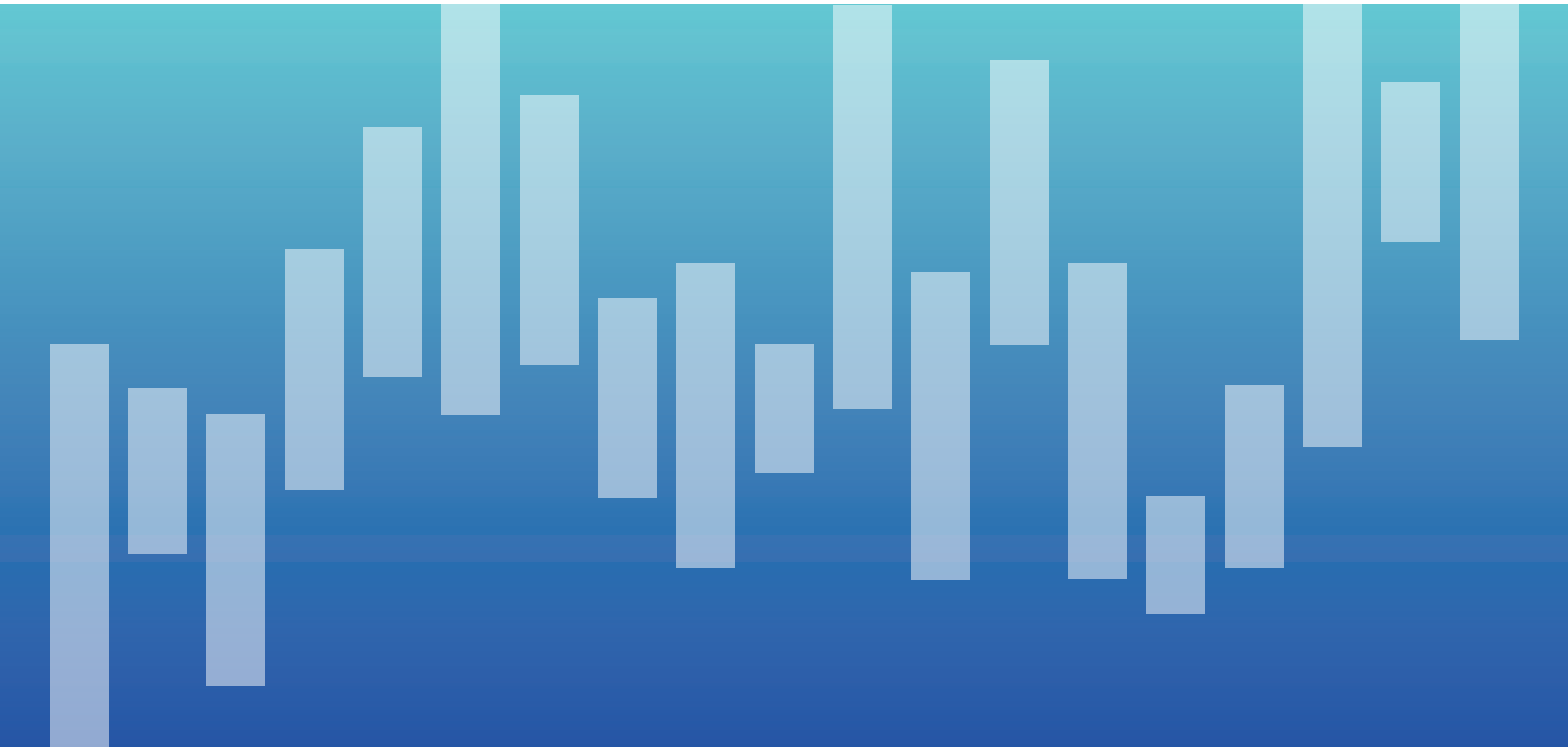
The APHRS White Book 2013



www.aphrs.asia / Asia Pacific Heart Rhythm Society

APHRS

Preface

The APHRS was founded in 2008 with its goal to enhance cardiac education, support academic research and inquiry, and promote professional exchange with other domestic and international scientific and medical organizations. In 2010, the APHRS recognized that it was very important to have an APHRS White Book focusing on current status of interventional therapies of cardiac arrhythmia in Asia-Pacific countries.

The interventional therapies for cardiac arrhythmia have developed rapidly in Asia-Pacific region within past few decades. There is a rapidly growing trend in electrophysiological procedures and implantation of cardiac implantable electronic devices (CIEDs) in most of Asia-Pacific countries. However, significant inequalities exist in healthcare and treatment of cardiac arrhythmia across Asian countries and regions, which makes it important and necessary for the healthcare community to share, recognize, and communicate with each other on the data and information relating to current status of cardiac electrophysiology and arrhythmia treatment. By doing so, the APHRS will not only promote scientific, technological, and clinical development for interventional therapy of cardiac arrhythmia but also improve healthcare for patients across countries and regions in Asia.

The APHRS White Book is planned to report valuable updated information about current status of activities 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, and etc. In the scientific session of APHRS2012 held in Taipei, professor Shu Zhang first presented such kind of data from 7 Asia-Pacific countries and regions: China mainland, India, Japan, Korea, New Zealand, Philippines, and Taiwan. The information presented at that session encouraged the APHRS to make the decision to publish the first edition of the APHRS White Book during the next annual scientific session of APHRS.

This first edition of the APHRS White Book only includes data from 10 countries and regions on the use of cardiac electronic devices and electrophysiological procedures in the past three years. Data collection is mostly the result of voluntary participation of national Society of Pacing and Electrophysiology or national Heart Rhythm Society in each country or region and the data are maintained in full autonomy by each national Society of Pacing and Electrophysiology or national Heart Rhythm Society. In some other Asian

countries, there are currently no registries or the data is limited. Thus, the APHRS White Book can also motivate these countries to adopt a systematic approach to preserve key data on arrhythmia therapies in the future. We hope more Asian countries and regions will participate in the future edition of APHRS White Book. This first edition of the APHRS White Book represents a successful and tangible attempt made by the APHRS leadership to serve its mission: to promote excellence and advancement in the diagnosis and treatment of the patients with heart rhythm disorders.

With the release of this first edition of the APHRS White Book, the APHRS recognizes the effort made by all authors, chairs and co-chairs from each of individual national Heart Rhythm Society working groups, and expresses special thanks to professor Shu Zhang who has played the key role in the publication of the First Edition of the APHRS White Book.

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Acknowledgement

As a member of APHRS and the chief editor of this White Book, I would like to express my deepest joy and appreciation for the publication of the first edition of the APHRS White Book. I owe particular thanks to the current president of APHRS, Professor Shih-Ann Chen, who led the preparation of this edition of the APHRS White Book. I would also like to thank our board members for their support of this work. I will express my appreciation to our contributors, the national Society of Pacing and Electrophysiology and the national Heart Rhythm Society of ten member countries or regions of Asia. Without their voluntary collection of data, the publication of this book would not have been possible. In addition, I am very grateful to members of my working group, especially to Dr. Xiaohan Fan and Miss. Na Lin, who performed the secondary research to cross verify and establish the quantitative and qualitative information contained in the book.

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Table of Contents

Country/Region: CHINA

1. Statistics

	2010	2011	2012
Population (thousand)[1]	1330141	1336718	1343240
Hospitals			
Beds (per 100,000 population)[2]			390
Physicians (per 1,000 population)[2]			1.46
Nurses (per 1,000 population)[2]			1.51
GDP (US$, billions)[3]	5,930.39	7,298.15	7,991.74
Total expenditure on health as % GDP[2]	5%	5.2%	
Government expenditure on health as %	54.3%	55.9%	
Insured citizens (%)	60%	60%	70%
SCD patients	0.54m	0.54m	0.54m
Heart failure patients	6m	6m	6m
AF patients	6m	6m	6m

[1] www.census.gov
[2] www.who.int
[3] www.imf.org

2. Pacemaker

	2010	2011	2012
Total Pacemakers	38768	42986	49502
New implants	31981	35573	41889
Replacements	6787	7413	7613
Single-chamber	15745	16309	18117
Dual-chamber	22693	25905	29747
Sick sinus syndrome	19506	21762	24980
AV block	15020	16765	19144
Implanting Centers	820	840	938
Implanting Physicians	3000	3000	3000
National Registry	☑	☑	☑

3. Cardiac resynchronization therapy

	2010	2011	2012
Total CRTs	1573	1876	2210
CRT-P	905	987	1020
CRT-P new implants	821	903	892
CRT-P replacements/upgrade	84	84	128
CRT-D	629	835	1173
CRT-D new implants	588	762	1062
CRT-D replacements/upgrade	41	73	111
Ischemic	431	548	587
Non-ischemic	1122	1289	1623
Implanting Centers	313	330	358
Implanting Physicians	3000	3000	3000
National Registry	☑	☑	☑

4. Implantable cardioverter defibrillator

	2010	2011	2012
Total ICDs	1027	1228	1553
ICD new implants	937	1126	1424
ICD replacements	90	102	129
Single-chamber	745	879	1044
Dual-chamber	282	349	509
Primary prevention	408	506	663
Secondary prevention	618	722	890
Implanting Centers	239	260	309
Implanting Physicians	3000	3000	3000
National Registry	☑	☑	☑

5. Interventional electrophysiology

	2010	2011	2012
Ablation procedures	54559	63355	74410
SVT ablation procedures	36342	41688	46499
AVNRT	17406	20483	23097
AVRT/WPW	16759	18415	20325
AFL (RA isthmus dependent)	1000	1363	1495
AT	1177	1427	1582
VT/VPC	NA	1747	1853
Idiopathic	NA	1598	1659
Structural	NA	149	194
AF ablation procedures	7308	9856	12343
Ablation centers			
AF ablation centers	300	316	331
Structural VT ablation centers			
Ablation physicians	2000	2000	2000
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

National Center of Quality Control for Interventional Arrhythmia Thrapy of MOH
Chinese Society of Pacing and Electrophysiology (CSPE)

Country/Region: Hong Kong SAR

1. Statistics

	2010	2011	2012
Population (thousand)[1]	7090	7123	7154
Hospitals	53	53	53
Beds	35,500	35,500	35,500
Physicians	12,440	12,634	12,800
Nurses	29,101	30,308	31,500
GDP (US$, billions)	224.174	243.302	260.471
Total expenditure on health as % GDP	2.06%	1.96%	2.05%
Government expenditure on health (US$)	4,243 mil	4,406 mil	4,916 mil
Insured citizens (%)			
SCD patients			
Heart failure patients			
AF patients			

[1] www.census.gov

2. Pacemaker

	2010	2011	2012
Total Pacemakers	894	859	987
New implants	722	670	818
Replacements	172	189	169
Single-chamber			
Dual-chamber			
Sick sinus syndrome			
AV block			
Implanting Centers			
Implanting Physicians			
National Registry	☐	☐	☐

3. Cardiac resynchronization therapy

	2010	2011	2012
Total CRTs			
CRT-P			
CRT-P new implants			
CRT-P replacements/upgrade			
CRT-D			
CRT-D new implants			
CRT-D replacements/upgrade			
Ischemic			
Non-ischemic			
Implanting Centers			
Implanting Physicians			
National Registry	☐	☐	☐

4. Implantable cardioverter defibrillator

	2010	2011	2012
Total ICDs	177	148	116
ICD new implants	131	123	79
ICD replacements	46	25	37
Single-chamber			
Dual-chamber			
Primary prevention			
Secondary prevention			
Implanting Centers			
Implanting Physicians			
National Registry	☐	☐	☐

5. Interventional electrophysiology

	2010	2011	2012
Ablation procedures			
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	☐	☐	☐

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

Name of national working group or arrhythmia body

Country/Region: India

1. Statistics

	2010	2011	2012
Population (bn)[1]	1.19	1.21	1.23
Hospitals (Govt. only)[2]	11,993	11,993	11,993
Beds[3] (Govt. only)	7,38,000	7,84,000	8,32,000
Physicians[4] (Govt. only)	44,432	71,975	1,16,592
Nurses (K)[5]	800	848	900
GDP (US$ - billion)[6]	1,632	1,838	1,824
Total expenditure on health as % GDP[7]	4.1%	N/A	N/A
Government expenditure on health as %[8]	1.2%	N/A	N/A
Insured citizens (%)[9]	0.07%	0.07%	0.08%
SCD patients[10] (K) (600K for 1.2bn)	595	600	615
Heart failure patients[11]	23,114,694	23,493,775	23,879,073
AF patients (mn)	11.9	12.1	12.3

2. Pacemaker

	2010	2011	2012
Total Pacemakers	22097	23542	27518
New implants	92.3%	90.3%	91.1%
Replacements	7.7%	9.7%	8.9%
Single-chamber	10523	10809	12392
Dual-chamber	4207	4885	5952
Sick sinus syndrome[12]	25%	25%	25%
AV block	65%	65%	65%
Implanting Centers	652	774	810
Implanting Physicians	1229	1392	1480
National Registry	☐	☐	☐

[1] 2011 India Census
[2] http://data.gov.in
[3] http://data.gov.in
[4] http://data.gov.in
[5] Northbridge Capital
[6] www.imf.org
[7] OECD
[8] OECD
[9] IRDA Annual reports
[10] Indian Heart Journal, v.63, No.4, July-August 2011.
[11] http://www.sph.umn.edu/img/assets/25422/Lyle_Joyce.pdf
[12] Mondo HG, et al. PACE v43, August 2011. p.1013.

3. Cardiac resynchronization therapy

	2010	2011	2012
Total CRTs	1050	1205	1514
CRT-P			
CRT-P new implants	650	690	745
CRT-P replacements/upgrade	70	81	89
CRT-D			
CRT-D new implants	330	390	612
CRT-D replacements/upgrade	0	44	68
Ischemic	65%	65%	65%
Non-ischemic	35%	35%	35%
Implanting Centers	158	180	207
Implanting Physicians	214	240	306
National Registry	☐	☐	☐

4. Implantable cardioverter defibrillator

	2010	2011	2012
Total ICDs	1067	1190	1540
ICD new implants	960	1012	1309
ICD replacements	106 (10%)	179 (15%)	308 (20%)
Single-chamber	855	940	1120
Dual-chamber	212	250	420
Primary prevention	160(15%)	273 (23%)	415 (27%)
Secondary prevention	906 (85%)	916 (77%)	1124 (73%)
Implanting Centers	181	213	230
Implanting Physicians	286	328	358
National Registry	☐	☐	☐

5. Interventional electrophysiology

	2010	2011	2012
Ablation procedures	5000	6200	7800
SVT ablation procedures			
AVNRT	3000	3650	4500
AVRT/WPW			
AFL (RA isthmus dependent)			
AT			
VT/VPC	1800	2200	2800
Idiopathic			
Structural			
AF ablation procedures	200	350	500
Ablation centers	80	90	100
AF ablation centers	10	15	20
Structural VT ablation centers	40	50	65
Ablation physicians	65	78	90
AF ablation physicians	12	18	25
Structural VT ablation physicians	30	35	48
National Registry	☐	☐	☐

All EP data – Company internal and Market data

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	20	20	20	15
Insurance	10	10	10	10
Public insurance	7	7	7	7
Private insurance	3	3	3	3
Individual	70	70	70	75%

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	☐	☐	☑	☐	☐

7. Source

Name of national working group or arrhythmia body

Country/Region: Japan

1. Statistics

	2010	2011	2012
Population (thousand)[1]	128074	127799	127515
Hospitals (per 100,000 population)	6.8	6.73	6.71
Beds	1730339	1712539	1706326
Physicians (per 100,000 population)	230.4	No data	N/A
Nurses (per 1,000 population)[2]			
GDP (US$, billions)[3]	5,488.42	5,869.47	5,981.00
Total expenditure on health as % GDP[2]	9.2%	9.3%	7.9%
Government expenditure on health as %[2]	18.4%		17.5%
Insured citizens (%)			81%
SCD patients			
Heart failure patients	1081000	1087000	1087000
AF patients	916000	929000	941000

[1] www.stat.go.jp
[2] www.who.int
[3] www.imf.org

2. Pacemaker

	2010	2011	2012
Total Pacemakers	57588	59209	59441
New implants	36287	37714	38893
Replacements	21301	21495	20548
Single-chamber	10647	12983	12163
Dual-chamber	46240	45422	45589
Sick sinus syndrome			
AV block			
Implanting Centers	1324	1365	
Implanting Physicians			
National Registry	☐	☐	☐

3. Cardiac resynchronization therapy

	2010	2011	2012
Total CRTs	3565	3868	4209
CRT-P	701	784	839
CRT-P new implants			
CRT-P replacements/upgrade			
CRT-D	2864	3084	3371
CRT-D new implants	2288	2486	2439
CRT-D replacements/upgrade	576	598	932
Ischemic			
Non-ischemic			
Implanting Centers	327	345	
Implanting Physicians			
National Registry	☐	☐	☐

4. Implantable cardioverter defibrillator

	2010	2011	2012
Total ICDs	4663	5059	5594
ICD new implants	3377	3515	3655
ICD replacements	1286	1544	1939
Single-chamber	899	961	1087
Dual-chamber	3764	4098	4507
Primary prevention			
Secondary prevention			
Implanting Centers	370	376	394
Implanting Physicians			
National Registry	☐	☐	☐

5. Interventional electrophysiology

	2010	2011	2012
Ablation procedures	32000	38000	42000
SVT ablation procedures			15000
AVNRT			
AVRT/WPW			
AFL (RA isthmus dependent)			
AT			
VT/VPC			6000
Idiopathic			
Structural			
AF ablation procedures	13000	17000	21000
Ablation centers	540	570	600
AF ablation centers	260	300	350
Structural VT ablation centers			
Ablation physicians	1350	1425	1500
AF ablation physicians	650	750	875
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

Name of national working group or arrhythmia body

Japanese Heart Rhythm Society

Country/Region: New Zealand

1. Statistics

	2010	2011	2012
Population (thousand)[1]	4252	4290	4328
Hospitals *(includes every small hosp.)*		184	184
Beds *(includes every small hosp.)*		27000	27000
Physicians	13883	14333	14500
Nurses			34000
GDP (US$, billions)[2]	140.79	161.85	180.55
Total expenditure on health as % GDP[2]	10.1%	10.1%	9%
Government expenditure on health as %[2]	83.2%	83.2%	
Insured citizens (%)			32%
SCD patients			3500 (estimate)
Heart failure patients			25000 (estimate)
AF patients			Unknown

[1] www.census.gov
[2] www.imf.org

2. Pacemaker

	2010	2011	2012
Total Pacemakers		1956	2100
New implants		1662	1800
Replacements		294	300
Single-chamber		700	700
Dual-chamber		1256	1400
Sick sinus syndrome			
AV block			
Implanting Centers		12	12
Implanting Physicians		30	30
National Registry	☐	☐	☐

3. Cardiac resynchronization therapy

	2010	2011	2012
Total CRTs			No data
CRT-P			
CRT-P new implants			
CRT-P replacements/upgrade			
CRT-D			
CRT-D new implants			63
CRT-D replacements/upgrade			15
Ischemic			
Non-ischemic			
Implanting Centers		4	5
Implanting Physicians		12	13
National Registry	☐	☐	☐

4. Implantable cardioverter defibrillator

	2010	2011	2012
Total ICDs	451	454	535
ICD new implants	344	382	423
ICD replacements	107	72	112
Single-chamber			
Dual-chamber			
Primary prevention			203
Secondary prevention			220
Implanting Centers	4	4	5
Implanting Physicians	10	12	13
National Registry	☐	☑	☑

5. Interventional electrophysiology

	2010	2011	2012
Ablation procedures			
SVT ablation procedures			No data
AVNRT			
AVRT/WPW			
AFL (RA isthmus dependent)			
AT			
VT/VPC			No data
Idiopathic			
Structural			
AF ablation procedures			
Ablation centers		7	
AF ablation centers		4	4
Structural VT ablation centers			4
Ablation physicians		11	
AF ablation physicians		4	6
Structural VT ablation physicians			7
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	95%	99%	99%	95%
Insurance				
Public insurance				
Private insurance				4%
Individual	5%	1%	1%	1%

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

Name of national working group or arrhythmia body

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

Country/Region: Philippines

1. Statistics

	2010	2011	2012
Population (thousand)[1]	99900	101834	103775
Hospitals	1921		
Beds (per 100,000 population)[2]			50
Physicians (per 1,000 population)	1.2	1.2	1.2
Nurses (per 1,000 population)			
GDP (US$, billions)[3]	199.591	213.129	227.584
Total expenditure on health as % GDP[3]	4.1%	4.1%	4.5%
Government expenditure on health as %[3]	36.1%	36.3%	
Insured citizens (%)			32%
SCD patients			
Heart failure patients			
AF patients			

[1] www.census.gov
[2] www.who.int
[3] www.imf.org

2. Pacemaker

	2010	2011	2012
Total Pacemakers	655	711	779
New implants	574	648	710
Replacements	84	63	69
Single-chamber	478	464	485
Dual-chamber	177	247	294
Sick sinus syndrome			
AV block			
Implanting Centers	34	36	
Implanting Physicians	68	74	
National Registry	☐	☐	☐

3. Cardiac resynchronization therapy

	2010	2011	2012
Total CRTs	7	13	8
CRT-P	1	2	1
CRT-P new implants	0	2	1
CRT-P replacements/upgrade	1	0	0
CRT-D	6	11	7
CRT-D new implants	4	9	7
CRT-D replacements/upgrade	2	2	0
Ischemic			
Non-ischemic			
Implanting Centers	10	10	10
Implanting Physicians	11	11	12
National Registry	☐	☐	☐

4. Implantable cardioverter defibrillator

	2010	2011	2012
Total ICDs	23	30	38
ICD new implants	21	29	35
ICD replacements	2	1	3
Single-chamber	16	23	27
Dual-chamber	7	7	11
Primary prevention			
Secondary prevention			
Implanting Centers	10	10	10
Implanting Physicians	11	11	12
National Registry	☐	☐	☐

5. Interventional electrophysiology

	2010	2011	2012
Ablation procedures	65	50	80
SVT ablation procedures			
AVNRT	17	16	21
AVRT/WPW	34	25	30
AFL (RA isthmus dependent)	6	0	5
AT	0	0	1
VT/VPC			
Idiopathic	8	9	8
Structural	0	0	2
AF ablation procedures	0	0	5
Ablation centers			
AF ablation centers	0	0	1
Structural VT ablation centers	0	0	1
Ablation physicians			
AF ablation physicians	0	0	4
Structural VT ablation physicians	0	0	2
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	50%	10%	5%	20%
Insurance				
Public insurance	0	0	0	0%
Private insurance	0	0	0	0%
Individual	50%	90%	95%	80%

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

Name of national working group or arrhythmia body

Country/Region: Singapore

1. Statistics

	2010	2011	2012
Population*	5,076,700	5,183,700	5,312,400
Hospitals *(Acute Hospitals/Specialty Centres)**	23	23	25
Beds *(Acute Hospitals/Specialty Centres/Other Hospitals)**	10,283	10,334	10,755
Physicians*	9,030	9,646	10,225
Nurses/Midwives* - Registered Nurses - Enrolled Nurses - Registered Midwive	29,340 21,575 7,478 287	31,749 23,598 7,869 282	34,507 25,971 8,274 262
GDP (US$, billions)[1]	227.38	259.85	270.02
Total expenditure on health as % GDP	4.5	4.6	-
Government expenditure on health as %	31.4	31.0	-
Insured citizens (%)	-	-	-
SCD patients	-	-	-
Heart failure patients	-	-	-
AF patients	-	-	-

*Data source: Singapore Health Facts, Ministry of Health, Singapore as of 13-16 August 2013 (www.moh.gov.sg)

[1] www.imf.org

2. Pacemaker

	2010	2011	2012
Total Pacemakers	499	532	536
-New implants	407	436	455
Replacements	71	84	65
Others	21	12	16
-Single-chamber	214	166	159
Dual-chamber	276	361	370
Not applicable	9	5	7
-Sick sinus syndrome	258	286	291
AV block	130	141	136
Implanting Centers	4	5	4
Implanting Physicians	~ 18	~17	~ 22
National Registry^	☑	☑	☑

^Data source: CGH, KTPH, NHCS, NUH, TTSH, SCDB
CGH:Changi General Hospital, KTPH:KhooTeckPuat Hospital, NHCS: National Heart Centre Singapore, NUH: National University Hospital, TTSH: Tan Tock Seng Hospital, SCDB: Singapore Cardiac Data Bank

3. Cardiac resynchronization therapy

	2010	2011	2012
Total CRTs	69	87	121
CRT-P	10	12	15
CRT-P new implants	4	6	6
CRT-P replacements/upgrade	4	6	8
Others	2	0	1
CRT-D	59	75	106
CRT-D new implants	47	54	77
CRT-D replacements/upgrade	10	12	23
Others	2	9	6
Ischemic	38	41	70
Non-ischemic	16	23	22
Implanting Centers	4	4	5
Implanting Physicians	~ 6	~10	~15
National Registry^	☑	☑	☑

^Data source: CGH, KTPH, NHCS, NUH, TTSH, SCDB

4. Implantable cardioverter defibrillator

	2010	2011	2012
Total ICDs	181	233	309
- ICD new implants	157	195	255
ICD replacements	21	28	44
Others	3	10	10
- Single-chamber	153	205	268
Dual-chamber	26	22	39
Others	2	6	2
- Primary prevention	90	135	174
Secondary prevention	91	97	135
Others	-	1	-
Implanting Centers	4	5	5
Implanting Physicians	~12	~16	~16
National Registry^	☑	☑	☑

^Data source: CGH, KTPH, NHCS, NUH, TTSH, SCDB

5. Interventional electrophysiology

	2010	2011	2012
Ablation procedures	433	412	543
SVT ablation procedures	-	-	-
AVNRT	113	103	155
AVRT/WPW	94	72	125
AFL (RA isthmus dependent)	87	81	93
AT	16	18	19
VT/VPC	47	46	58
Idiopathic	-	-	-
Structural	-	-	-
AF ablation procedures	72	84	82
Others	4	8	11
Ablation centers	2	2	2
AF ablation centers			
Structural VT ablation centers			
Ablation physicians	~11	~11	~15
AF ablation physicians			
Structural VT ablation physicians			
National Registry^	☑	☑	☑

^Data source: CGH, KTPH, NHCS, NUH, TTSH, SCDB

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

Name of national working group or arrhythmia body

Country/Region: South Korea (Republic of Korea)

1. Statistics

	2010	2011	2012
Population (thousand)[1]	48636	48755	48861
Hospitals[2]	1,650	1,711	
Beds (per 100,000 population)[2]			1030
Physicians (per 1,000 population)[2]			2.02
Nurses (per 1,000 population)[2]			5.29
GDP (US$, billions)[3]	1,014.89	1,116.25	1,155.87
Total expenditure on health as % GDP[3]	7.1%	7.2%	
Government expenditure on health as %[3]	58.2%	57.3%	
Insured citizens (%)	100	100	100
SCD patients	n/a	n/a	n/a
Heart failure patients		n/a	
AF patients	1.5%		

[1] www.census.gov
[2] www.who.int
[3] www.imf.org

2. Pacemaker

	2010	2011	2012
Total Pacemakers	2850	3217	3541
New implants	74.4%	72.8%	75.8%
Replacements	25.6%	27.2%	24.2%
Single-chamber	30.2%	28.5%	29.9%
Dual-chamber	69.8%	71.5%	70.1%
Sick sinus syndrome	42.6%	41.8%	42.2%
AV block	57.4%	58.2%	57.8%
Implanting Centers	138	140	n/a
Implanting Physicians			
National Registry	☐	☐	☐

3. Cardiac resynchronization therapy

	2010	2011	2012
Total CRTs	115	100	112
CRT-P	41	19	6
CRT-P new implants	40	18	5
CRT-P replacements/upgrade	1	1	1
CRT-D	74	81	106
CRT-D new implants	62	74	99
CRT-D replacements/upgrade	12	7	7
Ischemic	16.9%	13.2%	23.8%
Non-ischemic	83.1%	86.8%	762%
Implanting Centers	30	32	
Implanting Physicians			
National Registry	☐	☐	☐

4. Implantable cardioverter defibrillator

	2010	2011	2012
Total ICDs	350	440	562
ICD new implants	278	360	460
ICD replacements	72	80	102
Single-chamber	223	247	349
Dual-chamber	127	193	213
Primary prevention	21.4%	26.5%	28.4%
Secondary prevention	78.6%	73.5%	71.6%
Implanting Centers	72	73	90
Implanting Physicians			
National Registry	☐	☐	☐

5. Interventional electrophysiology

	2010	2011	2012
Ablation procedures			
SVT ablation procedures	3337	3694	3966
AVNRT	1464	1607	1777
AVRT/WPW	1324	1382	1487
AFL (RA isthmus dependent)	283	362	381
AT	170	257	257
VT/VPC	289	369	423
Idiopathic	90.5%	88.2%	87.6%
Structural	9.5%	11.8%	12.4%
AF ablation procedures	1052	1286	1561
Ablation centers			
AF ablation centers	21	27	30
Structural VT ablation centers	14	15	16
Ablation physicians			
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	95%	95%	95%	90%
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	☐	☑	☐	☐	☐

7. Source

Name of national working group or arrhythmia body

KHRS (Korean Heart Rhythm Society),

Because substantial data, especially of device therapy was missed by questionnaire, data of device therapy were acquired by manufacturer's data and Korea Health Insurance Company. So, some data was expressed by percentage rather than absolute number.

Country/Region: Taiwan

1. Statistics

	2010	2011	2012
Population (thousand)[1]	23127	23174	23235
Hospitals	482	479	487
Beds	146,187	146,377	146,510
Physicians	44,169	45,505	N/A
Nurses	128,720	133,092	N/A
GDP (US$, billions)[2]	428.22	464.03	473.97
Total expenditure on health as % GDP	5.7	5.8	5.8
Government expenditure on health as %	~32%	~34%	~35%
Insured citizens (%)	23,074,487	23,198,664	23,315,822
SCD patients	~16,908	~16,954	~17,020
Heart failure patients	~579,053	~580,622	~582,895
AF patients	~347,431	~348,373	~349,737

[1] www.census.gov
[2] www.imf.org

2. Pacemaker

	2010	2011	2012
Total Pacemakers	4022	3945	4043
New implants	2534	2564	2830
Replacements	1488	1381	1213
Single-chamber	1489	1381	1291
Dual-chamber	2533	2564	2752
Sick sinus syndrome	2421	2485	2426
AV block	1576	1445	1602
Implanting Centers	96	98	101
Implanting Physicians	~150	~160	~170
National Registry	☐	☐	☐

3. Cardiac resynchronization therapy

	2010	2011	2012
Total CRTs	192	208	179
CRT-P	135	150	145
CRT-P new implants	114	122	114
CRT-P replacements/upgrade	21	28	31
CRT-D	57	58	34
CRT-D new implants	37	32	26
CRT-D replacements/upgrade	20	26	8
Ischemic	38	41	36
Non-ischemic	154	167	143
Implanting Centers	35	37	40
Implanting Physicians	~150	~160	~170
National Registry	☐	☐	☐

4. Implantable cardioverter defibrillator

	2010	2011	2012
Total ICDs	276	347	348
ICD new implants	227	281	278
ICD replacements	49	66	70
Single-chamber	111	104	97
Dual-chamber	165	243	251
Primary prevention	0	0	1
Secondary prevention	276	347	348
Implanting Centers	35	37	40
Implanting Physicians	~150	~160	~170
National Registry	☐	☐	☐

5. Interventional electrophysiology

	2010	2011	2012
Ablation procedures	2510	2390	~2500
SVT ablation procedures	1510	1450	~1500
AVNRT			
AVRT/WPW			
AFL (RA isthmus dependent)	350	330	~330
AT			
VT/VPC	230	200	~220
Idiopathic	N/A	N/A	N/A
Structural			
AF ablation procedures	420	410	~450
Ablation centers			
AF ablation centers			
Structural VT ablation centers			
Ablation physicians			
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

Name of national working group or arrhythmia body

Country/Region: THAILAND

1. Statistics

	2010	2011	2012
Population (thousand)	63,878	64,076	64,456
Hospitals (per 100,000 population)[1]	1278	n/a	1.8
Beds (per 100,000 population)[1]		210	210
Physicians	22019	n/a	n/a
Nurses	120,012	n/a	n/a
GDP (US$, billions)[2]	318.908	345.672	365.564
Total expenditure on health as % GDP[1]	3.9%	4.1%	
Government expenditure on health as %[1]	75.0	75.5	
Insured citizens (%)	100	100	100
SCD patients			
Heart failure patients	16.9/10000		
AF patients			

[1] www.who.int
[2] www.imf.org

2. Pacemaker

	2010	2011	2012
Total Pacemakers	1857	2257	2619
New implants	1857	2153	2326
Replacements		122	293
Single-chamber			44%
Dual-chamber	48%	51%	54%
Sick sinus syndrome			34.4%
AV block			36%
Implanting Centers	40-50	60	70
Implanting Physicians	44	44	115
National Registry	☑	☑	☑

3. Cardiac resynchronization therapy

	2010	2011	2012
Total CRTs	100	88	111
CRT-P	47	52	65
CRT-P new implants	47	52	65
CRT-P replacements/upgrade			
CRT-D	53	36	46
CRT-D new implants	53	36	46
CRT-D replacements/upgrade			
Ischemic			
Non-ischemic			
Implanting Centers			
Implanting Physicians			20
National Registry	☐	☐	☐

4. Implantable cardioverter defibrillator

	2010	2011	2012
Total ICDs	387	487	662
ICD new implants	387	436	583
ICD replacements		51	79
Single-chamber	81%	82.5%	83.4%
Dual-chamber	8%	8.72%	5.5%
Primary prevention			
Secondary prevention			
Implanting Centers			
Implanting Physicians			
National Registry	☐	☐	☐

5. Interventional electrophysiology

	2010	2011	2012
Ablation procedures			
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	☐	☐	☐

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

Name of national working group or arrhythmia body

The APHRS White Book
-The current status of cardiac electrophysiology in APHRS member countries

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1. Foreword

Under the leadership by President Shih-Ann Chen, Asia Pacific Heart Rhythm Society (APHRS) is planning to publish White Book to provide valuable update 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, and obstacles to guideline implementation etc.. For the first time, we collected data of electrophysiological procedures and CIEDs from 7 of the 30 member countries of the APHRS. Although the data reported here is limited, that means an important start of our work on the APHRS White Book.

In this edition of APHRS white book, only 7 Asia-Pacific countries and regions participate in the project: China mainland, India, Japan, Korea, New Zealand, Philippines, and Taiwan.

2. Methodology

A primary research was conducted within national cardiology societies and 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 2009, 2010, and 2011 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 source of information have been used: healthcare data were extracted from the World Health Organization (WHO) (http://www.who.int), whereas demographic information were taken by the United States Census Bureau International Database (http://www.census.gov), and finally, the source of

economic information has been the International Monetary Fund (IMF) World Economic Outlook Databases (http://www.imf.org). The level of accuracy of the data gathered here was tested for device therapies used in 2009 and is presented as an example for pacemaker in Figure 1 as well as implantable cardioverter defibrilators (ICDs) in Figure 2. Overall, there was a very high consistency in the implantation rates of implantable pulse generators and ICDs collected by questionnaire and those reported by the 11th world survey[1]. Only 7 countries and regions provided their data, the analysis was performed on the trend of device implantation and catheter ablation from 2009 to 2011, and the device implantation rates or catheter ablation rates and centers in 2011.

3. Permanent Pacemaker Implantation

3.1 Three-year trends in pacemaker implantation

The implantation of permanent pacemaker has increased over time significantly in China mainland and India from 2009 through 2011. In China, pacemaker use increased by 27.9%, from 33614 in 2009 to 47387 in 2011. A similar increasing trend of 28.1% in pacemaker implantation was also seen in India. By contrast, the overall use of pacemaker remained constant during this time in other five countries and regions. In 2009, the overall implants were 58345 in Japan, 2651 in Korea, 672 in Philippines, and 3905 in Taiwan, and which were 59209 in Japan, 3210 in Korea, 929 in Philippines, and 3945 in Taiwan in 2011.

3.2 Pacemaker implantation rate

Data for 2011 were analyzed by evaluating pacemaker implantation rates. Across the 7 countries and regions, a marked heterogeneity was observed in the pacemaker implantation rate per million inhabitants with the highest reported implantation rate in Japan (464.5) and New Zealand (455.9) and the lowest in Philippines (9.1). A large gap among the 7 countries and regions was also seen in the number of pacemaker implanting center per million inhabitants. In Japan, there were 10.4 implanting centers per million inhabitants in 2011. By contrast, the countries with lowest density of implanting centers were India (0.3), Philippines (0.4), and China mainland (0.6). Significant differences were also noted in the pacemaker implants per center, 163 implants per center were performed in New Zealand, while the numbers of implants/center were only 22.9 in Korea, 25.8 in Philippines, 44.7 in Japan, 56.4 in China mainland, and 121.5 in India. In general, the reported data presented different features in each country. For example, Japan had the highest total number of pacemaker implantations (59209) and implantation

rate per million inhabitants (464.5) in 2011, but a relatively low number of implants (44.7) per center. By contrast, New Zealand had the lowest total number of pacemaker use (1956) in 2011, but a relatively higher implantation rate per million inhabitants (455.9) and implantations per center (163). The influence of GDP was also analyzed by evaluating implantation rate per million inhabitants in countries with different GDP per capita. Obviously, the countries with highest GDP per capita of the 7 countries and regions were Japan, Korea, New Zealand and Taiwan, and the countries with highest implantation rate per million inhabitants were also Japan, and New Zealand, then Taiwan (170.2), and Korea (65.8). Whereas the country with lowest GDP per capita and implantation rate per million inhabitants was the Philippines.

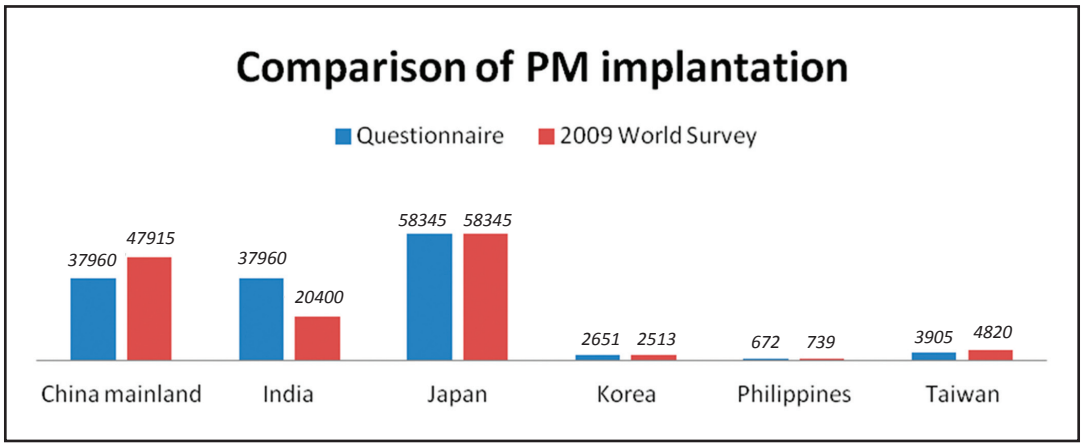

Figure 1. *Comparison of pacemaker (PM) implantation rate as presented by questionnaire with reported by the 11th world survey of cardiac pacing for the year 2009.*

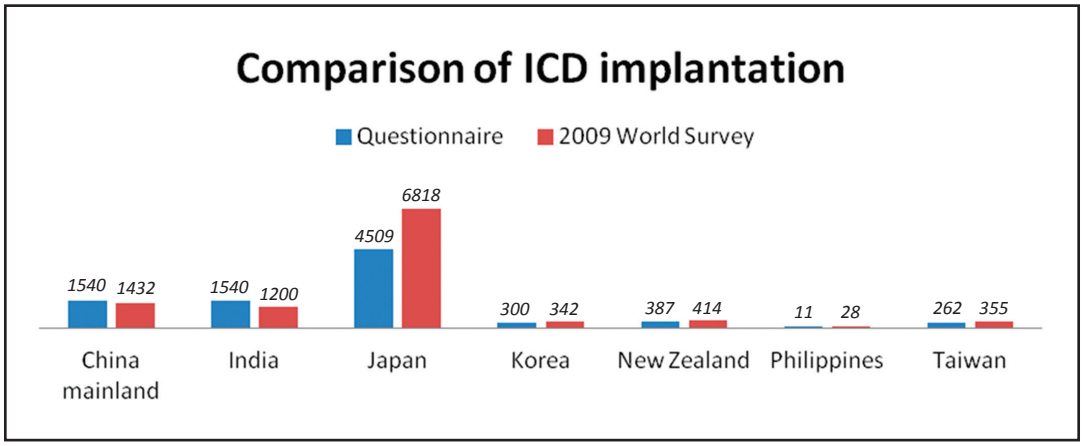

Figure 2. *Comparison of ICD implantation rate as presented by questionnaire with reported by the 11th world survey of cardiac pacing for the year 2009. ICD, implantable cardioverter defibrillator.*

4. ICD and Cardiac Resynchronization Therapy devices (CRT)

4.1 Three-year trends in ICD

The implantation of ICD has increased over time from 2009 through 2011 in almost all countries and regions. The significant increase was seen in Japan, India, and China mainland. Japan is the country with highest ICD implantation in Asia-Pacific region, and the ICD use was 4509 in 2009, and 5059 in 2011. In India, ICD increased by 66.8%, from 1504 in 2009 to 2508 in 2011. Similarly, a significant increasing trend in ICD implantation was also seen in China (82.2%), from 736 in 2009 to 1341 in 2011. By contrast, the ICD use increased slightly in New Zealand (from 387 in 2009 to 454 in 2011), Korea (from 300 in 2009 to 440 in 2011), and Taiwan (from 262 in 2009 to 310 in 2011). Although Philippines is the country with the lowest implants of ICD in Asia-Pacific region, the increase was great of 236%, from 11 in 2009 to 37 in 2011.

4.2 ICD implantation rate

It was reported a total number of 10149 ICD implants across the 7 countries and regions in 2011. The highest reported ICD implantation rate per million inhabitants was recorded in New Zealand (105.8), while the lowest in Philippines (0.4), China mainland (1.0), and India (2.1). In Japan, 39.7 ICD implants/million capita were performed, while Taiwan had 13.4, Korea had 9.0. The available data also showed a large gap among the 7 countries and regions in the number of ICD implanting center per million inhabitants. The countries with more than 1 ICD implanting centers per million inhabitants were Japan (2.9) and Korea (1.5) in 2011. By contrast, the other countries with less than 1 implanting centers per million inhabitants included New Zealand (0.9), India (0.3), Philippines (0.1), and China mainland (0.2). It might be just because New Zealand had the highest ICD implants/million but less than 1 implanting center/million capita, the highest implants per center were recorded in New Zealand (113.5). The numbers of ICD implants/center were only 6.0 in Korea, 5.3 in Philippines, 13.5 in Japan, 5.2 in China mainland, and 8.4 in India.

4.3 CRT utilization in Asia-Pacific area

The rising trend in CRT implants was similar to the implantation of ICD in Asia-Pacific countries and regions from 2009 through 2011. The total number of CRTs implantation exceeded 1000 in Japan, India, and China mainland, with the highest CRT implantation in Japan. The CRT use increased significantly by 78.1% in China mainland, from 1023 in 2009 to 1822 in 2011, by 62.1% in India, from 1452 in 2009 to 2354 in 2011, and by 32.5% in Japan, from 2920 in 2009 to 3868 in 2011. Although the reported total number of CRT

implantation was relatively lower in other countries and regions, the data also showed a significant increasing trend in CRT implantation in Korea (from 56 in 2009 to 89 in 2011), Taiwan (from 204 in 2009 to 224 in 2011), and Philippines (from 4 in 2009 to 14 in 2011). However, no data were available for New Zealand.

The collected data showed a total number of 8371 CRT implants in 6 Asia-Pacific countries and regions in 2011. The number of implants shows great heterogeneity from as low as 0.1/million (Philippines) to as high as 30.3/million (Japan). In Taiwan, 9.7 implants/million capita were performed, while India had only 2.0, Korea had 1.8, China mainland had 1.4. There was also significant variability in the ratio of CRT-D/CRT-P implants. The ratio of CRT-D implants was 79.7% in Japan, 80.9% in Korea, 39.3% in India or China mainland, and 36.6% in Taiwan.

CRT implantation is still technically challenging and is not performed in all pacemaker implanting centers. The number of "CRT centers" shows great geographical variability with the highest density of reported centers per million inhabitants in Japan (2.9) and lowest density of centers in India (0.1). The other three countries also had CRT centers/million less than 1 (0.9 in New Zealand, 0.7 in Korea, and 0.2 in China mainland). Because Japan had high number of CRT implanting centers, the implants/center was relatively lower (10.3/center) as compared with India (26.2), which had low number of CRT centers.

5. Catheter Ablation

5.1 General information of Catheter Ablation

Six countries and regions submitted their data about catheter ablation except for New Zealand. The number of ablations procedures was significantly higher in China mainland, and Japan than that in other countries and regions. Also an increasing trend was observed in ablation procedures across all 6 countries and regions from 2009 to 2011. In China mainland, the catheter ablations increased significantly by 56.2%, from 45363 in 2009 to 70847 in 2011, and which also rose by 52.0% in Japan, from 25000 in 2009 to 38000 in 2011. The total number of ablations was less than 10000 in other countries and regions (Korea, India, Philippines, and Taiwan).

5.2 Ablation procedure rates

By 2011, a total number of 123,983 ablations were performed in six Asia-Pacific countries and regions (China mainland, Japan, Korea, India, Philippines, and Taiwan). The highest number of ablation procedures per million inhabitants was recorded in Japan

(298.1), Taiwan (138.1), and Korea (112.8%), and the lowest in India (5.4) and Philippines (0.3). In China mainland, only 53.0 ablation procedures/million capita were performed. Regarding ablation centers per million inhabitants in 2011, the highest density was recorded also in Japan (4.5) and the lowest in India (0.1), Philippines (0.1) and China mainland (0.5). The distribution of ablation procedures per center also showed a marked heterogeneity. It was reported 107.7 ablation procedures/center in China mainland, 103.8/center in Korea, 66.7/center in Japan, 53.3/center in India, and only 5.8/center in Philippines. The data also showed a significant impact of GDP on the catheter ablation rate per million inhabitants. The top 3 countries with GDP per capita above 30 thousands US dollars in 2011 were Japan, Korea, and Taiwan. The three countries were also the top 3 countries of with the high number of ablation procedures per million inhabitants. By contrast, Philippines and India were at the bottom of the both GDP list and list of ablation procedures/million.

5.3 Atrial fibrillation (AF) catheter ablation

The data of AF ablation were available only for Japan, China mainland, Korea, and Taiwan (no data available for New Zealand and Philippines). Japan was the country with the highest number of AF ablation procedures since 2009. Compared with 2009, the AF ablations in 2011 significantly increased by 70% (from 10,000 to 17,000) in Japan, and by 97.3% in China mainland (from 4996 to 9856). There was an increase of 49.6% in the number of AF ablations from 2009 to 2011 in Korea, and also an increase of 11.0% in Taiwan from 2009 to 2012 (346 in 2009, 366 in 2010, 383 in 2011, and 384 in 2012). Across the 4 countries and regions with available data for 2011/2012, a total number of 28268 AF ablation procedures were performed, with the highest reported AF ablation rate per million inhabitants of 133.4 in Japan, 25.5 in Korea, 16.7 in Taiwan, and the lowest ablation rate of 7.4 in China mainland. Regarding the ratio of AF/total ablations, there was also a large gap among 4 countries and regions, with highest reported AF ablation ratio in Japan (44.7%). The ratio of AF ablation was 22.6% in Korea, 13.9% in China, 12.0% in Taiwan, and 0% in Philippines.

6. Conclusion and future work

The current report just brings together the data on implantation of cardiovascular electronic devices and electrophysiological procedures in 7 APHRS countries and regions. Primary analysis of these data showed a growing trend in arrhythmia interventional treatment in many Asia-Pacific countries and regions. However, there is still a great gap between Asia and Western countries. The 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. In some Asia countries, there are currently no registries or the data is limited. 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.

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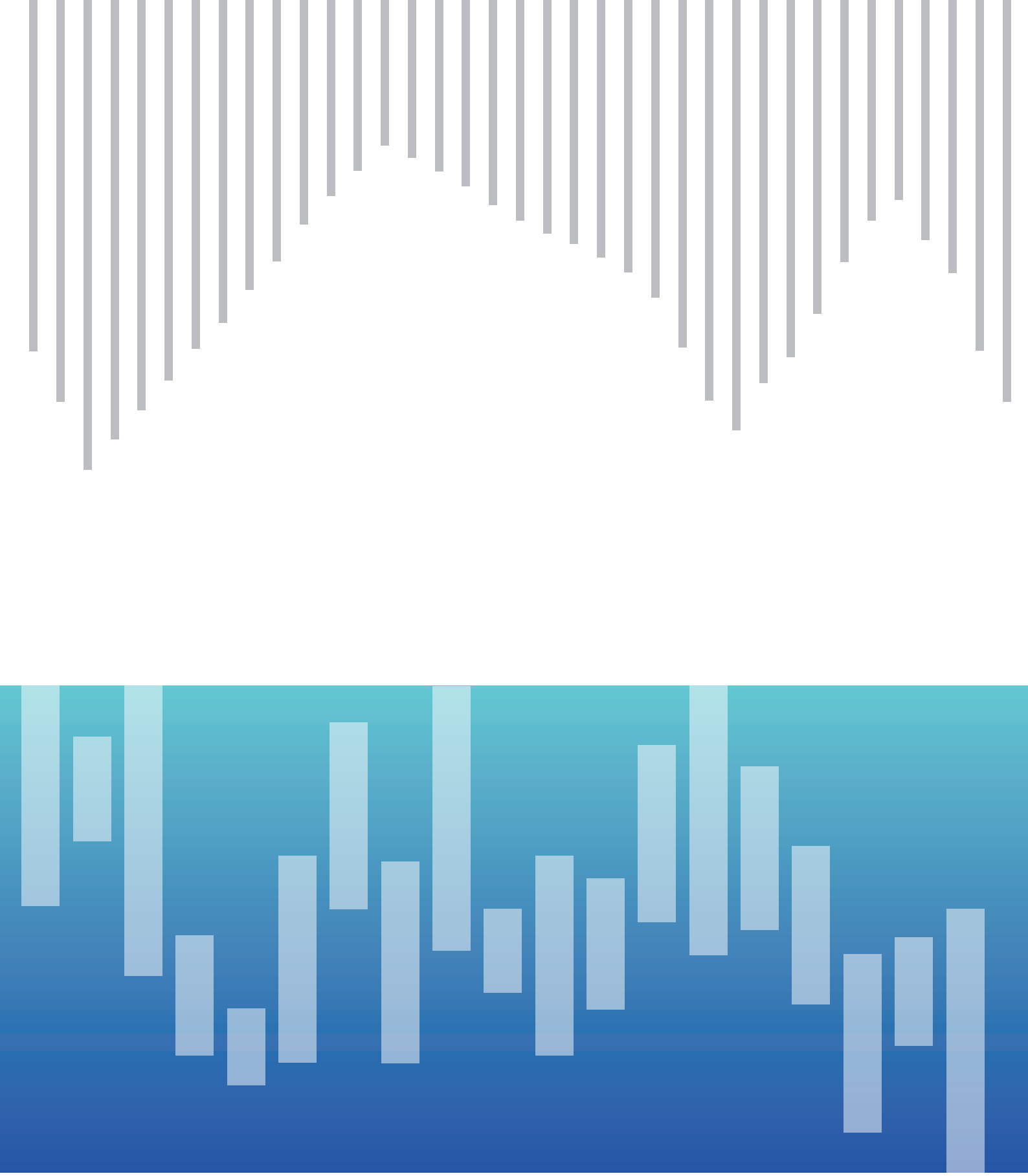

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