar	Nwe Nwe
New Zealand	Matthew Webber
People's Republic of China	Minglong Chen
Republic of Indonesia	Dicky A. Hanafy
Republic of Korea	Seil Oh
Republic of Philippines	Eden Gabriel
Republic of Singapore	Toon Wei Lim
Sri Lanka	Asunga Dunuwille
Taiwan	Hsuan-Ming Tsao
Vietnam	Phan Dinh Phong

List of Contributors and Authors

Brunei Darussalam	Sofian Johar
Hong Kong	Ngai-Yin Chan
India	Ulhas Pandurangi
Islamic Republic of Pakistan	Aamir Hameed Khan
Japan	Wataru Shimizu
Kingdom of Thailand	Sirin Apiyasawat
Malaysia	Kok Wei Koh
Mongolia	Dosjan Yedilkhan
Myanmar	Nwe New
New Zealand	Matthew Webber
People's Republic of China	Shu Zhang, Xiaohan Fan, Xiaohui Ning
Republic of Indonesia	Dicky A. Hanafy
Republic of Korea	Seil Oh
Republic of Philippines	Eden Gabriel, Giselle Gervacio
Republic of Singapore	Ching Chi Keong
Taiwan	Hsuan-Ming Tsao
Vietnam	Phan Dinh Phong

Table of Contents

Country/Region: PR.China

1. Statistics

	2017	2018	2019	2020
Population(thousand)[1]	1390080	1395380	1400050	1411780
Hospitals	31056	33009	34354	34354
Beds(per 100,000 population) [1]	572.20	572.20	630	630
Physicians(per 1,000 population)[1]	2.21	2.40	2.40	2.4
Nurses(per 1,000 population)[1]	2.36	2.70	2.70	2.7
GDP (US$, billions)[3]	13173.585	134572.67	143647.03	158800
Total expenditure on health as % GDP[2]	6.2%	6.2%	6.6%	7.12%
Government expenditure on health as %	30.88%	30.88%	30.88%	30.4%
Insured citizens (%)	70%	70%	70%	70%
SCD patients	0.54m	0.54m	0.54m	0.54m
Heart failure patients	4.5m	4.5m	4.5m	4.5m
AF patients	8m	8m	8m	8m

1, www.stats.gov.cn

2, www.who.int

3, www.imf.org

2. Pacemaker

	2017	2018	2019	2020
Total Pacemakers	76717	82779	90524	86181
New implants	63312	68660	72419	
Replacements	13405	14119	18105	
Single-chamber	20762	20853	26959	23731
Dual-chamber	55955	61926	63565	62450
Sick sinus syndrome	38791	40008	45388	
AV block	31122	34938	39396	
Implanting Centers	1055	1066	946	
Implanting Physicians	3000	3000	3433	
National Registry	☑	☑		

3. Cardiac resynchronization therapy

	2017	2018	2019	2020
Total CRTs	4138	4432	4523	3896
CRT-P	1633	1724	1628	
CRT-P new implants	1135			
CRT-P replacements/upgrade	498			
CRT-D	2505	2708	2895	2525
CRT-D new implants	1993			
CRT-D replacements/upgrade	512			
Ischemic	1319	1460	1492	
Non-ischemic	2819	2972	3031	
Implanting Centers	403	410	366	
Implanting Physicians	3000	3000	3433	
National Registry	☑	☑		

4. Implantable cardioverter defibrillator

	2017	2018	2019	2020
Total ICDs	4092	4471	5031	4800
ICD new implants	3541	3897		
ICD replacements	551	574		
Single-chamber	2550	2739	3119	2392
Dual-chamber	1542	1732	1912	2408
Primary prevention	1821	2129	2264	2540
Secondary prevention	2271	2342	2767	2260
Implanting Centers	433	459	408	
Implanting Physicians	3000	3000	3433	
National Registry	☑	☑		

5. Interventional electrophysiology

	2017	2018	2019	2020
Ablation procedures	133897	151595	173950	156873
SVT ablation procedures	80809	76971	77557	
AVNRT	40874	38754	38975	
AVRT/WPW	28885	26447	30065	
AFL (RA isthmus dependent)	5903	6428	4628	
AT	5147	5342	3889	
VT/VPC	-			
Idiopathic	-			
Structural	-			
AF ablation procedures	36615	48317	57275	56012
Ablation centers	863	886	812	
AF ablation centers	420	429		
Structural VT ablation centers	-			
Ablation physicians	2000	2000	2289	
AF ablation physicians	-			
Structural VT ablation physicians	-			
National Registry	☑	☑		

6. Management

National certification for physicians	☐PM	☐CRT	☐ICD	☐Ablation
National accreditation for centers	☐PM	☐CRT	☐ICD	☐Ablation
Guidelines followed	☐National	☐U.S.	☐Europe	☐AP

Payment (%)	Pacemaker	ICD	CRT	Ablation
Government	-	-	-	-
Insurance	-	-	-	-
Public insurance	-	-	-	-
Private insurance	-	-	-	-
Individual	-	-	-	-

Obstacles to guideline implementation (1=no obstacle, 5=great obstacle)

	1	2	3	4	5
Lack of centers	☑	☐	☐	☐	☐
Lack of reimbursement, limited financial resources	☐	☐	☐	☑	☐
Lack of referral	☐	☐	☑	☐	☐
Lack of trained personnel	☐	☐	☑	☐	☐
Low awareness of guidelines	☐	☐	☑	☐	☐
Lack of operators	☐	☐	☑	☐	☐

7. Source

Chinese Society of Pacing and Electrophysiology (CSPE)

Country/Region: Brunei Darussalam

1. Statistics

	2017	2018	2019	2020
Population (thousand)[1]	421	442	459	453
Hospitals	6	6	6	6
Beds	1224*			
Physicians	683			
Nurses	2713			
GDP (US$, billions)	12.1	13.5	13.4	12.2
Total expenditure on health as % GDP	1.9	1.9	2.1	2.3
Government expenditure on health (US$)	234,000,000	255,750,000	286,440,000	277,000,000
Insured citizens (%)				
SCD patients				
Heart failure patients				
AF patients				

* includes beds in Ministry of Health facilities only

2. Pacemaker

	2017	2018	2019	2020
Total Pacemakers	52	75	52	81
New implants	41	67	40	63
Replacements	11	8	12	18
Single-chamber	12	27	11	26
Dual-chamber	40	48	41	55
Sick sinus syndrome	-		30	44
AV block	-		18	30
Implanting Centers	2	2	2	2
Implanting Physicians	5	5	6	6
National Registry	☐			

	2017	2018	2019	2020
SSS	24	45	30	44
AVN	26	21	18	30
Bi Nodal	2	7	3	3
Others		2	1	4

3. Cardiac resynchronization therapy

	2017	2018	2019	2020
Total CRTs	16	13	19	22
CRT-P	6	4	4	8
CRT-P new implants	2	0	4	3
CRT-P replacements/upgrade	4	4	0	5
CRT-D	10	9	15	14
CRT-D new implants	5	5	13	11
CRT-D replacements/upgrade	5	4	2	3
Ischemic	3	7	10	11
Non-ischemic	7	2	9	11
Implanting Centers	2	2		2
Implanting Physicians	5	2		1
National Registry	☐			

*exclude CRT-P for ischemic & non ischemic.

4. Implantable cardioverter defibrillator

	2017	2018	2019	2020
Total ICDs	18	31	44	30
ICD new implants	14	30	37	27
ICD replacements	4	1	7	3
Single-chamber	3	2	1	3
Dual-chamber	15	29	43	27
Primary prevention	16	23	35	25
Secondary prevention	2	7	9	5
Implanting Centers	2	2	2	2
Implanting Physicians	5	5	6	6
National Registry	☐			

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2017	2018	2019	2020
Total lead extraction procedures	3	6	2	2
Hospitals performed lead extraction	1	1	1	1
Cardiologists performing lead extraction	1	1	1	1
Surgeons performing lead extraction	0	0	0	0
National Registry	☐			

6. Interventional electrophysiology

	2017	2018	2019	2020
Ablation procedures	103	149	103	92
SVT ablation procedures	32	29	41	29
AVNRT	19	21	10	14
AVRT/WPW	4	8	11	4
AFL(RA isthmus dependent)	1	9	11	5
AT	8	3	9	6
VT/VPC	15	7	15	30
Idiopathic	9	3	9	17
Structural	6	4	6	13
AF ablation procedures	56	59	47	33
Ablation centers	-	-		
AF ablation centers	1	1	1	1
Structural VT ablation centers	1	1	1	1
Ablation physicians	-	-		
AF ablation physicians	2	2	1	1
Structural VT ablation physicians	1	1	1	1
National Registry	☐			

7. Management

National certification for physicians	☐PM	☐CRT	☐ICD	☐ Ablation
National accreditation for centers	☐PM	☐CRT	☐ICD	☐ Ablation

Guidelines followed ☐ National ☑U.S. ☑Europe ☐AP

Payment (%)	Pacemaker	ICD	CRT	Ablation
Government				
Insurance				
Public insurance				
Private insurance				
Individual				

Obstacles to guideline implementation (1=no obstacle, 5=great obstacle)

	1	2	3	4	5
Lack of centers	☐	☑	☐	☐	☐
Lack of reimbursement, limited financial resources	☐	☑	☐	☐	☐
Lack of referral	☐	☑	☐	☐	☐
Lack of trained personnel	☐	☑	☐	☐	☐
Low awareness of guidelines	☐	☑	☐	☐	☐
Lack of operators	☐	☑	☐	☐	☐

8. Source
Name of national working group or arrhythmia body

Cardiac Society, Brunei Darussalam
Ministry of Health, Brunei Darussalam
Department of Economic Planning and Development, Prime Minister's Office, Brunei Darussalam

Country/Region: Hong Kong SAR

1. Statistics

	2017	2018	2019	2020
Population (thousand)[1]	7392	7,482.5	7,520.80	7,428.30
Hospitals	54	55	55	56
Beds	39683	40,434	41,474	42,180
Physicians	14290	14,651	15,004	15,298
Nurses	40505	42,485	44,601	46,168
GDP (US$, billions)	341.15	364.82	367.71	347.53
Total expenditure on health as % GDP	2.33%	2.99%	2.88%	7.00%
Government expenditure on health (US$)	7936mil	10,924mil	10,600mil	24,310mil
Insured citizens (%)				
SCD patients				
Heart failure patients				
AF patients				

1, www.census.gov

2. Pacemaker

	2017	2018	2019	2020
Total Pacemakers	1513	1958	1810 (including 302 leadless pacemakers)	1662 (including 414 leadless pacemakers)
New implants	1191			
Replacements	322			
Single-chamber	-			
Dual-chamber	-			
Sick sinus syndrome	-			
AV block	-			

Implanting Centers	-	-		
Implanting Physicians	-	-		
National Registry	☐	☐		

3. Cardiac resynchronization therapy

	2017	2018	2019	2020
Total CRTs	-	179	164	183
CRT-P	-	71	27	41
CRT-P new implants	-			
CRT-P replacements/upgrade	-			
CRT-D	-	108	137	142
CRT-D new implants	-			
CRT-D replacements/upgrade	-			
Ischemic	-			
Non-ischemic	-			
Implanting Centers	-			
Implanting Physicians	-			
National Registry	☐			

4. Implantable cardioverter defibrillator

	2017	2018	2019	2020
Total ICDs	142	268	274	234
ICD new implants	83			
ICD replacements	59			
Single-chamber	-			
Dual-chamber	-			
Primary prevention	-			
Secondary prevention	-			
Implanting Centers	-			
Implanting Physicians	-			
National Registry	☐			

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2017	2018	2019	2020
Total lead extraction procedures	-			
Hospitals performed lead extraction	-			
Cardiologists performing lead extraction	-			
Surgeons performing lead extraction	-			
National Registry	☐			

6. Interventional electrophysiology

	2017	2018	2019	2020
Ablation procedures	-	-	768	656
SVT ablation procedures	-	-		
AVNRT	-	-		
AVRT/WPW	-	-		
AFL (RA isthmus dependent)	-	-		
AT	-	-		
VT/VPC	-	-		
Idiopathic	-	-		
Structural	-	-		
AF ablation procedures	-	-		
Ablation centers	-	-		
AF ablation centers	-	-		
Structural VT ablation centers	-	-		
Ablation physicians	-	-		
AF ablation physicians	-	-		
Structural VT ablation physicians	-	-		
National Registry	☐	☐		

7. Management

National certification for physicians ☐PM ☐CRT ☐ICD ☐Ablation

National accreditation for centers	☐PM	☐CRT	☐ICD	☐Ablation
Guidelines followed	☐National	☐U.S.	☐Europe	☐AP

Payment (%)	Pacemaker	ICD	CRT	Ablation
Government	-	-	-	-
Insurance	-	-	-	-
Public insurance	-	-	-	-
Private insurance	-	-	-	-
Individual	-	-	-	-

Obstacles to guideline implementation (1=no obstacle, 5=great obstacle)

	1	2	3	4	5
Lack of centers	☐	☐	☐	☐	☐
Lack of reimbursement, limited financial resources	☐	☐	☐	☐	☐
Lack of referral	☐	☐	☐	☐	☐
Lack of trained personnel	☐	☐	☐	☐	☐
Low awareness of guidelines	☐	☐	☐	☐	☐
Lack of operators	☐	☐	☐	☐	☐

8. Source

Name of national working group or arrhythmia body

Country/Region: India

1. Statistics

	2017	2018	2019	2020
Population (bn)	1.342	1.354	1.38	1.39
Urban Hospitals (Govt. only)	-	8812	4375	25778
Beds (Govt. only)	-	1013017	713986	739024
Physicians	-	-	1154686	1.25 million
Nurses	-	-	ANM =860927; RN &RM = 2048979	ANM =0.90 million; RN &RM = 2151850
GDP (US$ - billion)	2597	2716	3202	2,708.77
Total expenditure on health as % GDP	2.5%	3.66 as per WHO and World Bank 2016 data; 1.5% as per Indian Health Ministry data	4%	3.6%
Government expenditure on health as %	-	1.02	1.6	1.6
Insured citizens (in Millions)	-	482	472	500
SCD patients[i1] (in Thousands)	-	202	204	700

1, http://www.worldometers.info/world-population/india-population/

2, https://data.gov.in/catalog/number-government-hospitals-and-beds-rural-and-urban-areas

3, http://statisticstimes.com/economy/gdp-of-india.php.

4, https://www.ihs.com/country-industry-forecasting.html?ID=1065985237

5, http://www.japi.org/december_2014/006_ra_sudden_cardiac_death.pdf.

6, http://csiheartfailure2015.org/

Heart failure patients[ii] (in Millions)	-	1.145	1.2	1.3-4.6
AF patients (million)	-	4.26	4.5	26.6

2. Pacemaker

	2017	2018	2019	2020
Total Pacemakers	38700	44700	48,860	44843
New implants	70%	70%	70%	32035
Replacements	30%	30%	30%	12808
Single-chamber	22200	25100	26,028	18829
Dual-chamber	16500	19600	22,832	23864
Sick sinus syndrome[iii]	20%	20%	20%	8968
AV block	80%	80%	80%	35875
Implanting Centers	1120	1120	1500	1120
Implanting Physicians	1560	1560	2000	1000
National Registry	☐	0	1	

3. Cardiac resynchronization therapy

	2017	2018	2019	2020
Total CRTs	2500	3000	3608	2816
CRT-P	1000	1200	1372	1120
CRT-P new implants	80%	88%	90%	1008
CRT-P replacements/upgrade	20%	12%	10%	112
CRT-D	1500	1800	2236	1696
CRT-D new implants	75%	82%	85%	1425
CRT-D replacements/upgrade	25%	18%	15%	271
Ischemic		40%	40%	50%
Non-ischemic		60%	60%	50%
Implanting Centers	345	345	350	1120
Implanting Physicians	395	395	400	1000
National Registry	☐	1	1	

4. Implantable cardioverter defibrillator

	2017	2018	2019	2020
Total ICDs	3500	4100	5021	4210

ICD new implants	75%	85%	88%	3793
ICD replacements	25%	15%	12%	517
Single-chamber	2300	2800	3360	2608
Dual-chamber	1200	1300	1661	1702
Primary prevention	20%	20%	22%	30%
Secondary prevention	80%	80%	78%	70%
Implanting Centers	400	400	400	1120
Implanting Physicians	515	515	500	1000
National Registry	☐	1	1	

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2017	2018	2019	2020
Total lead extraction procedures	-	170	84	50
Hospitals performed lead extraction	-	26	15	15
Cardiologists performing lead extraction	-	84	25	25
Surgeons performing lead extraction	-	8	6	8
National Registry	☐	0	0	

6. Interventional electrophysiology

	2017	2018 (Incomplete data, obtained only from a few centers)	2019 (Data from limited centers)	2020
Ablation procedures		7910	4659	4800
SVT ablation procedures		6642	3328	4000
AVNRT		4066	2342	
AVRT/WPW		2152	1482	
AFL (RA isthmus dependent)		424	239	
AT		456	220	
VT/VPC		1025	597	800

Idiopathic		618	262	
Structural		407	168	
AF ablation procedures		215	146	200
Ablation centers	176		66	150
AF ablation centers	30		29	15
Structural VT ablation centers	93		21	55
Ablation physicians	135		54	200
AF ablation physicians	41		31	30
Structural VT ablation physicians	83		35	80
National Registry	☐		0	

7. Management

National certification for physicians	☐PM	☐CRT	☐ICD	☐ Ablation
National accreditation for centers	☐PM	☐CRT	☐ICD	☐ Ablation
Guidelines followed	☐ National	√ U.S.	√ Europe	☐AP

Payment (%)	Pacemaker	ICD	CRT	Ablation
Government	60%	35%	40%	25%
Insurance	10%	10%	10%	50%
Public insurance				25%
Private insurance				25%
Individual	30%	55%	50%	25%

Insurance data – External consultant data, Media source

Obstacles to guideline implementation (1=no obstacle, 5=great obstacle)

	1	2	3	4	5
Lack of centers	☐	☐	☑	☐	☐
Lack of reimbursement, limited financial resources	☐	☐	☐	☑	☐
Lack of referral	☐	☐	☑	☐	☐
Lack of trained personnel	☐	☐	☐	☑	☐
Low awareness of guidelines	☐	☐	☐	☑	☐
Lack of operators	☐	☐	☑	☐	☐

8. Source

Name of national working group or arrhythmia body

INDIAN HEART RHYTHM SOCIETY

Country/Region: Indonesia

1. Statistics

	2017	2018	2019	2020
Population (thousand)[1]	261,890	265,050	268,074	271,066
Hospitals[2]	2,773	2,813	2,877	2,985
Beds[2]	353,136	310,710	321,544	379,548
Physicians[2]	192,879	205,597	228,180	233,064
Nurses[2]	345,276	354,218	345,508	438,234
GDP (US$, billions)	1,015.53	1,042.17	1,063.5	1,058.4
Total expenditure on health as % GDP	3.4	3.3	4.2	3.1
Government expenditure on health (US$)	124	124	4.510	14.66
Insured citizens (%)	72.9	78	83.94	82.05
SCD patients	-	-	-	-
Heart failure patients	-	-	-	-
AF patients	-	-	-	-

[2] Indonesian Health Profile 2019, Ministry of Health

2. Pacemaker

	2017	2018	2019	2020
Total Pacemakers	1049	1609	1637	1840
New implants	969	1522	1518	1714
Replacements	80	87	119	126
Single-chamber	693	1109	1075	1268
Dual-chamber	356	500	563	572
Sick sinus syndrome	381	555	673	676
AV block	668	1054	964	1102
Implanting Centers	65	65	65	65
Implanting Physicians	111	111	119	119
National Registry	☐	☐	☐	☐

3. Cardiac resynchronization therapy

	2017	2018	2019	2020
Total CRTs	63	62	63	55
CRT-P	29	31	35	32
CRT-P new implants	21	26	26	26
CRT-P replacements/upgrade	8	5	9	6
CRT-D	34	31	28	23
CRT-D new implants	28	28	22	20
CRT-D replacements/upgrade	6	3	6	3
Ischemic	24	34	32	39
Non-ischemic	39	28	31	16
Implanting Centers	8	12	12	11
Implanting Physicians	15	25	25	24
National Registry	☐	☐	☐	☐

4. Implantable cardioverter defibrillator

	2017	2018	2019	2020
Total ICDs	45	49	56	45
ICD new implants	38	44	49	37
ICD replacements	7	5	7	8
Single-chamber	40	35	37	29
Dual-chamber	5	14	19	16
Primary prevention	15	9	10	20
Secondary prevention	30	40	46	25
Implanting Centers	11	14	14	15
Implanting Physicians	19	25	25	26
National Registry	☐	☐	☐	☐

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2017	2018	2019	2020
Total lead extraction procedures	13	6	12	13
Hospitals performed lead extraction	9	8	9	8
Cardiologists performing lead extraction	17	17	17	21
Surgeons performing lead extraction	2	2	7	12
National Registry	☐	☐	☐	☐

6. Interventional electrophysiology

	2017	2018	2019	2020
Ablation procedures	760	880	1193	885
SVT ablation procedures	343	404	680	283
AVNRT	210	239	377	165
AVRT/WPW	133	165	228	34
AFL (RA isthmus dependent)	18	32	31	34
AT	41	32	44	17
VT/VPC	296	346	433	252
Idiopathic	249	312	386	30
Structural	47	34	47	30
AF ablation procedures	55	67	68	49
Ablation centers	19	16	17	21
AF ablation centers	7	9	11	11
Structural VT ablation centers	7	10	12	13
Ablation physicians	23	24	26	33
AF ablation physicians	18	17	17	22
Structural VT ablation physicians	17	18	20	23
National Registry	☐	☐	☐	☐

7. Management

National certification for physicians	☑PM	☑CRT	☑ICD	☑ Ablation
National accreditation for centers	☐PM	☐CRT	☐ICD	☑ Ablation
Guidelines followed	☑ National	☐U.S.	☐Europe	☐AP

Payment (%)	Pacemaker	ICD	CRT	Ablation
Government	85	90	80	90
Insurance	13	10	15	7
Public insurance	-	-	-	-
Private insurance	-	-	-	-
Individual	2	0	5	3

Obstacles to guideline implémentation (1=no obstacle, 5= great obstacle)

	1	2	3	4	5
Lack of centers	☐	☐	☑	☐	☐
Lack of reimbursement, limited financial resources	☐	☐	☐	☑	☐
Lack of referral	☐	☐	☑	☐	☐
Lack of trained personnel	☐	☑	☐	☐	☐
Low awareness of guidelines	☐	☐	☑	☐	☐
Lack of operators	☐	☑	☐	☐	☐

8. Source

Indonesian Heart Rhythm Society (InaHRS)

Country/Region: Japan

1. Statistics

	2017	2018	2019	2020
Population (thousand)[1]	126706	126496	126167	126226
Hospitals (per 100,000 population)	6.62			
Beds	1652102	1662567	1627288	1596328
Physicians (per 1,000 population) [2]				
Nurses (per 1,000 population) [2]				
GDP (US$, billions) [3]	4884.49	4938,64	4,971.77	5,048.69
Total expenditure on health as % GDP [2]	10.9			
Government expenditure on health as % [2]				
Insured citizens (%)				
SCD patients				
Heart failure patients				
AF patients				

2. Pacemaker

	2017	2018	2019	2020
Total Pacemakers	60137	61238	63411	64277
New implants	41895	43495	44359	43862
Replacements	18242	17743	19052	20415
Single-chamber	11734	13209	12575	12156
Dual-chamber	48403	48029	50836	52121
Sick sinus syndrome				
AV block				
Implanting Centers				
Implanting Physicians				
National Registry	☐			

3. Cardiac resynchronization therapy

	2017	2018	2019	2020
Total CRTs	4782	4778	5149	5475
CRT-P	1213	1330	1503	1620
CRT-P new implants	922	1041	1201	1279
CRT-P replacements/upgrade	291	289	302	341
CRT-D	3569	3448	3646	3855
CRT-D new implants	2399	2367	2406	2334
CRT-D replacements/upgrade	1170	1081	1240	1521
Ischemic	-			
Non-ischemic	-			
Implanting Centers	-			
Implanting Physicians	-			
National Registry	☐			

4. Implantable cardioverter defibrillator

	2017	2018	2019	2020
Total ICDs	6691	6772	6552	5779
ICD new implants	4288	4405	4341	3902
ICD replacements	2403	2367	2211	1877
Single-chamber	1931	2039	2096	1802
Dual-chamber	4760	4733	4456	3977
Primary prevention	-			
Secondary prevention	-			
Implanting Centers	-			
Implanting Physicians	-			
National Registry	☐			

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2017	2018	2019	2020
Total lead extraction procedures	588	648	819	1008
Hospitals performed lead extraction	96	106	109	144

Cardiologists performing lead extraction	87	100	103	138
Surgeons performing lead extraction	9	6	6	6
National Registry	☐	+(J-LEX)	+(J-LEX)	+(J-LEX)

6. Interventional electrophysiology

	2017	2018	2019	2020
Ablation procedures	75000	80000	96000	100000
SVT ablation procedures	15000	15000	11000	11000
AVNRT	-		7500	7500
AVRT/WPW	-		3500	3500
AFL (RA isthmus dependent)	-		10000	12000
AT	-		3000	5000
VT/VPC	6000	6000	6000	7000
Idiopathic	-			
Structural	-			
AF ablation procedures	54000	59000	62000	74000
Ablation centers	700	700	700	750
AF ablation centers	500	500	500	550
Structural VT ablation centers	-			
Ablation physicians	2200	2200	2500	2500
AF ablation physicians	1700	1700	2000	2000
Structural VT ablation physicians	-			
National Registry	☐	☑	☑	☑

7. Management

National certification for physicians	☐PM	☑CRT	☑ICD	☐ Ablation
National accreditation for centers	☐PM	☑CRT	☑ICD	☐ Ablation

Guidelines followed ☑ National ☐U.S. ☐Europe ☐AP

Payment (%)	Pacemaker	ICD	CRT	Ablation
Government	-	-	-	-
Insurance	-	-	-	-
Public insurance	-	-	-	-
Private insurance	-	-	-	-
Individual	-	-	-	-

Obstacles to guideline implementation (1=no obstacle, 5=great obstacle)

	1	2	3	4	5
Lack of centers	☑	☐	☐	☐	☐
Lack of reimbursement, limited financial resources	☑	☐	☐	☐	☐
Lack of referral	☑	☐	☐	☐	☐
Lack of trained personnel	☑	☐	☐	☐	☐
Low awareness of guidelines	☐	☑	☐	☐	☐
Lack of operators	☑	☐	☐	☐	☐

8. Source

Name of national working group or arrhythmia body

Japanese Heart Rhythm Society

Country/Region: Malaysia

1. Statistics

	2017	2018	2019	2020
Population (Thousand)	32042	32,400	32，733	45,010
Hospitals	147	148	7	7
Beds	42200	42400	1768	1,822
Physicians	53300	53450	715	639
Nurses	104900	105,000	3174	2,643
GDP (RM)	49890	49, 999	1，353，380	1,343,353,380
Total expenditure on health as % GDP	4.5	4.5	4	4
Government expenditure on health as %	50.2	50.2	7	10
Insured citizens (%)	-	-	32	22
SCD patients	-	-	12%	12%
Heart failure patients	-	-	1780	1,638
AF patients	-	-	492	927

***Data source: Portal Rasmi, Kementerian Kesihatan Malaysia (www.moh.gov.my)**

2. Pacemaker

	2017	2018	2019	2020
Total Pacemakers	640	755 (PPM), 87 (leadless)	798	883

New implants	516	597	626	668
Replacements	124	166	172	215
Single-chamber	159	252	233	246
Dual-chamber	481	503	560	569
Sick sinus syndrome	290	296	382	439
AV block	350	370	428	431
Implanting Centers	38	38	7	6
Implanting Physicians	122	127	28	26
National Registry	☑	☑	☑	-

3. Cardiac resynchronization therapy

	2017	2018	2019	2020
Total CRTs	171	177	160	175
CRT-P	40	55	60	56
CRT-P new implants	26	33	38	34
CRT-P replacements/upgrade	14	22	26	25
CRT-D	128	122	84	110
CRT-D new implants	93	92	73	74
CRT-D replacements/upgrade	35	30	19	42
Ischemic	72	65	51	53
Non-ischemic	97	106	55	76
Implanting Centers	16	16	5	6
Implanting Physicians	31	31	15	15

National Registry	☑	☑	☑	–

4. Implantable cardioverter defibrillator

	2017	2018	2019	2020
Total ICDs	213	256	223	207
ICD new implants	183	216	203	204
ICD replacements	30	40	29	46
Single-chamber	154	179	168	184
Dual-chamber	59	76	64	63
Primary prevention	80	91	78	90
Secondary prevention	133	140	154	157
Implanting Centers	21	21	7	6
Implanting Physicians	28	28	23	19
National Registry	☑	☑	☑	

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2017	2018	2019	2020
Total lead extraction procedures	10	12	19	22
Hospitals performed lead extraction	5	7	4	3
Cardiologists performing lead extraction	9	4	9	8
Surgeons performing lead extraction	2	1	3	3
National Registry	☑	☑		

6. Interventional electrophysiology

	2017	2018	2019	2020
Ablation procedures	979	822	891	1,038
SVT ablation procedures	647	611	576	524
AVNRT	283	233	251	253
AVRT/WPW	182	96	156	137
AFL (RA isthmus dependent)	124	90	101	129
AT	49	40	70	51
VT/VPC	232	164	238	268
Idiopathic	86	45	100	226
Structural	137	39	59	42
AF ablation procedures	94	101	122	191
Ablation centers	5	5	5	5
AF ablation centers	5	5	4	4
Structural VT ablation centers	2	2	3	5
Ablation physicians	12	13	8	10
AF ablation physicians	12	13	8	9
Structural VT ablation physicians	12	13	7	10
National Registry	☑	☑		

7. Management

National certification for physicians ☑PM ☑CRT ☑ICD ☑Ablation

National accreditation for centers ☑PM ☑CRT ☑ICD ☑Ablation

Guidelines followed ☑National ☑U.S. ☑Europe ☑AP

Payment (%)	Pacemaker	ICD	CRT	Ablation
Government	100	43	52	100
Insurance				
Public insurance	0	0	0	0
Private insurance	1	4	39	13
Individual	32	32	40	28

Obstacles to guideline implementation (1=no obstacle, 5=great obstacle)

	1	2	3	4	5
Lack of centers	☐	☑	☐	☐	☐
Lack of reimbursement, limited financial resources	☐	☐	☑	☐	☐
Lack of referral	☐	☑	☐	☐	☐
Lack of trained personnel	☐	☑	☐	☐	☐
Low awareness of guidelines	☐	☑	☐	☐	☐
Lack of operators	☐	☑	☐	☐	☐

6 Data source: UMMC, PPUKM, SGH, QEH2, HRPZII, IJN

Country/Region: Mongolia

1. Statistics

	2017	2018	2019	2020
Population (thousand)[1]	3177.9	3,238.5	3,296,9	3,402,7
Hospitals	13	13	58	60
Beds	23897	24884	25661	27083
Physicians	10576	11169	11788	12431
Nurses	11939	12267	12773	13112
GDP (US$, billions)	1.149	1.301	13.85	-
Total expenditure on health as % GDP	-	-	4%	5,6%
Government expenditure on health (US$)	3592390.4	-	458000.0	-
Insured citizens (%)	-	-	-	-
SCD patients	-	-	-	-
Heart failure patients	-	-	-	-
AF patients	-	-	-	-

3, www.census.gov

2. Pacemaker

	2017	2018	2019	2020
Total Pacemakers	115	166	180	237
New implants	112	153	-	225
Replacements	3	13	-	5
Single-chamber	-	-	-	-
Dual-chamber	-	-	180	237
Sick sinus syndrome	-	-	-	60%
AV block	-	-	-	40%
Implanting Centers	1	2	3	3
Implanting Physicians	3	5	6	6
National Registry	☐	none	none	none

3. Cardiac resynchronization therapy

	2017	2018	2019	2020
Total CRTs	2	3	3	7
CRT-P	2	3	3	7
CRT-P new implants	2	3	3	5
CRT-P replacements/upgrade	-	-	-	-
CRT-D	-	-	-	2
CRT-D new implants	-	-	-	2
CRT-D replacements/upgrade	-	-	-	2
Ischemic	-	-	-	2
Non-ischemic	2	3	3	1
Implanting Centers	1	1	1	1
Implanting Physicians	1	1	1	1
National Registry	☐		none	none

4. Implantable cardioverter defibrillator

	2017	2018	2019	2020
Total ICDs	2	5	1	4
ICD new implants	2	5	1	4
ICD replacements	-	-	-	
Single-chamber	2	-	-	1
Dual-chamber	-	5	1	3
Primary prevention	-	-	-	-
Secondary prevention	2	5	-	4
Implanting Centers	1	1	1	1
Implanting Physicians	2	2	2	2
National Registry	☐			none

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2017	2018	2019	2020
Total lead extraction procedures	-	-	1	1

Hospitals performed lead extraction	-	-	1	1
Cardiologists performing lead extraction	-	-	2	2
Surgeons performing lead extraction	-	-	-	-
National Registry	☐		none	none

6. Interventional electrophysiology

	2017	2018	2019	2020
Ablation procedures	49	74	156	90
SVT ablation procedures	44	70	140	86
AVNRT	20	32	98	46
AVRT/WPW	21	26	32	40
AFL(RA isthmus dependent)	2	5	6	1
AT	3	4	4	-
VT/VPC	3	2	10	3
Idiopathic	3	2	10	3
Structural	-		-	-
AF ablation procedures	2	4	6	-
Ablation centers	1	1	1	1
AF ablation centers	1	1	1	1
Structural VT ablation centers	1	1	1	1
Ablation physicians	1	2	2	3
AF ablation physicians	1	1	1	1
Structural VT ablation physicians	1	1	1	1
National Registry	☐		none	none

7. Management

National certification for physicians	☐PM	☐CRT	☐ICD	☐ Ablation
National accreditation for centers	☐PM	☐CRT	☐ICD	☐ Ablation
Guidelines followed	☐ National	☐U.S.	☑Europe	☐AP

Payment (%)	Pacemaker	ICD	CRT	Ablation
Government	75%	75%	75%	75%
Insurance				
Public insurance				
Private insurance				
Individual	25%	25%	25%	25%

Obstacles to guideline implementation (1=no obstacle, 5=great obstacle)

	1	2	3	4	5
Lack of centers	☐	☐	☐	☐	☑
Lack of reimbursement, limited financial resources	☐	☐	☑	☐	☐
Lack of referral	☐	☐	☑	☐	☐
Lack of trained personnel	☐	☐	☐	☐	☑
Low awareness of guidelines	☐	☐	☐	☑	☐
Lack of operators	☐	☐	☐	☐	☑

8. Source

Name of national working group or arrhythmia body

State Third Central Hospital, National Cardiac Center

Mongolian Heart Rhythm Society

Country/Region: Myanmar

1、Statistics

	2017	2018	2019	2020
Population (thousand)	55000	53850	54425	54000
Hospitals (implanting)	8	10	11	12
Beds				
Physicians				
Nurses				
GDP (US$, billions)	64.33	74		
Total expenditure on health as % GDP	1.0			
Government expenditure on health as %	45.9			
Insured citizens (%)				
SCD patients				
Heart failure patients				
AF patients				

1. Pacemaker

	2017	2018	2019	2020
Total pacemakers	554	648	641	509
New implants	529	624	610	479
Replacements	25	24	31	30
Single-chamber	513	589	572	475
Dual-chamber	41	59	69	34
Sick sinus syndrome	273	317	296	259
AV block	281	331	345	250
Implanting Centers	8	10	11	12
Implanting Physicians	18	21	21	21
National Registry	□		–	–

2. Cardiac resynchronization therapy

	2017	2018	2019	2020
Total CRTs	10	13	11	1
CRT-P	5	2	1	
CRT-P new implants	5	2	1	
CRT-P replacements/ upgrade		-		
CRT-D	5	11	10	1
CRT-D new implants		11	10	
CRT-D replacements/upgrade				1
Ischaemic	9	5	6	1
Non-ischaemic	1	8	5	
Implanting Centers	4	4	4	4
Implanting physicians	15	15	15	15
National Registry	☐		–	–

3. Implantable cardioverter defibrillator

	2017	2018	2019	2020
Total ICDs	33	24	37	22
ICD new implants	32	20	37	21
ICD replacements	1	4	-	1
Single-chamber	31	21	32	19
Dual-chamber	2	3	5	3
Primary prevention	8	9	21	12
Secondary prevention	25	15	16	10
Implanting Centers	4	4	5	6
Implanting physicians	15	15	15	15
National Registry	☐		–	–

4. Lead extraction

	2017	2018	2019	2020
Total lead extraction procedure	-	-	-	1
Hospitals performed lead extraction	-	-	-	1
Cardiologists performing lead extraction	-	-	-	2
Surgeons performing lead extraction	-	-	-	-
National Registry	-	-	-	-

5. Interventional Electrophysiology

	2017	2018	2019	2020
Ablation procedures	751	960	1034	601
SVT ablation procedures	672	891	945	555
AVNRT	362	461	519	303
AVRT/WPW	282	398	408	237
AFL (RA isthmus dependent)	15	17	10	5
AT	13	15	8	10
VT/PVC	66	58	76	38
Idiopathic	62	56	69	29
Structural	4	2	7	9
AF ablation procedures	13	11	13-	8
Ablation centers	4	5	6	6
AF ablation centers	1	1	1	1
Structural VT ablation centers	1	1	1	2
Ablation physicians	10	13	13	13
AF ablation physicians	1	1	1	1
Structural VT ablation physicians	1	1	1	2
National Registry	☐	☐		–

6. Management

National certification for physicians ☐PM ☐CRT ☐ICD ☐Ablation
National accreditation for centers ☐PM ☐CRT ☐ICD ☐Ablation
Guidelines followed ☐ National ☑**US** ☑**Europe** ☑**AP**

Payment (%)	Pacemaker	ICD	CRT	Ablation
Government	80 %	-	-	100 %
Insurance	-	-	-	-
Public insurance	-	-	-	-
Private insurance	-	-	-	-
Individual	20 %	100 %	100 %	-

Obstacles to guideline implementation (1=no obstacle, 5=great obstacle)

	1	2	3	4	5
Lack of centers	☑	☐	☐	☐	☐
Lack of reimbursement, limited financial resources	☐	☐	☐	☑	☐
Lack of referral	☐	☑	☐	☐	☐
Lack of trained personnel	☐	☑	☐	☐	☐
Low awareness of guidelines	☐	☑	☐	☐	☐
Lack of operators	☐	☑	☐	☐	☐

7. Source

Yangon General Hospital, North Okkalapa General Hospital, Mandalay General Hospital, No (1) Defense Services General Hospital, No (2) Defense Services General Hospital, Naypyitaw 1000 bedded Hospital, Private Hospitals in Yangon

Country/Region: New Zealand

1. Statistics

	2017	2018	2019	2020
Population (thousand)[1]	4844	4929	5000	4822
Hospitals *(includes every small hosp.)*		220		
Beds *(includes every small hosp.)*		13010		
Physicians		15819		
Nurses		58206		
GDP(US$, billions)[2]		206		
Total expenditure on health as % GDP[2]		9%		
Government expenditure on health as %[2]		80%		
Insured citizens (%)				
SCD patients				
Heart failure patients				
AF patients				

[4] www.census.gov

[5] www.imf.org

2. Pacemaker

	2017	2018	2019	2020
Total Pacemakers	2582	2635	2644	2670
New implants	2140	2133	2142	2062
Replacements	441	502	502	603
Single-chamber	703	829	773	647
Dual-chamber	1783	1806	1763	1848
Sick sinus syndrome				
AV block				
Implanting Centers	14	14	14	14
Implanting Physicians	38	38	39	39
National Registry	☑		Yes	Yes

3. Cardiac resynchronization therapy

	2017	2018	2019	2020
Total CRTs	326	329	318	347
CRT-P	166	168	168	210
CRT-P new implants		107	106	121
CRT-P replacements/upgrade		61	62	37
CRT-D	160	161	150	137
CRT-D new implants		121	108	74
CRT-D replacements/upgrade		40	42	23
Ischemic				6
Non-ischemic				45
Implanting Centers	6	8	9	9
Implanting Physicians	22	22	23	35
National Registry	☑			

4. Implantable cardioverter defibrillator

	2017	2018	2019	2020
Total ICDs	654	649	602	457
ICD new implants	459	479	416	319
ICD replacements	161	170	186	138
Single-chamber				120
Dual-chamber				70
Primary prevention				5
Secondary prevention				18
Implanting Centers	9		9	9
Implanting Physicians	22		23	24
National Registry	☑		Yes	Yes

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2017	2018	2019	2020
Total lead extraction procedures		40	42	52
Hospitals performed lead extraction	2	1	1	1

Cardiologists performing lead extraction	3	2	2	2
Surgeons performing lead extraction			Support	
National Registry				

6. Interventional electrophysiology

	2017	2018	2019	2020
Ablation procedures	1640	1725	1788	2056
SVT ablation procedures	901	882	1029	921
AVNRT	315	274	300	252
AVRT/WPW	133	178	146	125
AFL (RA isthmus dependent)	336	335	391	420
AT	97	80	80	111
VT/VPC	158	152	153	120
Idiopathic				36
Structural				22
AF ablation procedures	510	563	644	730
Ablation centers				
AF ablation centers	8	8	8	8
Structural VT ablation centers	4	4	7	7
Ablation physicians				
AF ablation physicians	14	15	16	21
Structural VT ablation physicians	14	15	16	21
National Registry			No	No

7. Management

National certification for physicians	☐PM	☐CRT	☐ICD	☐ Ablation
National accreditation for centers	☐PM	☐CRT	☐ICD	☐ Ablation
Guidelines followed	☑ National	☐U.S.	☐Europe	☐AP

Payment (%)	Pacemaker	ICD	CRT	Ablation
Government	98%	99.7%	99.7%	66%
Insurance	–	–	–	–
Public insurance	–	–	–	–
Private insurance	–	–	–	34%
Individual	2%	0.3%	0.3%	

Obstacles to guideline implementation (1=no obstacle, 5=great obstacle)

	1	2	3	4	5
Lack of centers	☐	☐	☑	☐	☐
Lack of reimbursement, limited financial resources	☐	☑	☐	☐	☐
Lack of referral	☐	☐	☑	☐	☐
Lack of trained personnel	☐	☑	☐	☐	☐
Low awareness of guidelines	☐	☐	☑	☐	☐
Lack of operators	☐	☑	☐	☐	☐

8. Source

"Heart Rhythm New Zealand" ---- a branch of the Cardiac Society of Australia and New Zealand

Country/Region: Pakistan

1. Statistics

	2017	2018	2019	2020
Population (million)[1]	182.7	190	194	200
Hospitals	–			
Beds(per thousand)	0.6	0.6	0.7	
Physicians	0.5/1000	0.5/1000	0.5/1000	
Nurses	–			
GDP (US$, billions)	247	246	248	
Total expenditure on health as % GDP	3.8	4.5	5	
Government expenditure on health (US$)	4.5%	4.9	5	
Insured citizens (%)	1	3%	3.1%	
SCD patients	–			
Heart failure patients	–			
AF patients	0.5%	0.5%	0.7%	

6' www.census.gov

2. Pacemaker

	2017	2018	2019	2020
Total Pacemakers	4030	4300	4600	3588
New implants	4000	4000	4050	2359
Replacements	500	520	550	224
Single-chamber	80%	70%	70%	56%
Dual-chamber	20%	30%	30%	43%
Sick sinus syndrome	26%	25%	23%	11%
AV block	74%	75%	77%	44%
Implanting Centers	31	32	34	0
Implanting Physicians	100	102	110	18
National Registry	☐	no		

3. Cardiac resynchronization therapy

	2017	2018	2019	2020
Total CRTs	416	360	390	113
CRT-P	290	300	290	64
CRT-P new implants	290	280	270	38
CRT-P replacements/upgrade	16	20	20	7
CRT-D				49
CRT-D new implants	110	100	100	41
CRT-D replacements/upgrade	–			8
Ischemic	80%	80%	70%	14%
Non-ischemic	20%	20%	30%	86%
Implanting Centers	8	8	10	0
Implanting Physicians	8	8	12	16
National Registry	☐	no		

4. Implantable cardioverter defibrillator

	2017	2018	2019	2020
Total ICDs	–			215
ICD new implants	350	360	390	179
ICD replacements				20
Single-chamber	85	80%	70%	74%
Dual-chamber		20%	30%	26%
Primary prevention	32%	27%	23%	32%
Secondary prevention	68%	73%	77%	68%
Implanting Centers	9	9	10	0
Implanting Physicians	8	12	15	18
National Registry	☐	no		

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2017	2018	2019	2020
Total lead extraction procedures	-		7	19
Hospitals performed lead extraction	-	1	2	0
Cardiologists performing lead extraction	-	1	2	3
Surgeons performing lead extraction	-			0
National Registry	☐	no		

6. Interventional electrophysiology

	2017	2018	2019	2020
Ablation procedures	-	1350	1500	2523
SVT ablation procedures	1200	1300	1450	2329
AVNRT	65%	67%	65%	75%
AVRT/WPW	25%	20%	35%	22%
AFL (RA isthmus dependent)	6%	8%	7%	2%
AT	5%	6%	5%	1%
VT/VPC	11%	82%	15%	25%
Idiopathic	10%	18%	10%	26%
Structural				12%
AF ablation procedures	20	16	10	34
Ablation centers		2		0
AF ablation centers	2	2	2	0
Structural VT ablation centers	2	2	2	0
Ablation physicians				5
AF ablation physicians	1	3	3	3
Structural VT ablation physicians		3	3	1
National Registry	☐			

7. Management

National certification for physicians	☐YPM	☐CRT	☐ICD	☐ Ablation
National accreditation for centers	☐PM	☐CRT	☐ICD	☐ Ablation
Guidelines followed	☐ National	☐U.S.	☐Europe	☐AP

Payment (%)	Pacemaker	ICD	CRT	Ablation
Government	40%	5%	20%	50%
Insurance	–	–	–	–
Public insurance	–	–	–	–
Private insurance	–	–	–	–
Individual	60%	95%	80%	50%

Obstacles to guideline implementation (1=no obstacle, 5=great obstacle)

	1	2	3	4	5
Lack of centers	☐	☐	☐	☑	Y
Lack of reimbursement, limited financial resources	☐	☐	☐	☑	Y
Lack of referral	☐	☐	☑	☐	☐
Lack of trained personnel	☐	☐	☑	☐	Y
Low awareness of guidelines	☐	☐	☑	☐	☐
Lack of operators	☐	☑	☐	☐	Y

8. Source

Pakistan Heart Rhythm Society

Asia Pacific Heart Rhythm Society APHRS

Country/Region: Philippines

1. Statistics

	2017	2018	2019	2020
Population (thousand) *	104,918	106,512	109,938,244	110,818
Hospitals	1436	1800	1800	1800
Beds (per 100,000 population)**	100	100	135	150
Physicians (per 1,000 population) ***	1.16	1.16	1.16	1.16
Nurses (per 1,000 population) ****	24	24	24	24
GDP (US$, billions) *****	313.6	354.31	376.79	377.205
Total expenditure on health as % GDP	4.5%	4.5%	7.1%	4.4%
Government expenditure on health as %	10.5%	33%	33%	33%
Insured citizens (%)	92%	93%	93%	93%
SCD patients	–	–	–	–
Heart failure patients	1.6%	-	-	-
AF patients	0.2%	0.2%	0.2%	0.40%

*http://www.worldometers.info/world-population/philippines-population/

** http://statista.com

*** http://data.worldbank.org/indicator/SH.MED.BEDS.ZS

**** http://www.who.int/whosis/whostat/EN_WHS2011_Full.pdf

***** http://www.tradingeconomics.com/philippines/gdp-growth-annual

2. Pacemaker

	2017	2018	2019	2020
Total Pacemakers	649	1037	1335	898
New implants	609	974	1168	768
Replacements	40	63	167	130
Single-chamber	308	414	526	352
Dual-chamber	336	617	778	546
Sick sinus syndrome	355	346	197	211
AV block	78	691	84	140
Implanting Centers	46	72	42	45
Implanting Physicians	51	76	55	58
National Registry	☐	☐	☐	

3. Cardiac resynchronization therapy

	2017	2018	2019	2020
Total CRTs	17	15	27	26
CRT-P	3	1	3	4
CRT-P new implants	6	0	1	3
CRT-P replacements/upgrade	2	1	2	1
CRT-D	12	14	24	22

CRT-D new implants	12	13	18	20
CRT-D replacements/upgrade		1	6	2
Ischemic	5	4	5	5
Non-ischemic	4	11	2	3
Implanting Centers	6	6	4	11
Implanting Physicians	6	6	6	20
National Registry	☐	☐	☐	N/A

4. Implantable cardioverter defibrillator

	2017	2018	2019	2020
Total ICDs	60	72	109	85
ICD new implants	58	70	98	73
ICD replacements	2	2	11	12
Single-chamber	38	53	61	45
Dual-chamber	22	19	48	40
Primary prevention	18	45	26	25
Secondary prevention	-	27	11	17
Implanting Centers	9	12	10	11
Implanting Physicians	11	11	9	20
National Registry	☐	☐	☐	N/A

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2017	2018	2019	2020
Total lead extraction procedures	4	-	-	-
Hospitals performed lead extraction	3	-	-	-
Cardiologists performing lead extraction	3	-	-	-
Surgeons performing lead extraction		-	-	-
National Registry	☐	☐	☐	☐

6. Interventional electrophysiology

	2017	2018	2019	2020
Ablation procedures	142	137	153	69
SVT ablation procedures	-	-		60
AVNRT	53	46	60	26
AVRT/WPW	46	47	55	30
AFL (RA isthmus dependent)	8	6	1	2
AT	5	4	1	2
VT/VPC	15	16	19	5
Idiopathic	-	-	-	5
Structural	-	-	-	0

AF ablation procedures	15	18	17	4
Ablation centers	4	4	4	4
AF ablation centers	1	4	4	3
Structural VT ablation centers	4	4	4	3
Ablation physicians	-	-	-	20
AF ablation physicians	-	-	-	-
Structural VT ablation physicians	-	-	-	-
National Registry	☐	☐	☐	N/A

7. Management

National certification for physicians	☐PM	☐CRT	☐ICD	☐Ablation
National accreditation for centers	☐PM	☐CRT	☐ICD	☐Ablation
Guidelines followed	☐Nationa	☑U.S.	☐Europe	☐AP

Payment (%)	Pacemaker	ICD	CRT	Ablation
Government	5%	5%	5%	5%
Insurance				
Public insurance	5%	5%	5%	5%
Private insurance	0	0	0	0%
Individual	90%	90%	90%	90%

Obstacles to guideline implementation (1=no obstacle, 5=great obstacle)

	1	2	3	4	5
Lack of centers	☐	☐	☑	☐	☐
Lack of reimbursement, limited financial resources	☐	☐	☐	☐	☑
Lack of referral	☐	☐	☑	☐	☐
Lack of trained personnel	☐	☐	☐	☑	☐
Low awareness of guidelines	☐	☐	☐	☑	☐
Lack of operators	☐	☐	☐	☑	☐

8. Source

a. Philippine Heart Rhythm Society, Inc.

b. Different ablation centers

c. Other Sources:

Medtronic Phils.

Abbott Phils.

Boston Phils.

Transmedic Phils.

Country/Region: Singapore

1. Statistics

	2017	*2018*	*2019*	*2020*
Population ('000)[1]	**5,612.3**	**5,638.7**	**5,703.6**	**5,685.8**
Hospitals [2]	**27**	**28**	**29**	**28**
a. Public Sector	*13*	*15*	*16*	*16*
- Acute Hospitals	*9*	*10*	*10*	*10*
- Psychiatric Hospitals	*1*	*1*	*1*	*1*
- Community Hospitals	*3*	*4*	*5*	*5*
b. Not-for-Profit	*5*	*5*	*5*	*5*
- Acute Hospitals	*1*	*1*	*1*	*1*
- Psychiatric Hospitals	*-*	*-*	*-*	*-*
- Community Hospitals	*4*	*4*	*4*	*4*
c. Private Sector	*9*	*8*	*8*	*7*
- Acute Hospitals	*8*	*8*	*8*	*7*
- Psychiatric Hospitals	*-*	*-*	*-*	*-*
- Community Hospitals	*1*	*-*	*-*	*-*
Beds[3]	**29,050**	**29,938**	**31,495**	**31,785**
a. Public Sector	*16,568*	*17,425*	*18,590*	*19,081*
- Acute Hospitals	*8,623*	*9,071*	*9,404*	*9,610*
- Psychiatric Hospitals	*1,950*	*1,950*	*1,950*	*1,950*
- Community Hospitals	*690*	*799*	*974*	*1,130*
- Nursing Homes	*5,281*	*5,581*	*6,238*	*6,391*
- Inpatient Hospices	*24*	*24*	*24*	*-*
b. Not-for-Profit	*7,267*	*7,360*	*7,418*	*7,187*
- Acute Hospitals	*271*	*273*	*288*	*285*
- Psychiatric Hospitals	*-*	*-*	*-*	*-*
- Community Hospitals	*969*	*979*	*1,012*	*939*
- Nursing Homes	*5,872*	*5,953*	*5,963*	*5,963*
- Inpatient Hospices	*155*	*155*	*155*	*-*

b. Private Sector	*5,215*	*5,153*	*5,487*	*5,517*
- Acute Hospitals	*1,446*	*1,482*	*1,629*	*1,650*
- Psychiatric Hospitals	*-*	*-*	*-*	*-*
- Community Hospitals	*4*	*-*	*-*	*-*
- Nursing Homes	*3,765*	*3,671*	*3,858*	*3,867*
- Inpatient Hospices	*-*	*-*	*-*	*-*
Physicians[4]	**13,386**	**13,766**	**14,279**	**N/A**
a. Public Sector	*8,573*	*8,819*	*9,030*	
b. Private Sector	*4,107*	*4,225*	*4,439*	
c. Not in active Practice	*706*	*722*	*810*	
Nurses/Midwives[4]	**41,440**	**42,125**	**42,777**	**N/A**
- Registered Nurses	*32,672*	*33,614*	*34,609*	
- Enrolled Nurses	*8,631*	*8,394*	*8,059*	
- Registered Midwives	*137*	*117*	*109*	
Advanced Practice Nurses[4]	**218**	**238**	**267**	**N/A**
GDP (US$, billions)				
Government Health Expenditure (as % of GDP)[5]	**2.1**	**2.1**	**N/A**	**N/A**
Government Health Expenditure (as % of Total Government Expenditure)[5]	**13.9**	**13.4**	**N/A**	**N/A**
Insured citizens (%)	-			
SCD patients	-			
Heart failure patients	-			
AF patients	-			

Source: Singapore Health Facts, Ministry of Health, Singapore and data.gov.sg retrieved as of 24 Sept 2020[1,2,3,4,5] (www.moh.gov.sg).

2. Pacemaker

	2017	***2018***	***2019***	***2020***
Total Pacemakers[4]	**801**	**875**	**928**	**910**
- New implants	574	589	620	613

Replacements/Upgrades	121	139	135	143
Others	106	147	173	154
- Single-chamber	141	143	131	97
Dual-chamber	562	591	621	673
Not applicable	98	141	176	140
- Sick sinus syndrome	387	377	338	360
AV block*	195	230	259	282
Implanting Centers[4]	6	6	6	6
Implanting Physicians[4]	~24	~25	~27	~22
National Registry[4]	☑	☑	☑	☑

Source: CGH, KTPH, NHCS, NTFGH, NUH, TTSH, SCDB as of 31 August 2020[4]

** refer to Complete AV Block only.*

CGH: Changi General Hospital, KTPH: Khoo Teck Puat Hospital, NHCS: National Heart Centre Singapore, NTFGH: Ng Teng Fong General Hospital, NUH: National University Hospital, TTSH: Tan Tock Seng Hospital, SCDB: Singapore Cardiac Data Bank

3. Cardiac resynchronization therapy

	2017	***2018***	***2019***	***2020***
Total CRTs[4]	**178**	**184**	**205**	**177**
- CRT-P	20	38	52	48
CRT-P new implants	11	16	30	31
CRT-P replacements/upgrade	9	22	20	15
Others	-	-	2	2
- CRT-D	158	146	153	129
CRT-D new implants	91	100	101	76
CRT-D replacements/upgrade	58	42	41	48
Others	9	4	11	5
- Ischemic	91	92	94	79
Non-ischemic	48	26	49	51
Implanting Centers[4]	6	6	6	6
Implanting Physicians[4]	~20	~22	~25	~21
National Registry[4]	☑	☑	☑	☑

Source: CGH, KTPH, NHCS, NTFGH, NUH, TTSH, SCDB as of 31 August 2020[4]

4. Implantable cardioverter defibrillator

	2017	2018	2019	2020
Total ICDs[4]	**378**	**394**	**345**	**410**
- ICD new implants	277	288	222	238
ICD replacements/upgrade	64	64	77	130
Others	37	42	46	42
- Single-chamber	295	311	246	296
Dual-chamber	59	54	70	78
Others	24	29	29	36
- Primary prevention	248	266	225	248
Secondary prevention	130	128	119	162
Others	-	-	1	-
Implanting Centers[4]	6	6	6	6
Implanting Physicians[4]	~23	~21	~26	~23
National Registry[4]	☑	☑	☑	☑

Source: CGH, KTPH, NHCS, NTFGH, NUH, TTSH, SCDB as of 31 August 2020[4]

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2017	2018	2019	2020
Total lead extraction procedures	45	47	49	53
Hospitals performed lead extraction	~5	~6	~5	~4
Cardiologists performing lead extraction	~18	~16	~16	~14
Surgeons performing lead extraction	~2	-	~2	~2
National Registry	☑	☑	☑	☑

Inclusive of Explantation of PPM / ICD

6. Interventional electrophysiology

	2017	2018	2019	2020
Ablation procedures[4]	**844**	**951**	**963**	**720**
SVT ablation procedures	-	-	-	-
AVNRT	185	193	206	162
AVRT/WPW	114	116	116	97

AFL (RA isthmus dependent)	188	205	198	156
AT	43	42	67	52
VT/VPC	107	128	152	90
Idiopathic	-	-	-	-
Structural	-	-	-	-
AF ablation procedures	181	244	193	143
Others	26	23	31	20
Ablation centers[4]	3	3	3	3
AF ablation centers	2	2	2	2
Structural VT ablation centers	2	2	2	2
Ablation physicians[4]	~15	~20	~21	~19
AF ablation physicians	–	–	–	–
Structural VT ablation physicians	–	–	–	–
National Registry[4]	☑	☑	☑	☑

Source: CGH, KTPH, NHCS, NTFGH, NUH, TTSH, SCDB as of 31 August 2020[4]

7. Management

National certification for physicians	☐PM	☐CRT	☐ICD	☐Ablation
National accreditation for centers	☑PM	☑CRT	☑ICD	☑Ablation
Guidelines followed	☐ National	☑U.S.	☑Europe	☐AP

Payment (%)	Pacemaker	ICD	CRT	Ablation
Government	-	-	-	-
Insurance	–	–	–	–
Public insurance	-	-	-	-
Private insurance	-	-	-	-
Individual	-	-	-	-

Obstacles to guideline implementation (1=no obstacle, 5=great obstacle)

	1	2	3	4	5
Lack of centers	☑	☐	☐	☐	☐
Lack of reimbursement, limited financial resources	☐	☐	☑	☐	☐

Lack of referral	☐	☐	☑	☐	☐
Lack of trained personnel	☐	☑	☐	☐	☐
Low awareness of guidelines	☐	☐	☑	☐	☐
Lack of operators	☐	☑	☐	☐	☐

8. Source

The source of information is contributed by the public hospitals i.e. Changi General Hospital, Khoo Teck Puat Hospital, National Heart Centre Singapore, Ng Teng Fong General Hospital, National University Hospital and Tan Tock Seng Hospital.

Country/Region: South Korea (Republic of Korea)

1. Statistics

	2017	2018	2019	2020
Population (thousand)[1]	50982	51164	51269	51780
Hospitals[2]	-		-	40049
Beds (per 100,000 population)[2]	-	1,240	-	1321
Physicians (per 1,000 population)[2]	2.3	2.4	-	2.1
Nurses (per 1,000 population)[2]	6.9	7.3	-	4.3
GDP (US$, billions)[3]	1,530.7		1913.9	1933.1
Total expenditure on health as % GDP[3]	7.6%	-	8.0%	8.4%
Government expenditure on health as %[3]			4.9%	5.2%
Insured citizens (%)	100	100	100	100
SCD patients	-			
Heart failure patients	-			
AF patients	-			

1, www.census.gov

2, www.who.int / http://apps.who.int/nha/database/country_profile/Index/en

3, www.imf.org

2. Pacemaker

	2017	2018	2019	2020
Total Pacemakers	5347	5408	4368	4285
New implants	4336	4457		3497
Replacements	1011	951		
Single-chamber	2106	-		620
Dual-chamber	3241	-		3006
Sick sinus syndrome	1828	-		1682
AV block	2716	-		2089
Implanting Centers	-	-		56
Implanting Physicians	247	84		109

National Registry	☐	No		No

3. Cardiac resynchronization therapy

	2017	2018	2019	2020
Total CRTs	350	272	352	346
CRT-P	49	-		58
CRT-P new implants	32	-		31
CRT-P replacements/upgrade	17	-		22
CRT-D	301	-		284
CRT-D new implants	251	-		176
CRT-D replacements/upgrade	50	-		67
Ischemic	15	-		58
Non-ischemic	284	-		229
Implanting Centers	-	-		50
Implanting Physicians	57	62		89
National Registry	☐	No		No

4. Implantable cardioverter defibrillator

	2017	2018	2019	2020
Total ICDs	1157	1542	1248	1146
ICD new implants	1022	1366		896
ICD replacements	135	176		116
Single-chamber	666	-		564
Dual-chamber	491	-		456
Primary prevention	361	-		491
Secondary prevention	688	-		576
Implanting Centers	-	-		56
Implanting Physicians	112	76		103
National Registry	☐	No		No

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2017	2018	2019	2020
Total lead extraction procedures	-	92	113	125
Hospitals performed lead extraction	-	12		19
Cardiologists performing lead extraction	-	31		71
Surgeons performing lead extraction	-	2		21
National Registry	☐	No		No

6. Interventional electrophysiology

	2017	**2018**	**2019**	**2020**
Ablation procedures	3961	9545	9631	10348
SVT ablation procedures	2160	5040	4936	4636
AVNRT	1045	-		1992
AVRT/WPW	626	-		1379
AFL (RA isthmus dependent)	489	-		1030
AT	187	506		359
VT/VPC	172	461	671	975
Idiopathic	140	-		447
Structural	32	-		106
AF ablation procedures	1375	3538	4024	4977
Ablation centers	24	40		
AF ablation centers	22	37	45	49
Structural VT ablation centers	15	17	19	16
Ablation physicians	44	66		
AF ablation physicians	33	54		88
Structural VT ablation physicians	26	42		80
National Registry	☐	Yes		No

7. Management

National certification for physicians ☐PM ☐CRT ☐ICD ☐ Ablation

National accreditation for centers	☐PM	☐CRT	☐ICD	☐ Ablation
Guidelines followed	☒ National	☐U.S.	☐Europe	☐AP

Payment (%)	Pacemaker	ICD	CRT	Ablation
Government	95%	95%	95%	95%
Insurance				
Public insurance	100%	100%	100%	100%
Private insurance				
Individual				

Obstacles to guideline implementation (1=no obstacle, 5=great obstacle)

	1	2	3	4	5
Lack of centers	☑	☐	☐	☐	☐
Lack of reimbursement, limited financial resources	☐	☐	☑	☐	☐
Lack of referral	☐	☐	☑	☐	☐
Lack of trained personnel	☐	☑	☐	☐	☐
Low awareness of guidelines	☐	☐	☑	☐	☐
Lack of operators	☐	☑	☐	☐	☐

8. Source

KHRS (Korean Heart Rhythm Society)

Country/Region: Taiwan

1. Statistics

	2017	2018	2019	2020
Population (thousand)[1]	23571	23590	23574	23561
Hospitals[2]	478	473	476	472
Beds[2]	164590	148947	168,266	151,862
Physicians[3]	46311	46356	49,542	51,045
Nurses[3]	135969	159621	154,747	160,795
GDP (US$, billions)[4]	574.895	589.391		669,321
Total expenditure on health as % GDP[5]	6.3	6.1		
Government expenditure on health as %[6]				
Insured citizens (%)	99%	99%	99%	99%
SCD patients				
Heart failure patients				
AF patients				

2. Pacemaker

	2017	2018	2019	2020
Total Pacemakers	6222	6735	6904	6990
New implants	85%	85%	82%	81%
Replacements	15%	15%	18%	19%
Single-chamber(Leadless included)	23%	23%	22%	18%
Leadless	0	1.7%	1.3%	1.3%
Dual-chamber	77%	77%	78%	82%
Sick sinus syndrome	59%	55%	63%	55%
AV block	41%	45%	37%	45%
Implanting Centers	110	112	110	116
Implanting Physicians	538	552	550	349
National Registry	☑	☑	☑	☑

3. Cardiac resynchronization therapy

	2017	2018	2019	2020
Total CRTs	328	312	354	315
CRT-P	243	227	216	223
CRT-P new implants	60%	70%	60%	67%
CRT-P replacements/upgrade	40%	30%	40%	33%
CRT-D	85	85	138	92
CRT-D new implants	52%	71%	43%	53%
CRT-D replacements/upgrade	48%	29%	57%	47%
Ischemic	31%	34%	40%	32%
Non-ischemic	69%	66%	60%	68%
Implanting Centers	60	52	35	54
Implanting Physicians	166	122	120	123
National Registry	☑	☑	☑	☑

4. Implantable cardioverter defibrillator

	2017	2018	2019	2020
Total ICDs	695	816	891	864
ICD new implants	85%	80%	77%	76%
ICD replacements	15%	20%	23%	24%
Single-chamber	42%	44%	39%	36%
Dual-chamber	58%	56%	61%	64%
Primary prevention	2%	2%	1.5%	0.6%
Secondary prevention	98%	98%	98.5%	99.4%
Implanting Centers	69	82	58	71
Implanting Physicians	206	234	175	178
National Registry	☑	☑	☑	☑

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2017	2018	2019	2020
Total lead extraction procedures		55	14	26
Hospitals performed lead extraction		6	8	2
Cardiologists performing lead extraction		44	12	12
Surgeons performing lead extraction		11	2	12
National Registry	☐	☑	☑	☑

6. Interventional electrophysiology

	2017	2018	2019	2020
Ablation procedures	4997	5069	5020	5501
SVT ablation procedures	3443	2514	2507	2923
AVNRT	1828	1757	1804	1530
AVRT/WPW	766	740	722	624
AFL (RA isthmus dependent)	646	621	632	666
AT	203	158	171	246
VT/VPC	816	1056	1115	1021
Idiopathic	548	676	810	889
Structural	135	135	125	212
AF ablation procedures	738	1241	1142	1185
Ablation centers	15	38	38	73
AF ablation centers	15	15	15	22
Structural VT ablation centers	15	15	15	22
Ablation physicians	89	94	98	78
AF ablation physicians	66	67	70	65
Structural VT ablation physicians	65	66	69	57
National Registry	☐	☐		

7. Management

National certification for physicians	☐ PM	☐CRT	☑ ICD	☑ Ablation
National accreditation for centers	☐ PM	☐CRT	☐ICD	☐ Ablation
Guidelines followed	☑ National	☑ U.S.	☑ Europe	☑ AP

Payment (%)	Pacemaker	ICD	CRT	Ablation
Government	100	100	100	95
Insurance				
Public insurance				
Private insurance				
Individual				5

Obstacles to guideline implementation (1=no obstacle, 5=great obstacle)

	1	2	3	4	5
Lack of centers	☑	☐	☐	☐	☐
Lack of reimbursement, limited financial resources	☐	☐	☐	☑	☐
Lack of referral	☑	☐	☐	☐	☐
Lack of trained personnel	☑	☐	☐	☐	☐
Low awareness of guidelines	☑	☐	☐	☐	☐
Lack of operators	☑	☐	☐	☐	☐

8. Source

Taiwan Heart Rhythm Society

[1]https://www1.stat.gov.tw/np.asp?ctNode=4649&mp=3

[2]https://dep.mohw.gov.tw/DOS/cp-1735-3246-113.html

[3]https://dep.mohw.gov.tw/DOS/cp-1735-3245-113.html

[4]https://www1.stat.gov.tw/point.asp?index=1#

[5]https://iiqsw.mohw.gov.tw/InteractiveIntro.aspx?TID=9FBD55607C91A331

[6]https://dep.mohw.gov.tw/DOS/lp-2156-113.html

Country/Region: Thailand

2017 EP & Implant data(Black) limited to government hospitals, (Red) are national total from device companies

1. Statistics

	2017	2018	2019	2020
Population	69,037,513	69,282,825	69,828,393	**67,921,857**
Hospitals				**1356**
Beds(per 100,000 population)				**245 beds/100,000 Or Bed:Population = 1:415**
Physicians				**Physician: Popopulation 1:1674**
Nurses				**Nurse: Population 1:379**
GDP (US$)	**$403.6 billion**		**$543.65 billion**	**$512 billion**
Total expenditure on health as % GDP				
Government expenditure on health as %	3.76% of GDP			**1.7% Gov Expenditure on Health 343,906 mil Baht GDP 16,898,086 mil Baht**
Insured citizens (%)			87.9	**99.3%**
SCD patients				

Heart failure patients				**Inpatients with heart failure Dx: 216,131 0r 3/1000 pop**
AF patients				

2. Pacemaker

	2017	2018	2019	2020
Total Pacemakers	2306(3749)	3863	3827	**4509**
New implants	1862(2985)	3301	2802	**3498**
Replacements	252(784)	562	1025	**1011**
Single-chamber	325(14.1%),(1094) 10 micra	1160	1138	**1133 + 25 Micra**
Dual-chamber	1729(74.9%) (2736)	2633	2711	**3351 (74.3%)**
Sick sinus syndrome				
AV block				
Implanting Centers	16		25 (government)	
Implanting Physicians				
National Registry	no		no	no

3.Cardiac resynchronization therapy

	2017	2018	2019	2020
Total CRTs	329(389)	384	373	429
CRT-P				82
CRT-P new implants	46(51)	50	62	43
CRT-P replacements/upgrade	14(20)	20	33	39
CRT-D				347
CRT-D new implants	245(262)	234	177	255
CRT-D replacements/upgrade	24(56)	80	101	92
Ischemic				
Non-ischemic				

Implanting Centers			25(government)	
Implanting Physicians				
National Registry				

4. Implantable cardioverter defibrillator

	2017	2018	2019	
Total ICDs	927(950)	949	952	1110
ICD new implants	919(1091), 3SICD	820	750	930
ICD replacements	8(174)	129	202	180
Single-chamber	575(710)	809	805	880 + 20SICD
Dual-chamber	82(119)	148	225	216
Primary prevention				
Secondary prevention				
Implanting Centers			25(government)	
Implanting Physicians				
National Registry	☐	☐		

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2017	2018	2019	2020
Total lead extraction procedures	33	42	23	43
Hospitals performed lead extraction	3	5	7	7
Cardiologists performing lead extraction				
Surgeons performing lead extraction				
National Registry	☐	☐		

6. Interventional electrophysiology

	2017	2018	2019	2020
Ablation procedures				
SVT ablation procedures				
AVNRT	1296	1158	1135	1060
AVRT/WPW	702	667	372	347
AFL (RA isthmus dependent)	244	181	184	279
AT	156	116	138	125
VT/VPC				
Idiopathic	413	384	479	526
Structural	6	10	16	31
AF ablation procedures	128	131	177	188
Ablation centers	16	18	25(government)	
AF ablation centers			25(government)	12
Structural VT ablation centers				12
Ablation physicians	40			
AF ablation physicians				
Structural VT ablation physicians				
National Registry	☐	N/A		

7. Management

National certification for physicians	☑PM	☑CRT	☑ICD	☑Ablation
National accreditation for centers	☐PM	☐CRT	☑ICD	☐Ablation
Guidelines followed	☑National	☑U.S.	☑Europe	☑AP

Payment (%)	Pacemaker	ICD	CRT	Ablation
Government	100% except MICRA (20%)	100%	100%	100% except Cryo (30%)
Insurance				
Public insurance				
Private insurance				
Individual				

Obstacles to guideline implementation (1=no obstacle, 5=great obstacle)

	1	2	3	4	5
Lack of centers	☐	☐	☑	☐	☐
Lack of reimbursement, limited financial resources	☐	☐	☐	☑	☐
Lack of referral	☐	☐	☐	☑	☐
Lack of trained personnel	☐	☑	☐	☐	☐
Low awareness of guidelines	☐	☐	☐	☑	☐
Lack of operators	☐	☑	☐	☐	☐

Country/Region: Vietnam

1. Statistics

	2017	2018	2019	2020
Population (thousand)[1]	94,971	96,452		97338
Hospitals	-	-		
Beds	-	-		
Physicians	-	-		
Nurses	-	-		
GDP (US$, billions)	220	241		271
Total expenditure on health as % GDP	-	-		
Government expenditure on health (US$)	-	-		
Insured citizens (%)	86.4	87.7		
SCD patients		-		
Heart failure patients		-		
AF patients		-		

7, www.census.gov

2. Pacemaker

	2017	2018	2019	2020
Total Pacemakers	2805	3242	4891	2042
New implants	2595	2594		
Replacements	210	648		
Single-chamber	1.118	1450	1876	
Dual-chamber	1.687	1792	2641	
Sick sinus syndrome	1.825	2107		
AV block	980	1135		
Implanting Centers	43	44	46	46
Implanting Physicians	110	120	126	130
National Registry	☐			

3. Cardiac resynchronization therapy

	2017	2018	2019	2020
Total CRTs	95	94	111	104
CRT-P	71	54	49	73
CRT-P new implants	67	48		
CRT-P replacements/upgrade	4	6		
CRT-D	14	40	62	32
CRT-D new implants	13	35		
CRT-D replacements/upgrade	1	5		
Ischemic	12	-		
Non-ischemic	83	-		
Implanting Centers	14	14	14	14
Implanting Physicians	30	30	30	30
National Registry	☐			

4. Implantable cardioverter defibrillator

	2017	2018	2019	2020
Total ICDs	153	192	263	263
ICD new implants	144	168		
ICD replacements	9	24		
Single-chamber	148	170		219
Dual-chamber	5	22		44
Primary prevention	122	154		
Secondary prevention	31	38		
Implanting Centers	16	18	18	18
Implanting Physicians	36	40	40	40
National Registry	☐			

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2017	2018	2019	2020
Total lead extraction procedures	5	-		1
Hospitals performed lead extraction	2	-		1
Cardiologists performing lead extraction	4	-		1
Surgeons performing lead extraction	1	-		
National Registry	☐			

6. Interventional electrophysiology

	2017	2018	2019	2020
Ablation procedures	4022	3483	4042	2947
SVT ablation procedures				
AVNRT	1.478	1729	1656	785
AVRT/WPW	936	804	902	835
AFL (RA isthmus dependent)	121	49	40	29
AT	38	129	100	57
VT/VPC	1290	1343	1289	1064
Idiopathic	1280	1343		1064
Structural	10	0		
AF ablation procedures	159	101	55	106
Ablation centers	20	21	22	22
AF ablation centers	7	7	7	7
Structural VT ablation centers	4	4	4	4
Ablation physicians	44	45		45
AF ablation physicians	14	14	16	16
Structural VT ablation physicians	7	7		9
National Registry	☐			

7. Management

National certification for physicians ☑PM ☑CRT ☑ICD ☑Ablation

National accreditation for centers	☑PM	☑CRT	☑ICD	☑Ablation
Guidelines followed	☑National	☑U.S.	☑Europe	☐AP

Payment (%)	Pacemaker	ICD	CRT	Ablation
Government				
Insurance				
Public insurance	50%	20%	25%	80%
Private insurance				
Individual	50%	80%-	75%	20%

Obstacles to guideline implementation (1=no obstacle, 5=great obstacle)

	1	2	3	4	5
Lack of centers	☐	☑	☐	☐	☐
Lack of reimbursement, limited financial resources	☑	☐	☐	☐	☐
Lack of referral	☑	☐	☐	☐	☐
Lack of trained personnel	☐	☑	☐	☐	☐
Low awareness of guidelines	☑	☐	☐	☐	☐
Lack of operators	☐	☐	☑	☐	☐

8. Source

Vietnam Heart Rhythm Society: Tran Van Dong, MD., Phan Dinh Phong, MD. Vien Hoang Long, MD., et al

Country/Region: Sri Lanka

1. Statistics

	2017	2018	2019	2020
Population (thousand)[1]	21444	21670		21803
Hospitals	637	639		696
Beds	80896	80980		
Physicians (MO s)	18574	18679		19900
Nurses	45780	45930		-
GDP (US$, billions)	87.17	88.22		
Total expenditure on health as % GDP	1.96	1.97		
Government expenditure on health (US$)	2568 million			
Insured citizens (%)		-		
SCD patients		-		
Heart failure patients		-		
AF patients		-		

8, www.census.gov

2. Pacemaker

	2017	2018	2019	2020
Total Pacemakers	1442	2215		1700
New implants	1231	1463		1563
Replacements	211	752		137
Single-chamber	896	1003		1207
Dual-chamber	546	460		493
Sick sinus syndrome	562	886		812
AV block	912	1329		888
Implanting Centers	11	11		14
Implanting Physicians	12	12		13
National Registry	☐	☐		–

3. Cardiac resynchronization therapy

	2017	2018	2019	2020
Total CRTs	32	34		43
CRT-P	21	22		35
CRT-P new implants	15	18		28
CRT-P replacements/upgrade	6	4		7
CRT-D	11	12		8
CRT-D new implants	6	11		7
CRT-D replacements/upgrade	5	1		1
Ischemic	7	9		11
Non-ischemic	25	23		32
Implanting Centers	4	6		9
Implanting Physicians	7	7		9
National Registry	☐	☐		–

4. Implantable cardioverter defibrillator

	2017	2018	2019	2020
Total ICDs	65	83		202
ICD new implants	57	73		185
ICD replacements	8	8		17
Single-chamber		76		165
Dual-chamber		7		37
Primary prevention		-		123
Secondary prevention		-		79
Implanting Centers	8	8		13
Implanting Physicians	8	9		10
National Registry	☐	☐		–

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2017	2018	2019	2020
Total lead extraction procedures	-	-		5
Hospitals performed lead extraction	-	-		3

Cardiologists performing lead extraction	-	-		-
Surgeons performing lead extraction	-	-		2
National Registry	☐	☐	☐	–

6. Interventional electrophysiology

	2017	2018	2019	2020
Ablation procedures	578	891		658
SVT ablation procedures	364			361
AVNRT	238	401		267
AVRT/WPW	98	133		69
AFL(RA isthmus dependent)	16	10		10
AT	10	01		15
VT/VPC	214	346		297
Idiopathic	212	344		289
Structural		2		8
AF ablation procedures				-
Ablation centers		5		5
AF ablation centers		-		-
Structural VT ablation centers		-		-
Ablation physicians		7		9
AF ablation physicians				-
Structural VT ablation physicians				-
National Registry	☐	☐		

7. Management

National certification for physicians	☐PM	☐CRT	☐ICD	☐Ablation
National accreditation for centers	xPM	xCRT	xICD	xAblation
Guidelines followed	☐National	☑U.S.	☑Europe	xAP

Payment (%)	Pacemaker	ICD	CRT	Ablation
Government	95	60	65	55
Insurance	-	08	08	10
Public insurance	-	5	5	7
Private insurance	-	3	3	3

Individual	-	32	27	35

Obstacles to guideline implementation (1=no obstacle, 5=great obstacle)

	1	2	3	4	5
Lack of centers	☐	☑	☐	☐	☐
Lack of reimbursement, limited financial resources	☐	☐	☑	☐	☐
Lack of referral	☐	☑	☐	☐	☐
Lack of trained personnel	☐	☑	☐	☐	☐
Low awareness of guidelines	☐	☑	☐	☐	☐
Lack of operators	☐	☑	☐	☐	☐

8. Source

Sri Lanka College of Cardiology(SLCC)

The APHRS White Book: Ninth edition

-The current status of cardiac electrophysiology in APHRS member countries

Shu Zhang, M.D.FHRS, FESC
Professor of Medicine, Chief of Department of Cardiology
Director of Clinical EP Lab and Arrhythmia Center
National Center for Cardiovascular Disease & Fu Wai Cardiovascular Hospital,
Chinese Academy of Medical Sciences & Beijing Union Medical College
President, Chinese Society of Arrhythmias
Past President of APHRS

1. Foreword

The White Book of Asia Pacific Heart Rhythm Society (APHRS) is an annual compilation of the cardiac electrophysiology data from APHRS member countries and regions from 2013. As in previous years, the APHRS white book provided valuable updated information about current status of activity in the field of arrhythmia treatment encompassing country demographics, epidemiology of cardiac arrhythmia, implantation of CIEDs (pacemaker, cardiac resynchronization therapy, and implantable cardioverter defibrillator), procedures of interventional electrophysiology, obstacles to guideline implementation, etc. Under the joint efforts of our board members, the nineth edition of APHRS White Book was finally released with data from 18 countries and regions, including China mainland, Hong Kong CN, India, Indonesia, Japan, Korea, Malaysia, Myanmar, New Zealand, Pakistan, Philippines, Singapore, Taiwan CN, Thailand, Vietnam, Brunei Darussalam, Mongolia, and Sri Lanka. The Data collection is mainly the result of voluntary participation of each national Society of Pacing and Electrophysiology or national Heart Rhythm Society. We hope the APHRS White Book will become a key reference for those seeking information about electrophysiological procedures and CIEDs in Asia-Pacific countries.

2. Methodology

A primary research was conducted within national Heart Rhythm Societies or working groups of cardiac pacing and electrophysiology of each country. Each chairman of the societies and/or working groups was asked to compile information about their country for the year 2020 based on a questionnaire. Secondary research has been conducted with the help of reliable official online databases to cross verify the information reported here. Three major sources of

information have been used: healthcare data were extracted from the World Health Organization (WHO) (http://www.who.int), whereas demographic information was taken by the United States Census Bureau International Database (http://www.census.gov), and lastly, the source of economic information has been the International Monetary Fund (IMF) World Economic Outlook Databases (http://www.imf.org). A total of 18 APHRS member countries and regions provided their data in this edition. The analysis was performed on the trend of device implantation and catheter ablation from 2017 to 2020, and the device implantation or catheter ablation rates and centers in 2020.

3. Permanent Pacemaker Implantation

3.1 Increase in pacemaker implantation

As shown in Figure 1, the increasing trend in the implantation of permanent pacemaker was seen in 8 countries or regions in 2020 as compared with 2019. For Brunei Darussalam, the implantation of pacemaker demonstrated a significant increasing rate at 58%. The pacemaker implantation in Indonesia, Malaysia, Mongolia and Thailand showed an increasing rate over 5%. Reported data showed decreased pacemaker implantation in China Mainland, Hongkong CN, india, Myanmar, Pakistan, Philippine, Singapore, and Vietnan. In figure 2, the implantation rates/ million inhabitants in 2020 were shown.

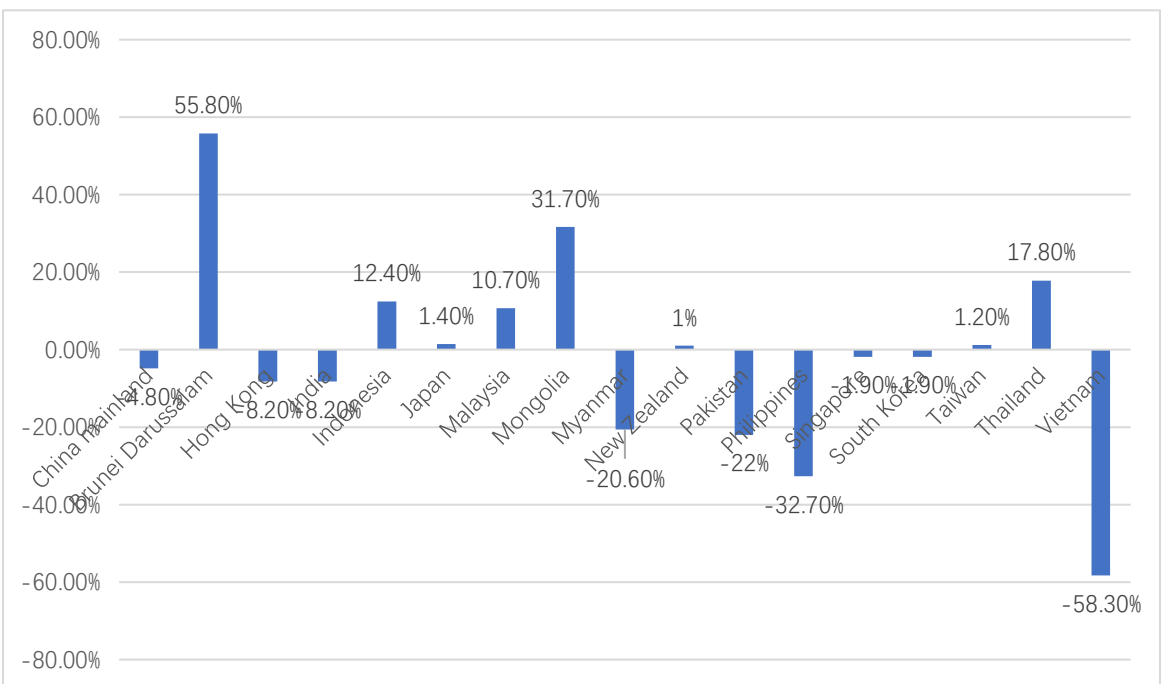

Figure 1: Increasing rate of pacemaker implantation in 2020 as compared with 2019

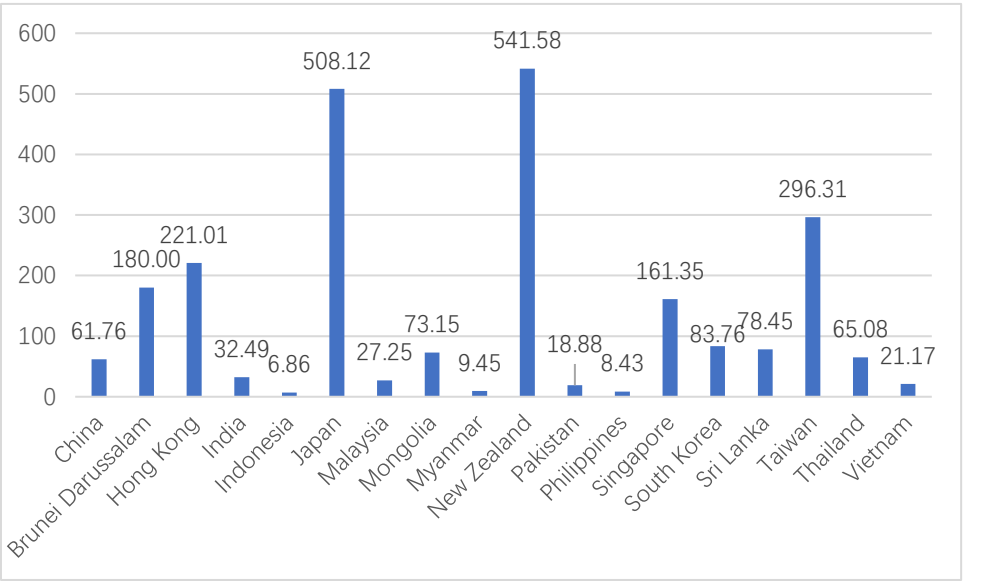

Figure 2 Pacemaker implantation rate/ million inhabitants in 2020

3.2 Pacemaker implantation rate

As shown in Table 1, data in 2020 were analyzed by evaluating pacemaker implantation rates. Across the 17 countries or regions, the pacemaker implantation rate per million inhabitants showed similar trend to that in last year with the highest reported implantation rate in New Zealand (541.6) and Japan (508.1) and the lowest in Indonesia (6.86). The pacemaker implantation rates per million inhabitants were also low in Philippines (8.43) and Myanmar (9.45). The large gap in the number of pacemaker implanting center per million inhabitants still remained among the 17 countries and regions. In 2020, Taiwan remained as the top region which had the highest implanting centers per million inhabitants (4.7), followed by Brunei(4.5) and Vietnam(4.5) that shared the second place. Other countries remained similar level to that in 2019. Although the reported data in 2020 did not differ significantly from that in 2019, our analysis still found a significant change as compared with several years before. One major difference from last year is that an increasing trend of pacemaker implantation rate was shown in half of Asia-Pacific countries and regions. Other data provided similar information. For example, China and Japan are still the countries that had the highest total number of pacemaker implantations in 2020. The influence of GDP on pacemaker implants did not differ as compared with that in 2019. The countries with highest GDP per capita of the 17 countries and regions were Hong Kong, New Zealand, Japan, and Taiwan. The countries with highest implantation rate per million inhabitants were also New Zealand, Japan, Taiwan and Hong Kong.

3. ICD and Cardiac Resynchronization Therapy devices (CRT)

3.1 The implantation of ICD in 2020

Unlike data last year, the decreasing trend of implantation of ICD was observed in 13 APHRS countries and regions in 2020 as compared with 2019, and only 3 APHRS countries and regions showed increasing trend (Figure 2). Most Asia-Pacific countries and region showed a decreasing trend in ICD implantation. Japan, China and India are the three countries that had the highest total number of ICD implantations in 2020. The countries with the decrease rates of ICD implant more than 30% in 2020 were Brunei(-31.8%), Myanmar(-40.5%), Pakistan (-44.9%). China had an decreasing trend of 4.6% in ICD implantation. The ICD implantation was still rare in some Asia-Pacific countries like Mongolia (4 cases).

We also analyzed the data on ICD primary or secondary prevention from 11 countries and regions: China mainland, India, Philippines, Taiwan, Indonesia, Singapore, Malaysia, Myanmar, Pakistan, Brunei, and Mongolia. The use of ICD for primary prevention in Brunei, Singapore, and Myanmar were higher than 50% (79.5%, 65.22%, 56.76%, respectively). China mainland and Malaysia had a primary prevention ratio of ICD more than 30% (45%, 34.98%, respectively). Brunei was the country having the highest ratio of primary prevention in Asia-Pacific countries and regions (79.5%).

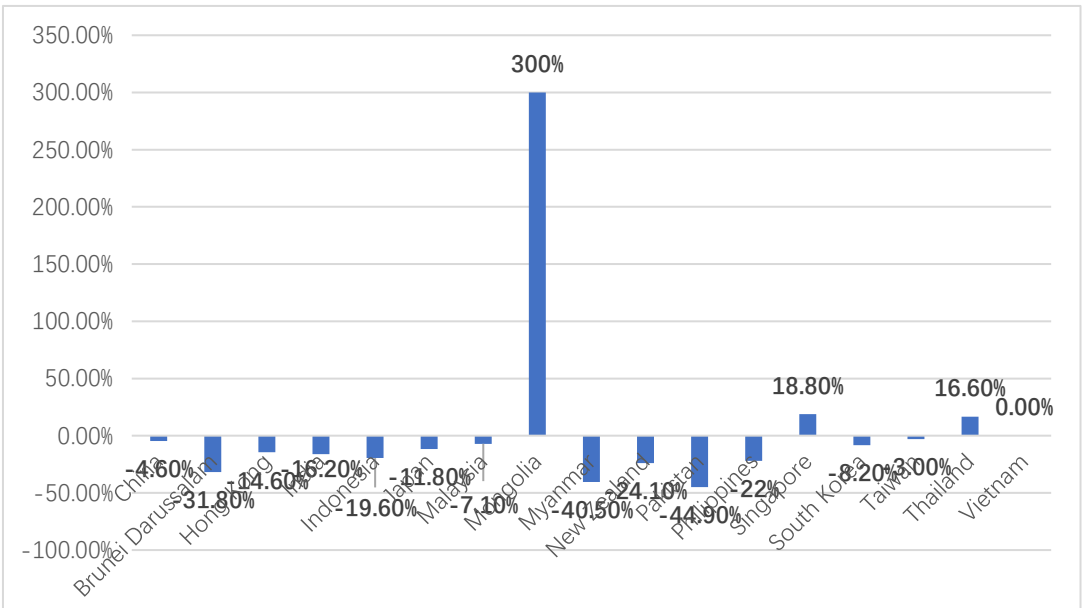

Figure 3: Increasing rate of ICD implantation in 2020 as compared with 2019

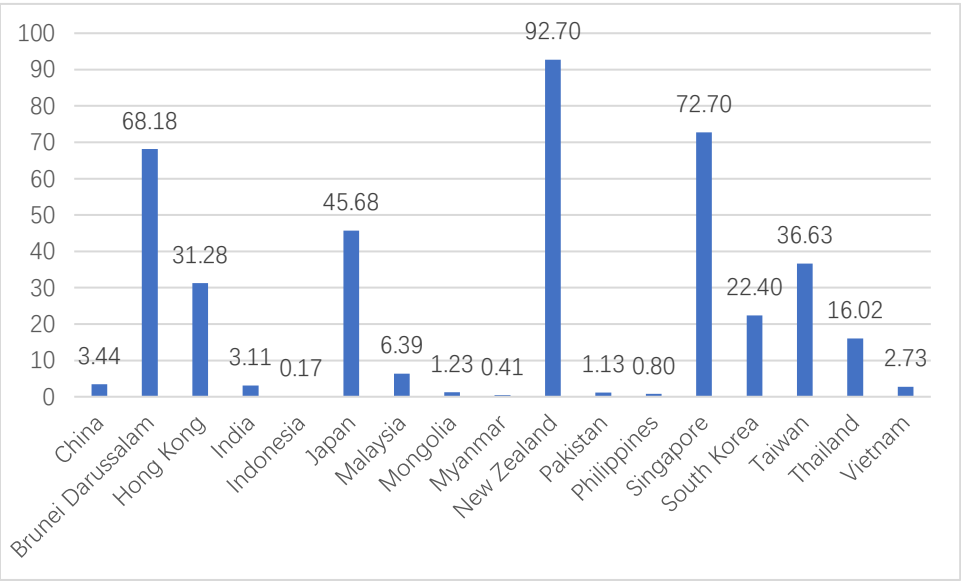

Figure4: ICD implantation rate/ million inhabitants in 2020

3.2 ICD implantation rate

As shown in table 1, New Zealand was still the country with highest reported ICD implantation rate per million inhabitants (92.7). Brunei(68.18), Singapore (72.7) and Japan (45.68) were the other countries with high ICD implants/million. Some countries kept increasing ICD implants/million, including Singapore and Thailand. Countries with low ICD implants/million were Philippines (0.8), Myanmar (0.4) and Indonesia (0.17). The available data also showed a large gap among the 17 countries and regions in the number of ICD implanting center per million inhabitants. In 2020 data, the countries with more than 1 ICD implanting centers per million inhabitants were Brunei (4.5), Taiwan (3.5), New Zealand (1.6), and Singapore (1.1). The other countries and regions with less than 1 implanting centers per million inhabitants included India (0.3), Indonesia(0.1), Malaysia (0.6), Mongolia (0.3), Myanmar (0.1), Sri Lanka (0.4), Philippines (0.1), Mainland China (0.3), and Vietnam (0.2).

3.3 CRT utilization in Asia-Pacific area

In 2020, we had data on CRT implantation from 17 Asia-Pacific countries and regions (Figure 3). The rising trend in CRT implantation remains in 7 among the data from 17 countries and regions, there were 10 countries and regions which showed decreased CRT implantation.

In 2020, the countries with total number of CRTs implantation more than 1000 were Japan (5475), Mainland China (3896) and India (2816), and those with CRT implantation between 100

and 1000 were Hong Kong (183), Malaysia (175), Thailand (429), New Zealand (347), Pakistan (113) , Singapore (177), South Korea (346), Taiwan (315), and Vietnam(104). The countries with increasing rates of CRT implant more than 10% in 2020 were Brunei (15.7%), Hong Kong (11.5%), Mongolia(133%), and Thailand (15%). And the countries and regions with a decreasing rate in CRT implantation included China(-14%), India(-21%), Indonesia(-12.7%), Myanmar (-90%), Pakistan(-71%), Philippines (-3.7%), Singapore (-13.6%), Taiwan (-11%) and Vietnam(-6.3%). The total number of CRT implant was also relatively low in 4 countries and regions, including Mongolia(7), Philippines (26), Brunei (22), and Myanmar (1), although some of them had been demonstrated as an increasing trend.

The CRT implantation rate per million inhabitants in 2020 seemed to be decreased as compared to last year, and a great heterogeneity was seen similar to last year, from as low as 0.02-1/million (Myanmar, Pakistan, Indonesia, Philippines and Vietnam) to as high as 70/million in New Zealand, 50 in Brunei, 43 in Japan, and 31 in Singapore. The decreasing trend was seen in the CRT implantation rate per million inhabitants in most Asia-Pacific countries and regions, including Singapore (from 36.3 in 2019 to 31.3 in 2020), India (from 2.7 in 2019 to 2.0 in 2020), , South Korea (from 6.9 in 2019 to 6.73 in 2020), and there was a slightly increasing trend in Hong Kong (from 21.9 in 2018 to 24.46 in 2019), Japan (from 40.7 in 2018 to 43.28 in 2019), Malaysia (from 4.9 in 2019 to 5.4 in 2020).

There was also significant variability in the ratio of CRT-D/CRT-P implants. The number from “CRT implant centers” in 15 countries and regions were analyzed. 11 out of 15 Asia-Pacific countries and regions were with more than 50% CRT-D implantation rate, in which Myanmar was shown with the highest CRT-D/total CRT ratio (90.91%). CRT-D implantation rate above 50% was shown in other 10 countries and regions, including China(64%), Brunei(78.95%), Hong Kong (83.54%), India (85%), Japan (70.81%), Malaysia (52.5%), Philippines(88.89%), Singapore(74.63%), Thailand(74.53%), Vietnam(55.86%). However, CRT-D implant rate was less than 30% in Pakistan(25.64%).

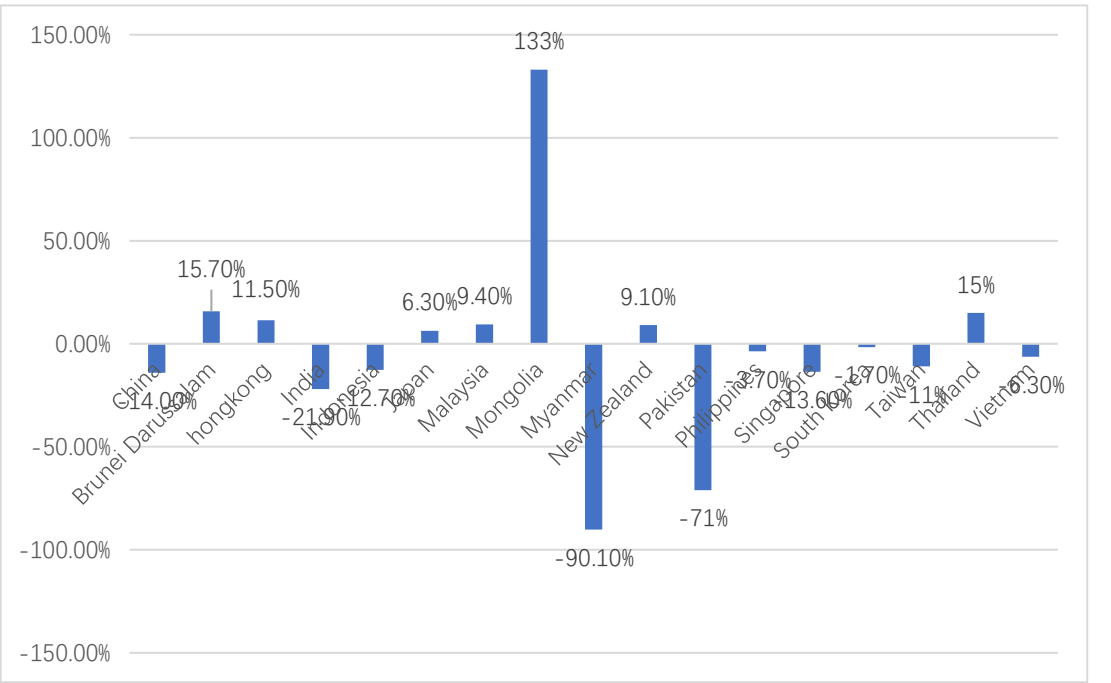

Figure 5: Increasing rate of CRT implantation in 2020 as compared with 2019

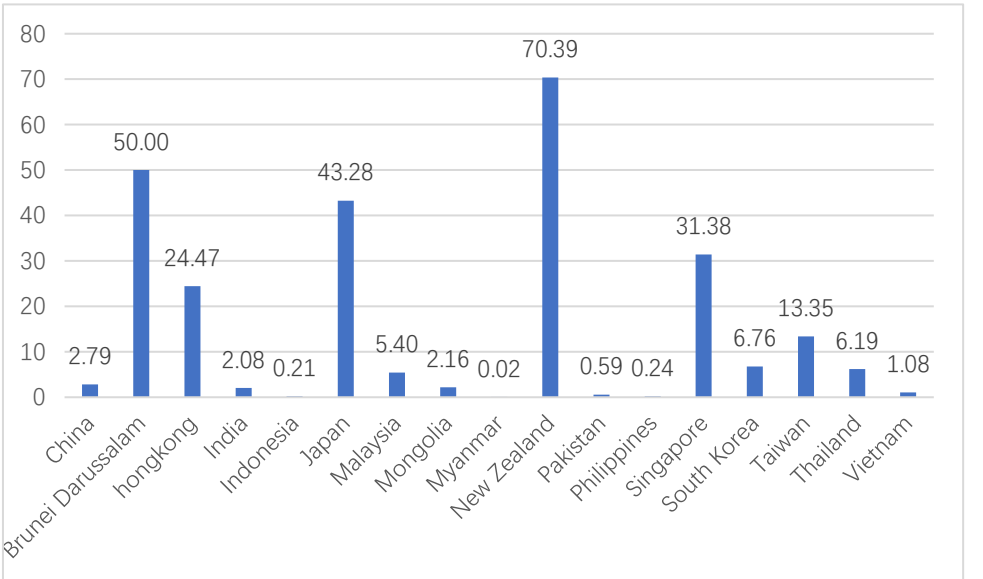

Figure 6: CRT implantation rate/ million inhabitants in 2020

4 Catheter Ablation

4.1 General information of Catheter Ablation

We received data about catheter ablation from 15 countries and regions in 2020. China mainland was still the country having the highest cases receiving catheter ablations (156873). Japan was the other countries with high cases of 100000, and South Korea 10348 . The ablation procedures in other countries and regions were less than 10000. An increasing trend was observed in ablation procedures across 8 countries. Pakistan was the country with the highest ablation increasing rate (40.5%). There were 2 countries and regions with an increasing rate between 10% and 20%, including Malaysia(14.2%) and New Zealand(13.0%). The increasing rate in India(2.9%) , Japan(4%), South Korea(6.9%), Taiwan(8.7%) and Thailand(2.2%) were relatively low as compared with other countries. However, China(-10.9%), Indonesia(-34.8%), Mongolia(-73%), Myanmar(-72%), Philippine (-122%) , Singapore(-33.8%), Vietnam(-37%) demonstrated decrease in catheter ablation.

4.2 Ablation procedure rates

Table 2 shows the ablation procedures per million inhabitants in 17 countries and regions. Japan was the country which continued having increasing ablation procedures per million inhabitants, from 591.9 in 2017 to 632.4 in 2018, 758.9 in 2019, and 790.5 in 2020. New Zealand also has increased ablation procedures per million inhabitants (from 362.7 to 417). Countries having more than one hundred ablation procedures per million inhabitants included Mainland China (112.4), Singapore (127.7), Brunei (209), South Korea(202.3), and Taiwan (233.2). Philippines(0.65) Indonesia(3.3) and India(3.5) had the lowest ablation procedures per million inhabitants. In China mainland, the ablation procedures/ million inhabitants increased from 95.8 in 2017 to 108.6 in 2018, 124.7 in 2019, and decreased to 112.4 in 2020. Regarding ablation centers per million inhabitants in 2020, the highest density was remained in Japan (5.53) and the lowest in pakistan (0.01) and Philippines (0.04).

4.3 Atrial fibrillation (AF) catheter ablation

We had the data of AF ablation from 15 countries and regions this year. In 2020, AF ablation procedures increased almost in all countries. Japan was still the country with the highest number of AF ablation procedures (74000 cases). As shown in Table 2, the AF ablation rate per million inhabitants was increased from 490.1 to 585 in Japan, which was the highest among APHRS member countries and regions. India (0.15), Philippines (0.04) and Myanmar(0.15) were the countries with the lowest AF ablation rate. Regarding the ratio of AF ablation/total ablation, there was also a large gap among 15 countries and regions, with highest ratio of AF ablation/total ablation in Japan (74%), and lowest AF ablation ratio in Myanmar (1.3%). And the

AF ablation ratio was 4.2% in India, 5.5% in Indonesia, 18.4% in Malaysia, 1.35% in Pakistan, 35.5%in New Zealand, 5.8% in Philippines, 19.9% in Singapore, 48.1% in South Korea, 21.54% in Taiwan, 7.36% in Thailand, and 3.6% in Vietnam.

5 Conclusion and future work

This edition of APHRS White book had made a great progress with collection of data from 18 APHRS countries and regions although some data were not available. Primary analysis of these data showed a growing trend in arrhythmia interventional treatment in part of Asia-Pacific countries and regions, and some of countries and regions presented decreased CIED implantation and catheter ablation rate. There is still a great gap between Asia and Western countries. These data also highlight significant inequalities covering all arrhythmia interventional therapies in Asia-Pacific countries. The overview of these data indicated that more supervision, cardiac education training and guideline implementation are needed to promote the development of arrhythmia interventional therapy. The APHRS White Book needs indispensable support and participation of all member countries in Asia-Pacific regions. The APHRS White book may serve as motivation for these countries to adopt a systematic approach to key data on arrhythmia therapy in the future.

Table 1. The CIEDs implantation rates and implanting centers per million inhabitants for the year 2020 in 18 Asia-Pacific countries and regions

Countries and regions	Pacemaker implantation rate/ million inhabitants	Pacemaker implanting centers / million	ICD implantation rate/ million inhabitants	CRT implantation rate/ million inhabitants	ICD/CRT implanting centers / million
PR. China	61.8	0.8	3.4	2.8	0.3
Brunei	180	4.5	68.2	50	4.5
Hong Kong	221	No data	31.3	24.5	No data
India	32.5	0.8	3.1	2.1	0.3
Indonesia	6.9	0.2	0.17	0.21	0.1
Japan	508.1	No data	45.68	43.3	No data
Malaysia	27.3	1.2	6.39	5.4	0.6
Mongolia	73.1	0.6	1.2	2.2	0.3
Myanmar	9.5	0.2	0.4	0.02	0.1
New Zealand	541.6	2.8	92.7	70.4	1.6
Pakistan	18.9	0.2	1.1	0.6	No data
Philippines	8.4	0.7	0.8	0.2	0.1
Singapore	161.3	1.1	72.7	31.38	1.1

South Korea	83.8	No data	22.4	6.8	No data
Taiwan	296.3	4.7	36.6	13.4	3.5
Thailand	66.1	No data	16	6.2	No data
Vietnam	21.2	4.5	2.7	1.1	0.2
Sri Lanka	78.4	0.52	No data	No data	No data

Table 2 The ablation procedure rate and centers per million inhabitants for the year 2020 in 18 Asia-Pacific countries and regions

Countries and regions	Ablation procedure rate/ million inhabitants	Ablation centers/ million inhabitants	AF ablation rate/ million inhabitants	AF ablation centers/ million inhabitants	AF ablation/ ablation procedure
PR. China	112.4	0.63	40	0.31	35.71%
Brunei	209	No data	75	No data	35.87%
Cambodia	No data	0.06	No data	No data	No data
India	3.5	0.05	0.15	0.02	4.2%
Indonesia	3.3	0.06	0.18	0.03	5.5%
Japan	790.5	5.53	585	3.95	74%
Malaysia	32	0.15	5.89	0.15	18.4%
Mongolia	27.8	0.31	No data	No data	No data
Myanmar	11.2	0.09	0.15	0.02	1.33%
New Zealand	417	1.62	148.1	0.81	35.5%
Pakistan	13.3	0.01	0.18	0.01	1.35%
Philippines	0.65	0.04	0.04	0.04	5.89%
Singapore	127.7	0.53	25.4	0.35	19.9%
South Korea	202.3	0.78	97.3	0.72	48.1%
Sri Lanka	30.4	0.23	No data	No data	No data
Taiwan	233.2	1.61	50.2	0.64	21.54%
Thailand	36.9	0.26	2.71	No data	7.36%
Vietnam	30.6	0.22	1.1	0.07	3.60%

- *ISSN: **2424-9386** (Online)*

  *ISSN: **2424-9378** (Print)*