Preface

The APHRS was founded in 2008 with its goal to establish infrastructure for basic and clinical researches in the arrhythmia field of Asia-Pacific countries, to provide systematic educational opportunities for young researchers and clinicians wanting to specialize in this field, and to promote multinational researches.

In 2010, the need of White Book focusing on basic statistical data and current status of interventional therapies of cardiac arrhythmia in Asia-Pacific countries has been keenly felt.

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 make 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. We hope annually updated White Book will not only promote scientific, technological, and clinical development for better therapy of cardiac arrhythmia, but also improve and equalize healthcare for patients across Asia-Pacific countries and regions.

The APHRS White Book reports the most updated information about today 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, etc. Professor Shu Zhang first presented valuable data across 7 countries in the scientific session of APHRS 2012, and the first edition of the APHRS White Book was published during the scientific session of APHRS 2013. This year we have the Fourth edition of the APHRS White Book.

As in 2015 edition of APHRS White Book, the Fourth edition of the APHRS White Book 2016 includes data from 15 countries and regions on the use of CIEDs and

electrophysiological procedures in the past three years. Unlike last edition, we have new data from Myanmar and Vietnam, but lost data from Australia. 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. In some other Asia countries, there are currently no registries or the data are limited. Thus, the APHRS White Book can be a cradle of international registry or collaboration and also provocative to adopt a systematic approach to collect data on arrhythmia therapies in each country. We hope more Asian countries and regions would participate in the future edition of APHRS White Book.

With the release of this Fourth edition of the APHRS White Book, the APHRS appreciates the effort made by all authors, chairs and co-chairs from each of individual national HRS working groups, and expresses special thanks to Professor Shu Zhang, China, as the chief editor of White book, who devoted his precious time to annually updated APHRS White Book.

Wee Siong TEO
President APHRS

Acknowledgement

As a member of APHRS and the chief editor of this book, I would like to express my great appreciation for the publication of the Fourth edition of the APHRS White Book. I owe particular thanks to the current president of APHRS, Professor Wee Siong TEO, and the Immediate Past President, Professor Young-Hoon Kim, both of them led the preparation of this edition of the APHRS White Book. I would also like to thank our board members for their great support to this work. I want to express my appreciation to all contributors, the national Society of Pacing and Electrophysiology and the national Heart Rhythm Society of 15 member countries or regions of APHRS. Without their voluntary collection of data, the publication of this book would not have been possible. In addition, I'd like to thank Ms. Shigeno, Mr. Jimmy Yap, the secretary of APHRS, who help us collect data from member countries or regions. Finally, I'd like to mention contributions of members of my working group, Dr. Xiaohan Fan and Miss. Na Lin, who performed the 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
Vice President of APHRS

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Table of Contents

Country/Region: PR. China

1. Statatistics

	2012	2013	2014[4]	2015
Population(thousand)[1]	1343240	1349586	1367820	1367820
Hospitals	23170	24709	25860	25906
Beds(per 100,000 population) [2]	390	468.41	482.59	482.59
Physicians(per 1,000 population)[2]	1.46	1.67	1.74	1.74
Nurses(per 1,000 population)[2]	1.51	2.05	2.20	2.20
GDP (US$, billions)[3]	7,991.74	9,469.12	10,356.51	10,982.829
Total expenditure on health as % GDP[2]	5.26%	5.39%	5.55%	5.55%
Government expenditure on health as %	30.0%	30.1%	30.0%	30.0%
Insured citizens (%)	70%	70%	70%	70%
SCD patients	0.54	0.54	0.54	0.54
Heart failure patients	4.5m	4.5m	4.5m	4.5m
AF patients	6m	6m	8m	8m

1. www.census.gov
2. www.who.int
3. www.imf.org
4. www.stats.gov.cn

2. Pacemaker

	2012	2013	2014	2015
Total Pacemakers	49502	51752	59735	65785
New implants	41889	43917	48273	57683
Replacements	7613	7835	8305	8102
Single-chamber	18117	17706	17199	20393
Dual-chamber	29747	33753	35856	45392
Sick sinus syndrome	24980	26318	27294	26253
AV block	19144	20240	21262	21177
Implanting Centers	938	933	963	955
Implanting Physicians	3000	3000	3000	3000
National Registry	☑	☑	☑	☑

3. Cardiac resynchronization therapy

	2012	2013	2014	2015
Total CRTs	2210	2198	2753	3092
CRT-P	1020	959	1057	1330
CRT-P new implants	892	840	754	1052
CRT-P replacements/upgrade	128	119	180	278
CRT-D	1173	1220	1234	1762
CRT-D new implants	1062	1066	873	1456
CRT-D replacements/upgrade	111	154	254	306
Ischemic	587	542	528	866
Non-ischemic	1623	1656	1571	2226
Implanting Centers	358	353	383	374
Implanting Physicians	3000	3000	3000	3000
National Registry	☑	☑	☑	☑

4. Implantable cardioverter defibrillator

	2012	2013	2014	2015
Total ICDs	1553	1903	2333	2851
ICD new implants	1424	1745	1864	2601
ICD replacements	129	158	199	250
Single-chamber	1044	1300	1295	1939
Dual-chamber	509	603	622	912
Primary prevention	663	855	894	1197
Secondary prevention	890	1048	1022	1654
Implanting Centers	309	323	368	363
Implanting Physicians	3000	3000	3000	3000
National Registry	☑	☑	☑	☑

5. Interventional electrophysiology

	2012	2013	2014	2015
Ablation procedures	74410	83450	101063	117021
SVT ablation procedures	46499	50990	54481	53176
AVNRT	23097	25588	27036	26916
AVRT/WPW	20325	21809	21653	20383
AFL (RA isthmus dependent)	1495	1781	3136	3074
AT	1582	1812	2656	2803
VT/VPC	392	478	494	
Idiopathic	369	423	476	
Structural	23	16	18	
AF ablation procedures	11214	14752	17352	24545
Ablation centers	732	737	773	759
AF ablation centers	331	345	390	341
Structural VT ablation centers				
Ablation physicians	2000	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

Chinese Society of Pacing and Electrophysiology (CSPE)

Country/Region: Hong Kong SAR

1. Statistics

	2013	2014	2015
Population (thousand)[1]	7,219	7,266	7,324
Hospitals	53	53	53
Beds	35,790	36,965	38,287
Physicians	13,203	13,417	13,726
Nurses	34,597	35,821	37,670
GDP (US$, billions)	272.481	274.948	307.3
Total expenditure on health as % GDP	2.17%	2.64%	2.95%
Government expenditure on health (US$)	5,905 mil	7,269mil	9,051 mil
Insured citizens (%)			
SCD patients			
Heart failure patients			
AF patients			

1, www.census.gov

2. Pacemaker

	2013	2014	2015
Total Pacemakers	537	762	695
New implants	470	620	594
Replacements	67	142	101
Single-chamber			
Dual-chamber			
Sick sinus syndrome			
AV block			
Implanting Centers			
Implanting Physicians			
National Registry	☐	☐	

3. Cardiac resynchronization therapy

	2013	2014	2015
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

	2013	2014	2015
Total ICDs	79	110	102
ICD new implants	57	77	60
ICD replacements	22	33	42
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

	2013	2014	2015
Total lead extraction procedures			
Hospitals performed lead extraction			
Cardiologists performing lead extraction			

Surgeons performing lead extraction			
National Registry	☐	☐	☐

6. Interventional electrophysiology

	2013	2014	2015
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	☐	☐	☐

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

	2013	2014	2015
Population (bn)	1.252	1.267[i]	
Urban Hospitals (Govt. only)	13,761	14,432[ii]	
Beds (Govt. only)	14,38,738	15,96,168[2]	
Physicians	9,19,812	9,36,448[3]	
Nurses	23,61,591	25,30,275[3]	
GDP (US$ - billion)	1,877	2049.5[4]	
Total expenditure on health as % GDP	4.0%	3.9%[4]	
Government expenditure on health as %	33.1%	21%[4]	
Insured citizens (in Millions)	410	550	
SCD patients[iii1] (in Thousands)	627	700[5]	
Heart failure patients[iv] (in Millions)	2.31	~4.6[6]	
AF patients (mn)	12.7	15.8	

2. Pacemaker

	2013	2014	2015
Total Pacemakers	36,322	32747	31230
New implants	85.8%	80%	70%
Replacements	14.4%	20%	30%
Single-chamber	14,477	18386	17066
Dual-chamber	21,846	14361	14161
Sick sinus syndrome[v]	25%	25%	20%
AV block	65%	75%	80%
Implanting Centers	888	930	945

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/

Implanting Physicians	1500	1535	1540
National Registry	☐	☐	

3. Cardiac resynchronization therapy

	2013	2014	2015
Total CRTs	1830	2935	2147
CRT-P	1157	1005	784
CRT-P new implants	90%	88%	88%
CRT-P replacements/upgrade	10%	12%	12%
CRT-D	1331	951	1363
CRT-D new implants	90%	88%	85%
CRT-D replacements/upgrade	10%	12%	15%
Ischemic		65%	
Non-ischemic		35%	
Implanting Centers	300	315	315
Implanting Physicians	360	380	380
National Registry	☐	☐	

4. Implantable cardioverter defibrillator

	2013	2014	2015
Total ICDs	2963	2540	3061
ICD new implants			
ICD replacements			
Single-chamber	2030	1755	1907
Dual-chamber	933	785	1154
Primary prevention	20%	30%	30%
Secondary prevention	80%	70%	70%
Implanting Centers	340	350	355
Implanting Physicians	440	475	484
National Registry	☐	☐	

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2013	2014	2015
Total lead extraction procedures	20	30	
Hospitals performed lead extraction	4	5	
Cardiologists performing lead extraction	4	6	
Surgeons performing lead extraction	1	1	
National Registry	☐	☐	

6. Interventional electrophysiology

	2013	2014	2015
Ablation procedures	**13707**	**16349**	**19370**
SVT ablation procedures	**9179**	**10555**	**12033**
AVNRT	4436	5128	5846
AVRT/WPW	3143	3618	4125
AFL (RA isthmus dependent)	630	713	813
AT	970	1096	1249
VT/VPC	**3768**	**4792**	**6035**
Idiopathic	1324	1638	1998
Structural	2444	3154	4037
AF ablation procedures	**760**	**1002**	**1303**
Ablation centers	126	143	160
AF ablation centers	20	24	28
Structural VT ablation centers	69	78	89
Ablation physicians	95	102	109
AF ablation physicians	27	33	40
Structural VT ablation physicians	51	63	72
National Registry	☐	☐	

All EP data – Company internal and Market data

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	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	☐	☐	X	☐	☐
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: Indonesia

1. Statistics

	2013	2014	2015
Population (thousand)[1]	248,422.90	252,101.20	255.461.70
Hospitals	2,228	2,486	2406*
Beds	238,373	269,791	269,791
Physicians	90,444	157,393	157,393
Nurses	288,405	281,111	281,111
GDP (US$, billions)	868.30	870.00	861.93
Total expenditure on health as % GDP	3.1%	No data	2.8
Government expenditure on health (US$)	91.66	96.54	94.49
Insured citizens (%)	76.18	No data	78.0
SCD patients	No data	No data	No data
Heart failure patients	0.3%	No data	No data
AF patients	9.8%	No data	No data

[2], www.census.gov

2. Pacemaker

	2013	2014	2015
Total Pacemakers	573	717	707
New implants	542	688	657
Replacements	27	29	50
Single-chamber	357	436	405
Dual-chamber	216	281	302
Sick sinus syndrome	224	341	393
AV block	349	376	314
Implanting Centers	11	12	16
Implanting Physicians	20	23	76
National Registry	☐	☐	

3. Cardiac resynchronization therapy

	2013	2014	2015
Total CRTs	38	55	67
CRT-P	16	40	32
CRT-P new implants	27	40	27
CRT-P replacements/upgrade	2	0	4
CRT-D	4	15	35
CRT-D new implants	9	14	28
CRT-D replacements/upgrade	0	1	7
Ischemic	27	37	25
Non-ischemic	11	18	12
Implanting Centers	3	4	16
Implanting Physicians	10	11	23
National Registry	☐	☐	

4. Implantable cardioverter defibrillator

	2013	2014	2015
Total ICDs	21	19	24
ICD new implants	19	19	21
ICD replacements	2	0	3
Single-chamber	15	18	16
Dual-chamber	5	0	8
Primary prevention	15	12	2
Secondary prevention	5	6	43
Implanting Centers	7	7	15
Implanting Physicians	20	23	23
National Registry	☐	☐	

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2013	2014	2015
Total lead extraction procedures	1	5	7
Hospitals performed lead extraction	2	2	2
Cardiologists performing lead extraction	2	2	2
Surgeons performing lead extraction	0	0	
National Registry	☐	☐	☐

6. Interventional electrophysiology

	2013	2014	2015
Ablation procedures	382	416	491
SVT ablation procedures	157	174	268
AVNRT	69	75	115
AVRT/WPW	48	48	107
AFL (RA isthmus dependent)	25	31	31
AT	15	20	15
VT/VPC	5	12	147
Idiopathic	60	80	47
Structural	2	4	8
AF ablation procedures	48	39	65
Ablation centers	6	6	9
AF ablation centers	2	3	5
Structural VT ablation centers	2	2	2
Ablation physicians			22
AF ablation physicians			7
Structural VT ablation physicians			5
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 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：

Indonesian Heart Rhythm Society (InaHRS)

Country/Region: Japan

1. Statistics

	2013	2014	2015
Population (thousand)[1]	127298	127083	126990
Hospitals (per 100,000 population)	6.71	6.71	6.69
Beds	1695210	1691450	1611026
Physicians (per 1,000 population) [2]	2.38	2.38	2.39
Nurses (per 1,000 population) [2]	7.98	7.99	8.41
GDP (US$, billions) [3]	5040.95	5008.57	4990.57
Total expenditure on health as % GDP [2]	7.3%	8.0%	7.6%
Government expenditure on health as % [2]			
Insured citizens (%)			
SCD patients			
Heart failure patients	108700	1200000	1254300
AF patients	902521	1000000	1000000

1. http://www.stat.go.jp/data/jinsui/2.htm#monthly

2.3. http://www.mhlw.go.jp/toukei/saikin/hw/iryosd/m15/is1501.html 8492/1270=

4. http://www.mhlw.go.jp/toukei/saikin/hw/ishi/12/dl/gaikyo.pdf#search='%E6%97%A5%E6%9C%AC%E3%81%AE%E5%8C%BB%E5%B8%AB%E6%95%B0' 303268/126990=

5. http://www.mhlw.go.jp/file/05-Shingikai-10801000-Iseikyoku-Soumuka/0000072895.pdf#search='%E6%97%A5%E6%9C%AC%E3%81%AE%E7%9C%8B%E8%AD%B7%E5%B8%AB%E6%95%B0' 1067760/126990=

6. http://www.nikkei.com/biz/report/gdp/ 529000000000000/106

7 http://www.mhlw.go.jp/toukei/saikin/hw/k-iryohi/13/dl/kekka.pdf

8 http://www.chugaiigaku.jp/upfile/browse/browse492.pdf#search='%E5%BF%83%E4%B8%8D%E5%85%A8%E6%82%A3%E8%80%85%E6%95%B0

2. Pacemaker

	2013	2014	2015
Total Pacemakers	59487	57678	57337
New implants	39290	39398	39292
Replacements	20197	18280	17935
Single-chamber	11676	11304	11109
Dual-chamber	46876	45325	46118
Sick sinus syndrome			
AV block			
Implanting Centers			
Implanting Physicians			
National Registry	☐	☐	☐

3. Cardiac resynchronization therapy

	2013	2014	2015
Total CRTs	4260	4405	4575
CRT-P	935	1049	1167
CRT-P new implants			729
CRT-P replacements/upgrade			438
CRT-D	3325	3356	3408
CRT-D new implants	2217	2139	2147
CRT-D replacements/upgrade	1108	1217	1261
Ischemic			
Non-ischemic			
Implanting Centers			
Implanting Physicians			
National Registry	☐	☐	☐

4. Implantable cardioverter defibrillator

	2013	2014	2015
Total ICDs	6373	5830	5780
ICD new implants	3775	3650	3822
ICD replacements	2598	2108	1958
Single-chamber	1308	1440	1345

Dual-chamber	5065	4289	4435
Primary prevention			
Secondary prevention			
Implanting Centers			
Implanting Physicians			
National Registry	☐	☐	☐

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2013	2014	2015
Total lead extraction procedures			
Hospitals performed lead extraction			
Cardiologists performing lead extraction			
Surgeons performing lead extraction			
National Registry	☐	☐	☐

6. Interventional electrophysiology

	2013	2014	2015
Ablation procedures	46000	59000	63000
SVT ablation procedures	15000	15000	14500
AVNRT			
AVRT/WPW			
AFL (RA isthmus dependent)			
AT			
VT/VPC	6000	6000	5500
Idiopathic			
Structural			
AF ablation procedures	25000	38000	43000
Ablation centers	550	490	480
AF ablation centers	350	400	400
Structural VT ablation centers			
Ablation physicians	1600	1800	1800
AF ablation physicians	1000	1200	1300
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

	2013	2014	2015
Population (Thousand)	29,714.7	30,097.9	30, 331.0
Hospitals	141	142	145
Beds	39,728	40,126	42,056
Physicians	46,916	51,453	53,132
Nurses	89,167	92,681	103,465
GDP (RM)	37,542	44,748	46,812
Total expenditure on health as % GDP	4.40	4.53	4.51
Government expenditure on health as %	52.73	51.96	50.12
Insured citizens (%)	-	-	-
SCD patients	-	-	-
Heart failure patients	-	-	-
AF patients	-	-	-

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

2. Pacemaker

	2013	2014	2015
Total Pacemakers	577	659	755
New implants	430	482	569

Replacements	147	177	186
Single-chamber	255	285	299
Dual-chamber	322	374	456
Sick sinus syndrome	151	172	218
AV block	183	216	356
Implanting Centers	18	35	38
Implanting Physicians	54	101	122
National Registry	X	X	X

3. Cardiac resynchronization therapy

	2013	2014	2015
Total CRTs	121	173	203
CRT-P	57	78	102
CRT-P new implants	36	45	68
CRT-P replacements/upgrade	21	33	34
CRT-D	64	95	101
CRT-D new implants	39	58	77
CRT-D replacements/upgrade	25	37	24
Ischemic	65	102	131
Non-ischemic	56	71	72
Implanting Centers	11	13	16
Implanting Physicians	17	24	31
National Registry	X	X	X

4. Implantable cardioverter defibrillator

	2013	2014	2015
Total ICDs	119	143	201
ICD new implants	89	108	167
ICD replacements	30	35	34
Single-chamber	72	96	135
Dual-chamber	47	47	66
Primary prevention	29	49	65
Secondary prevention	90	94	136
Implanting Centers	11	18	21
Implanting Physicians	17	24	28
National Registry	X	X	X

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2013	2014	2015
Total lead extraction procedures			16
Hospitals performed lead extraction			3
Cardiologists performing lead extraction			6
Surgeons performing lead extraction			3
National Registry	☐	☐	x

6. Interventional electrophysiology

	2013	2014	2015
Ablation procedures	506	612	793
SVT ablation procedures	297	328	362
AVNRT	179	201	226
AVRT/WPW	118	127	136
AFL (RA isthmus dependent)	46	94	86
AT	31	54	51
VT/VPC	75	116	181
Idiopathic	53	63	121
Structural	22	53	60
AF ablation procedures	57	89	113
Ablation centers			5
AF ablation centers	0	2	4
Structural VT ablation centers	0	1	2
Ablation physicians	4	7	9

AF ablation physicians	3	5	6
Structural VT ablation physicians	3	4	4
National Registry	X	X	X

7. Management

National certification for physicians	☐PM	☐CRT	☐ICD	☐Ablation
National accreditation for centers	XPM	XCRT	XICD	XAblation
Guidelines followed	XNational	XU.S.	XEurope	☐AP

Payment (%)	Pacemaker	ICD	CRT	Ablation
Government	60	90	90	70
Insurance	20	5	5	20
Public insurance	0	0	0	0
Private insurance	20	5	5	20
Individual	10	5	5	10

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

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

8. Data source: UMMC, Penang Hospital Heart Centre, IJN, UiTM, PPUKM, SGH, QEH2, Pantai Medical Centre

Country/Region: Myanmar

1. Statistics

	2015
Population (thousand)	51.48 million
Hospitals (implanting)	8
Beds	
Physicians	
Nurses	
GDP (US$, billions)	64.33
Total expenditure on health as % GDP	1.0
Government expenditure on health as %	45.9
Insured citizens (%)	
SCD patients	
Heart failure patients	
AF patients	

2. Pacemaker

	2015
Total pacemakers	485
New implants	475
Replacements	10
Single-chamber	470
Dual-chamber	15
Sick sinus syndrome	218
AV block	257
Implanting Centers	8
Implanting Physicians	8
National Registry	No

3. Cardiac resynchronization therapy

	2015
Total CRTs	18
CRT-P	6
CRT-P new implants	6
CRT-P replacements / upgrade	
CRT-D	12
CRT-D new implants	12
CRT-D replacements/upgrade	
Ischaemic	18
Non-ischaemic	
Implanting Centers	2
Implanting physicians	2
National Registry	No

4. Implantable cardioverter defibrillator

	2015
Total ICDs	16
ICD new implants	16
ICD replacements	
Single-chamber	11
Dual-chamber	5
Primary prevention	
Secondary prevention	16
Implanting Centers	3
Implanting physicians	3
National Registry	No

5. Lead extraction

	2015
Total lead extraction procedure	
Hospitals performed lead extraction	
Cardiologists performing lead extraction	

Surgeons performing lead extraction	
National Registry	

6. Interventional Electrophysiology

	2015
Ablation procedures	530
SVT ablation procedures	481
AVNRT	240
AVRT/WPW	237
AFL (RA isthmus dependent)	3
AT	1
VT/PVC	46
Idiopathic	46
Structural	-
AF ablation procedures	3
Ablation centers	
AF ablation centers	1
Structural VT ablation centers	-
Ablation physicians	
AF ablation physicians	1
Structural VT ablation physicians	-
National Registry	No

7. 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 %	1 00 %	1 00 %	

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

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

Yangon General Hospital, North Okkalapa General Hospital, Mandalay General Hospital, No (1) Defense Services General Hospital, No (2) Defense Services General Hospital

Country/Region: New Zealand

1. Statistics

	2013	2014	2015
Population (thousand)[1]	4511	4550	4600
Hospitals *(includes every small hosp.)*	184	184	184
Beds *(includes every small hosp.)*	27000	27000	12880
Physicians	14686	14808	14678
Nurses	42400	45293	52729
GDP(US$, billions)[2]	179.8	191.7	173.75
Total expenditure on health as % GDP[2]	8.9%	9%	10%
Government expenditure on health as %[2]	77%	77%	80%
Insured citizens (%)	30%	30%	30%
SCD patients	3500	3500	3500
Heart failure patients	25000	25000	26000
AF patients	unknown	Unknown	Unknown

3, www.census.gov

4, www.imf.org

2. Pacemaker

	2013	2014	2015
Total Pacemakers	2200	2240	2470
New implants	1850	1817	2010
Replacements	350	423	460
Single-chamber	750	750	960
Dual-chamber	1350	1490	1510
Sick sinus syndrome			
AV block			
Implanting Centers	12	12	12
Implanting Physicians	31	31	36
National Registry	☐yes	☐Yes	Yes

3. Cardiac resynchronization therapy

	2013	2014	2015
Total CRTs			210
CRT-P			90
CRT-P new implants		68	70
CRT-P replacements/upgrade		17	20
CRT-D			120
CRT-D new implants	75	79	100
CRT-D replacements/upgrade	20	19	20
Ischemic			
Non-ischemic			
Implanting Centers	6	6	6
Implanting Physicians	13	14	20
National Registry	☐yes	☐	

4. Implantable cardioverter defibrillator

	2013	2014	2015
Total ICDs	560	624	625
ICD new implants	435	499	500
ICD replacements	125	125	125
Single-chamber			
Dual-chamber			
Primary prevention	207		
Secondary prevention	228		
Implanting Centers	6	7	7
Implanting Physicians	13	14	18
National Registry	☐yes	☐	

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2013	2014	2015
Total lead extraction procedures			32
Hospitals performed lead extraction			2
Cardiologists performing lead extraction			3
Surgeons performing lead extraction			0 (support)
National Registry	☐	☐	☐

6. Interventional electrophysiology

	2013	2014	2015
Ablation procedures	720	1267	1290
SVT ablation procedures	410	788	813
AVNRT		266	293
AVRT/WPW		194	182
AFL (RA isthmus dependent)		260	252
AT		68	86
VT/VPC	60	141	76
Idiopathic	25	78	40
Structural	35	14	36
AF ablation procedures	230	355	363
Ablation centers			
AF ablation centers	4	6	8
Structural VT ablation centers	4	4	4
Ablation physicians			
AF ablation physicians	7	8	9
Structural VT ablation physicians	7	7	9
National Registry	☐no	☐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	95%	99%	99%	80%
Insurance				
Public insurance				
Private insurance				19%
Individual	5%	1%	1%	1%

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

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

8. 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: Pakistan

1. Statistics

	2013	2014	2015
Population (million)[1]		182	182
Hospitals			
Beds		0.6bed/1000	06bed/1000
Physicians		0.5 doc/1000	05/1000
Nurses			
GDP (US$, billions)		246.88	246
Total expenditure on health as % GDP		3.2	3.5
Government expenditure on health (US$)			
Insured citizens (%)		0.1%	0.1%
SCD patients			
Heart failure patients			
AF patients			1%

[5], www.census.gov

2. Pacemaker

	2013	2014	2015
Total Pacemakers			
New implants		2000	2400
Replacements		222	300
Single-chamber		70%	70%
Dual-chamber		30%	30%
Sick sinus syndrome		20%	20%
AV block		80%	80%
Implanting Centers		25	27
Implanting Physicians		50	62
National Registry	☐	☐	☐

3. Cardiac resynchronization therapy

	2013	2014	2015
Total CRTs		45	76
CRT-P		30	56
CRT-P new implants			
CRT-P replacements/upgrade			3
CRT-D			
CRT-D new implants		15	20
CRT-D replacements/upgrade			
Ischemic		90%	90%
Non-ischemic		10%	10%
Implanting Centers		4	5
Implanting Physicians		6	
National Registry	☐	☐	☐

4. Implantable cardioverter defibrillator

	2013	2014	2015
Total ICDs			
ICD new implants		100	112
ICD replacements			
Single-chamber		90%	90%
Dual-chamber			
Primary prevention		20%	20%
Secondary prevention		80%	80%
Implanting Centers		5	6
Implanting Physicians		7	8
National Registry	☐	☐	☐

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2013	2014	2015
Total lead extraction procedures		non	non
Hospitals performed lead extraction			
Cardiologists performing lead extraction			
Surgeons performing lead extraction			
National Registry	☐	☐	☐

6. Interventional electrophysiology

	2013	2014	2015
Ablation procedures			
SVT ablation procedures	700		765
AVNRT	60%		61%
AVRT/WPW	25%		24%
AFL (RA isthmus dependent)	4%		5%
AT	2%		2%
VT/VPC	6%		6%
Idiopathic	3%		3%
Structural			
AF ablation procedures	0		5
Ablation centers			1
AF ablation centers	1		1
Structural VT ablation centers	1		1
Ablation physicians			1
AF ablation physicians			1
Structural VT ablation physicians	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	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	☐	☐	☐	4	☐
Lack of reimbursement, limited financial resources	☐	☐	☐	4	Y
Lack of referral	☐	☐	3	☐	☐
Lack of trained personnel	☐	☐	3	☐	☐
Low awareness of guidelines	☐	☐	3	☐	☐
Lack of operators	☐	2	☐	☐	☐

8. Source

Name of national working group or arrhythmia body

Pakistan Heart Rhythm Society

Country/Region: Philippines

1. Statistics

	2013	2014	2015
Population (thousand) *	98,393	100,096	102,435
Hospitals	1840	1921	1974
Beds (per 100,000 population)	100	100	1
Physicians (per 1,000 population) **	1.2	1.5	1.15
Nurses (per 1,000 population) ***		6	6
GDP (US$, billions) ****	272.02	284.58	291.97
Total expenditure on health as % GDP	4.4%	4.4%	4.7%
Government expenditure on health as %	27%	31.6%	34.3%
Insured citizens (%)		80%	80%
SCD patients			43/100,000
Heart failure patients			No data
AF patients			0.2%

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

** 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

	2013	2014	2015
Total Pacemakers	1389	1528	1049
New implants	631	677	913
Replacements	102	87	136
Single-chamber	378	395	523
Dual-chamber	278	369	526
Sick sinus syndrome			
AV block			
Implanting Centers	36	37	42
Implanting Physicians	84	100	95
National Registry	☐	☐	

3. Cardiac resynchronization therapy

	2013	2014	2015
Total CRTs	18	17	28
CRT-P	2	2	2
CRT-P new implants	2	0	2
CRT-P replacements/upgrade	0	2	0
CRT-D	16	15	26
CRT-D new implants	15	12	21
CRT-D replacements/upgrade	1	3	5
Ischemic			
Non-ischemic			
Implanting Centers	10	23	21
Implanting Physicians	13	15	18
National Registry	☐	☐	

4. Implantable cardioverter defibrillator

	2013	2014	2015
Total ICDs	48	52	53
ICD new implants	44	50	44
ICD replacements	4	2	9
Single-chamber		20	38
Dual-chamber		32	15
Primary prevention			
Secondary prevention			
Implanting Centers	10	23	21
Implanting Physicians	13	15	18
National Registry	☐	☐	☐

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2013	2014	2015
Total lead extraction procedures		none	
Hospitals performed lead extraction		none	
Cardiologists performing lead extraction		none	
Surgeons performing lead extraction		none	
National Registry	☐	☐	☐

6. Interventional electrophysiology

	2013	2014	2015
Ablation procedures	82	77	97
SVT ablation procedures			68
AVNRT	25	25	38
AVRT/WPW	37	33	28
AFL (RA isthmus dependent)	2	3	1
AT	3	1	1
VT/VPC			22
Idiopathic	9	6	19
Structural	2	3	3
AF ablation procedures	7	6	7
Ablation centers			3
AF ablation centers	1	1	1
Structural VT ablation centers	1	1	1
Ablation physicians			10
AF ablation physicians	4	6	
Structural VT ablation physicians	2	6	6
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	50%	10%	5%	20%
Insurance				
Public insurance	10%	0	0	0%
Private insurance	0	0	0	0%
Individual	40%	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	☐	☐	☐	☒	☐

8. Source

Name of national working group or arrhythmia body:

Philippine Heart Rhythm Society, Inc.

Other Source: Medtronic, Phils.

Country: Singapore

1. Statistics

	2013	*2014*	*2015*
Population ('000)[1]	**5,399.2**	**5,469.7**	**5,535.0**
Hospitals [2]	**25**	**26**	**26**
a. Public Sector	*15*	*15*	*16*
- Acute Hospitals	*7*	*7*	*8*
- Specialty Centres	*8*	*8*	*8*
b. Private Sector	*10*	*11*	*10*
- Acute Hospitals	*9*	*10*	*10*
- Other Hospitals	*1*	*1*	0
Beds[2]	**10,969**	**11,230**	**11,794**
a. Public Sector	*9,387*	*9,602*	*10,078*
-Acute Hospitals	*7,192*	*7,467*	*7,943*
-Specialty Centres	*2,195*	*2,135*	*2,135*
b. Private Sector	*1,582*	*1,628*	*1,716*
-Acute Hospitals	*1,562*	*1,610*	*1,716*
-Other Hospitals	*20*	*18*	*0*
Physicians[3]	**10,953**	**11,733**	**12,459**
a. Public Sector	*6,661*	*7,330*	*7,909*
b. Private Sector	*3,678*	*3,790*	*3,914*
c. *Not in active Practice*	*614*	*613*	*636*
Nurses/Midwives[3]	**36,075**	**37,618**	**39,005**
-Registered Nurses	*27,556*	*28,864*	*29,894*
-Enrolled Nurses	*8,273*	*8,528*	*8,931*
- *Registered Midwives*	*246*	*226*	*180*
Advanced Practice Nurses[3]	**117**	**145**	**172**
GDP (US$, billions)			
Government Health Expenditure (as % of GDP)[3]	**1.6**	**1.9**	**na**

Government Health Expenditure (as % of Total Government Expenditure)[3]	**10.8**	**11.9**	**na**
Insured citizens (%)	-	-	
SCD patients	-	-	
Heart failure patients	-	-	
AF patients	-	-	

Source: Singapore Health Facts, Ministry of Health, Singapore as of 3 May 2016[1], 9 June 2016[2] and 20 May 2016[4] (www.moh.gov.sg).

2. Pacemaker

	2013	***2014***	***2015***
Total Pacemakers[4]	**610**	**646**	**698**
- New implants	513	540	530
Replacements/Upgrades	76	83	98
Others	21	23	70
- Single-chamber	160	162	141
Dual-chamber	433	470	488
Not applicable	17	14	60
- Sick sinus syndrome	319	316	344
AV block*	164	188	182
Implanting Centers[4]	5	5	5
Implanting Physicians[4]	~ 20	~26	~19
National Registry[4]	☒	☒	☒

Source: CGH, KTPH, NHCS, NUH, TTSH, SCDB as of 02 August 2016[4]

** refer to Complete AV Block only.*

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

3. Cardiac resynchronization therapy

	2013	***2014***	***2015***
Total CRTs[4]	**129**	**147**	**154**
- CRT-P	19	12	24
CRT-P new implants	12	8	12

CRT-P replacements/upgrade	6	3	12
Others	1	1	-
- CRT-D	110	135	129
CRT-D new implants	77	90	98
CRT-D replacements/upgrade	29	41	25
Others	4	4	6
- Ischemic	77	99	82
Non-ischemic	15	11	11
Implanting Centers[4]	5	5	5
Implanting Physicians[4]	~14	~18	~17
National Registry[4]	☒	☒	☒

Source: CGH, KTPH, NHCS, NUH, TTSH, SCDB as of 02 August 2016[4]

4. Implantable cardioverter defibrillator

	2013	***2014***	***2015***
Total ICDs[4]	**293**	**289**	**332**
- ICD new implants	249	238	274
ICD replacements/upgrade	35	37	40
Others	9	14	18
- Single-chamber	245	239	273
Dual-chamber	44	39	50
Others	4	11	9
- Primary prevention	183	184	211
Secondary prevention	109	105	121
Others	1	-	-
Implanting Centers[4]	5	5	5
Implanting Physicians[4]	~15	~22	~17
National Registry[4]	☒	☒	☒

Source: CGH, KTPH, NHCS, NUH, TTSH, SCDB as of 02 August 2016[4]

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2013	***2014***	***2015***
Total lead extraction procedures	8	35	27
Hospitals performed lead extraction	~2	~4	~5
Cardiologists performing lead extraction	~4	~10	~11
Surgeons performing lead extraction		~1	
National Registry	☒	☒	☒

Inclusive of Explantation of PPM / ICD

6. Interventional electrophysiology

	2013	***2014***	***2015***
Ablation procedures[4]	**541**	**659**	**707**
SVT ablation procedures	-	-	-
AVNRT	141	160	171
AVRT/WPW	115	123	112
AFL (RA isthmus dependent)	96	136	139
AT	38	46	41
VT/VPC	42	51	63
Idiopathic	-	-	-
Structural	-	-	-
AF ablation procedures	82	101	115
Others	27	42	66
Ablation centers[4]	2	3	3
AF ablation centers	2	2	2
Structural VT ablation centers	2	3	3
Ablation physicians[4]	~14	~17	~16
AF ablation physicians			
Structural VT ablation physicians			
National Registry[4]	☒	☒	☒

Source: CGH, KTPH, NHCS, NUH, TTSH, SCDB as of 02 August 2016[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, National University Hospital and Tan Tock Seng Hospital.

Country/Region: South Korea (Republic of Korea)

1. Statistics

	2013	2014	2015
Population (thousand)[1]	51266	51314	50293
Hospitals[2]			66,896
Beds (per 100,000 population)[2]	1,068	1181	1,341
Physicians (per 1,000 population)[2]	2.16	2.2	2.4
Nurses (per 1,000 population)[2]	5.45	5.6	6.4
GDP (US$, billions)[3]	1,449.49	1,421.31	1,321.2
Total expenditure on health as % GDP[3]	7.6%	7.2%	7.2%
Government expenditure on health as %[3]	58.2%		
Insured citizens (%)	100	100	100
SCD patients	28,342 OHCA		
Heart failure patients			
AF patients	800,000		

6, www.census.gov

7, www.who.int

8, www.imf.org

2. Pacemaker

	2013	2014	2015
Total Pacemakers	3890	4259	4480
New implants	3280	3349	3224
Replacements	610	910	1256
Single-chamber	1189	1125	1058
Dual-chamber	2701	2594	3397
Sick sinus syndrome	43.7%	1846	2283
AV block	56.3%	2420	2343
Implanting Centers	146	157	122
Implanting Physicians	156	184	210
National Registry	☐	☐	☐

3. Cardiac resynchronization therapy

	2013	2014	2015
Total CRTs	166	190	265
CRT-P	16	14	18
CRT-P new implants	9	9	10
CRT-P replacements/upgrade	7	5	8
CRT-D	150	176	247
CRT-D new implants	125	157	207
CRT-D replacements/upgrade	25	19	40
Ischemic	17.9%	43	22
Non-ischemic	82.1%	110	186
Implanting Centers	6	11	14
Implanting Physicians	7	12	15
National Registry	☐	☐	☐

4. Implantable cardioverter defibrillator

	2013	2014	2015
Total ICDs	667	800	1015
ICD new implants	580	680	844
ICD replacements	67	120	171
Single-chamber	401	472	651
Dual-chamber	246	328	364
Primary prevention	347	199	324
Secondary prevention	288	532	627
Implanting Centers	96		77
Implanting Physicians			95
National Registry	☐	☐	☐

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2013	2014	2015
Total lead extraction procedures		30	
Hospitals performed lead extraction			
Cardiologists performing lead extraction		30	
Surgeons performing lead extraction			
National Registry	☐	☐	☐

6. Interventional electrophysiology

	2013	2014	2015
Ablation procedures	6875	7059	7026
SVT ablation procedures	4380	4829	464
AVNRT	1866	2263(46.86%)	2321
AVRT/WPW	1523	1613(33.41%)	1681
AFL (RA isthmus dependent)	502	694(14.37%)	941
AT	489	259(5.36%)	394
VT/VPC	512	360	283
Idiopathic	85.8%	332(92.28%)	354
Structural	14.2%	28(7.72%)	34
AF ablation procedures	1983	1870	2097
Ablation centers	53	66	74
AF ablation centers	34	39	50
Structural VT ablation centers	19	21	24
Ablation physicians			
AF ablation physicians	31	46	59
Structural VT ablation physicians	19	24	26
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	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

	2013	2014	2015
Population (thousand)[1]	23373	23433	23492
Hospitals	495	497	486
Beds	159,422	161,491	162,163
Physicians	43,556	44,539	44,006
Nurses	145,172	147,773	148,223
GDP (US$, billions)[2]	511.293	529.587	523.009
Total expenditure on health as % GDP	6.6	6.6	6.19
Government expenditure on health as %	37%	30%	6.83
Insured citizens (%)	100%	100%	99
SCD patients	~17,082	~17,242	
Heart failure patients	~584,880	~58,679	
AF patients	~351,025	~353,243	

2. Pacemaker

	2013	2014	2015
Total Pacemakers	4156	4734	5916
New implants	3056	3642	75%
Replacements	1100	1092	25%
Single-chamber	1162	1312	24%
Dual-chamber	2994	3422	76%
Sick sinus syndrome	2380	2440	59%
AV block	1537	1563	41%
Implanting Centers	103	96	104
Implanting Physicians	~175	234	435
National Registry	x	x	x

3. Cardiac resynchronization therapy

	2013	2014	2015
Total CRTs	162	207	265
CRT-P	132	158	182
CRT-P new implants	104	122	58%

CRT-P replacements/upgrade	28	36	42%
CRT-D	30	49	83
CRT-D new implants	24	40	67%
CRT-D replacements/upgrade	6	9	33%
Ischemic	33	25	46%
Non-ischemic	129	92	54%
Implanting Centers	41	24	55
Implanting Physicians	~175	46	105
National Registry	x	x	x

4. Implantable cardioverter defibrillator

	2013	2014	2015
Total ICDs	379	458	583
ICD new implants	308	378	71%
ICD replacements	71	80	29%
Single-chamber	112	136	32%
Dual-chamber	266	322	68%
Primary prevention	0	0	1%
Secondary prevention	379	458	99%
Implanting Centers	42	40	59
Implanting Physicians	~175	71	130
National Registry	x	x	x

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2013	2014	2015
Total lead extraction procedures		12	
Hospitals performed lead extraction		6	
Cardiologists performing lead extraction		8	
Surgeons performing lead extraction		2	
National Registry	☐	☐	x

6. Interventional electrophysiology

	2013	2014	2015
Ablation procedures	2754	3740	3861
SVT ablation procedures	~1910	2309	2812
AVNRT	~1130	1126	1447
AVRT/WPW	~515	620	785
AFL (RA isthmus dependent)	~250	450	436
AT		113	144
VT/VPC	160	463	493
Idiopathic	70	248	386
Structural	80	186	107
AF ablation procedures	434	531	556
Ablation centers	10		37
AF ablation centers	5		13
Structural VT ablation centers	3		10
Ablation physicians		57	81
AF ablation physicians		34	47
Structural VT ablation physicians		28	22
National Registry	No	No	0

7. Management

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

***http://www.tma.tw/stats/stater.asp**

#http://www.dgbas.gov.tw/ct.asp?xItem=14616&CtNode=3566&mp=1

+http://www.mohw.gov.tw/cht/DOS/Statistic.aspx?f_list_no=312&fod_list_no=1828

$http://www.stat.gov.tw/ct.asp?xItem=15428&CtNode=3638&mp=4

&http://www.mohw.gov.tw/cht/DOS/Statistic_P.aspx?f_list_no=312&fod_list_no=2220&doc_no=4

3390

Country/Region: Thailand

1. Statistics

	2013	2014	2015
Population	67,367,943	67,091,120	67,959,357
Hospitals	583	1318(1002 public)	1318
Beds(per 100,000 population)	210(2010)	210(as 2010)	210(as 2010)
Physicians	0.3:1000	0.3:1000	0.3:1000
Nurses	2.8:1000	2.8:1000	2.8:1000
GDP (US$, billions)	365.97	373.536	
Total expenditure on health as % GDP	4.3%(2009)	4.6%	6.5%(2014)
Government expenditure on health as %			77% of healthcare (2011)
Insured citizens (%)	99.5%	99.5%	
SCD patients			
Heart failure patients	95,390/year extrapolated		
AF patients	3.6/1000 (1999)		

2. Pacemaker

	2013	2014	2015
Total Pacemakers	2401	3078	2963
New implants	2198	2834	2728
Replacements	203	244	235
Single-chamber	33.65%	35.9%	26.2%
Dual-chamber	64.93%	62.86%	73.8%
Sick sinus syndrome	43.34%	43.9%	40.1%
AV block	47,15%	42.64%	51.2
Implanting Centers	55	70	70
Implanting Physicians	115	115	120
National Registry	yes	yes	yes

3. Cardiac resynchronization therapy

	2013	2014	2015
Total CRTs	99	123	139
CRT-P		42	
CRT-P new implants			24
CRT-P replacements/upgrade			
CRT-D			
CRT-D new implants	99	81	115
CRT-D replacements/upgrade			
Ischemic			
Non-ischemic			
Implanting Centers	55		70
Implanting Physicians	115		120
National Registry			

4. Implantable cardioverter defibrillator

	2013	2014	2015
Total ICDs	662	700	837
ICD new implants		627	761
ICD replacements	71	73	76
Single-chamber	77.34%	78.47%	78.8
Dual-chamber	7.7%	8.61%	6.1
Primary prevention			
Secondary prevention			
Implanting Centers	55		70
Implanting Physicians	115		120
National Registry	□	□	yes

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2013	2014	2015
Total lead extraction procedures			
Hospitals performed lead extraction		2	1
Cardiologists performing lead extraction		4	
Surgeons performing lead extraction			
National Registry	☐	☐	☐

6. Interventional electrophysiology

	2013	2014	2015
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	☐	☐	N/A

7. Management

National certification for physicians	☐PM	☐CRT	ICD	☐Ablation
National accreditation for centers	☐PM	☐CRT	X ICD	☐Ablation
Guidelines followed	XNational	XU.S.	XEurope	☐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	☐	☐	x	☐	☐
Lack of reimbursement, limited financial resources	☐	☐	☐	☐	x
Lack of referral	☐	☐	☐	x	☐
Lack of trained personnel	☐	☐	x	☐	☐
Low awareness of guidelines	☐	☐	☐	x	☐
Lack of operators	☐	x	☐	☐	☐

8. Source

Name of national working group or arrhythmia body

Country/Region: Vietnam

1. Statistics

	2013	2014	2015
Population (thousand)[1]	89,760	90,700	93.448
Hospitals	1.063	1.069	N/A
Beds	897.600	954.165	N/A
Physicians	68,6000	71,8000	N/A
Nurses	98,3000	102,000	N/A
GDP (US$, billions)	153	178	N/A
Total expenditure on health as % GDP	N/A	N/A	N/A
Government expenditure on health (US$)	N/A	N/A	N/A
Insured citizens (%)	69.5	70.8	78
SCD patients	N/A	N/A	N/A
Heart failure patients	N/A	N/A	N/A
AF patients	N/A	N/A	N/A

9, www.census.gov

2. Pacemaker

	2013	2014	2015
Total Pacemakers	2470	2740	2.722
New implants	N/A	N/A	N/A
Replacements	N/A	N/A	N/A
Single-chamber	1.631	1.482	1.658
Dual-chamber	839	1.258	916
Sick sinus syndrome	N/A	N/A	N/A
AV block	N/A	N/A	N/A
Implanting Centers	28	30	32
Implanting Physicians	60	66	74
National Registry	☐	☐	☐

3. Cardiac resynchronization therapy

	2013	2014	2015
Total CRTs	42	55	59
CRT-P	38	45	49
CRT-P new implants	N/A	N/A	N/A
CRT-P replacements/upgrade	N/A	N/A	N/A
CRT-D	4	10	10
CRT-D new implants	N/A	N/A	N/A
CRT-D replacements/upgrade	N/A	N/A	N/A
Ischemic	N/A	N/A	N/A
Non-ischemic	N/A	N/A	N/A
Implanting Centers	9	10	12
Implanting Physicians	22	24	32
National Registry	☐	☐	☐

4. Implantable cardioverter defibrillator

	2013	2014	2015
Total ICDs	81	90	89
ICD new implants			N/A
ICD replacements			N/A
Single-chamber	74	72	77
Dual-chamber	7	18	12
Primary prevention	N/A	N/A	N/A
Secondary prevention	N/A	N/A	N/A
Implanting Centers	16	20	20
Implanting Physicians	32	40	40
National Registry	☐	☐	☐

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2013	2014	2015
Total lead extraction procedures	N/A	N/A	N/A
Hospitals performed lead extraction	N/A	N/A	N/A

Cardiologists performing lead extraction	N/A	N/A	N/A
Surgeons performing lead extraction	N/A	N/A	N/A
National Registry	☐	☐	☐

6. Interventional electrophysiology

	2013	2014	2015
Ablation procedures	1.823	1.964	2.100
SVT ablation procedures			
AVNRT	796	936	976
AVRT/WPW	435	442	444
AFL (RA isthmus dependent)	28	50	36
AT	28	24	30
VT/VPC	520	494	574
Idiopathic	N/A	N/A	N/A
Structural	N/A	N/A	N/A
AF ablation procedures	16	18	24
Ablation centers			
AF ablation centers	12	14	16
Structural VT ablation centers	N/A	N/A	N/A
Ablation physicians			
AF ablation physicians	4	8	12
Structural VT ablation physicians	N/A	N/A	N/A
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

The APHRS White Book: Fourth edition

-The current status of cardiac electrophysiology in APHRS member countries

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Professor of Medicine, Chief of Department of Cardiology
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President, Chinese Society of Arrhythmias
Vice 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 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. Under the leadership by current president Professor Wee Siong TEO, and under the joint effort of our board members, the Fourth edition of APHRS White Book was finally released with data from 15 countries and regions, including two new participants: Myanmar and Vietnam. The other 13 countries and regions having provided their data for last editions include: China mainland, Hong Kong, India, Indonesia, Japan, Korea, Malaysia, New Zealand, Pakistan, Philippines, Singapore, Taiwan, and Thailand. The Data collection is mostly 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 2013, 2014, and 2015 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). A total of 15 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 2013 to 2015, and the device implantation rates or catheter ablation rates and centers in 2015.

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 only seen in 7 of the 15 countries and regions in 2015 compared with 2014. The implantation of pacemaker kept to maintain above 10% of increasing rate in China, Malaysia, and New Zealand, and about 8%-9% of increasing rate in Singapore. In Taiwan region, the increasing rate significantly went up to 24.97% in 2015 as compared to the increasing rate of 13.9% in 2014. In contrast, the implantation of permanent pacemaker decreased in Hong Kong, Thailand and Indonesia in 2015 as compared to that in 2014, which might be explained by their significantly increasing rate in 2014. Like last year, the overall use of pacemaker continued to decrease in 2015 as compared with 2014 by 4.63% in India and by 0.59% in Japan. The data from Philippines showed significantly decrease in pacemaker implantation in 2015 as compared with data in 2014.

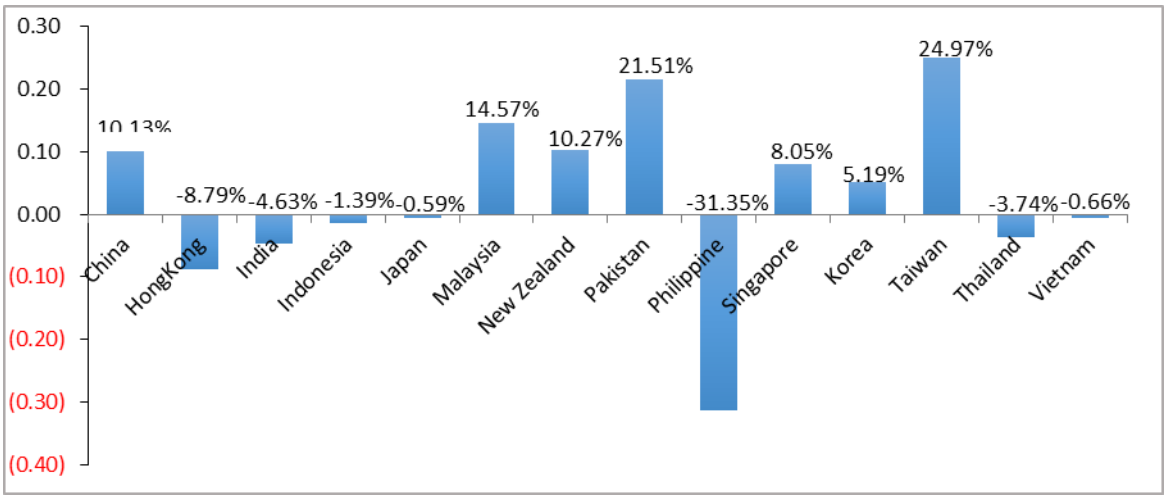

Figure 1: Increasing rate of pacemaker implantation in 2015 as compared with 2014

3.2 Pacemaker implantation rate

As shown in Table 1, data for 2015 were analyzed by evaluating pacemaker implantation rates. Across the 16 countries and regions (no data in Australia), the pacemaker implantation rate per million inhabitants showed similar trend to that in last year with the highest reported implantation rate in Japan (451.5) and New Zealand (537.0) and the lowest in Indonesia (2.8). The pacemaker implantation rate per million inhabitants were also low in Myanmar (9.4), Philippines (10.2) and in Pakistan (14.8). The large gap in the number of pacemaker implanting center per million inhabitants still remained among the 15 countries and regions. In data for 2015, Taiwan still kept to be the top one region where had the highest implanting centres per million inhabitants (4.4), while the second groups with high pacemaker implanting centers per million inhabitants were New Zealand (2.6) and Korea (2.4). The countries with lowest density of implanting centers in 2015 data were Indonesia (0.06), Pakistan (0.2), Myanmar (0.2), Vietnam (0.3) and Philippines (0.4). Other countries remained similar level to that in 2014. Although the reported data in 2015 did not differ significantly from that in 2014, our analysis still found a significant change as compared to last several years. That was the implantation of pacemaker showing a decreased trend in more than half of Asia-Pacific countries and regions. Other data provided similar information. For example, China and Japan are the countries that had the highest total number of pacemaker implantations in 2015. The influence of GDP on pacemaker implants did not differ as compared with that in 2015. The countries with highest GDP per capita of the 15 countries and regions were Japan, and New Zealand, Taiwan. The countries with highest implantation rate per million inhabitants were also Japan, and New Zealand.

4. ICD and Cardiac Resynchronization Therapy devices (CRT)

4.1 The implantation of ICD in 2015

Similar to data last year, the increasing trend of implantation of ICD was observed in 10 APHRS countries and regions in 2015 as compared with 2014 (Figure 2). However, the implantation of ICD decreased in Hong Kong and New Zealand in contrast to the increase trend last year. Malaysia was the country with the highest increasing rate of ICD implantation (40.6%). China, India, Korea, Taiwan, and Thailand kept the increasing trend in ICD implantation. Indonesia and Singapore showed a significantly increasing trend as compared to the decrease last year. Japan still is the country with highest ICD implantation in Asia-Pacific regions. However, Japan showed a sustained decreasing

trend in ICD implant from 6373 in 2013 to 5830 in 2014 to 5780 in 2015. The ICD implant was still rare in some Asia-Pacific countries like Indonesia (24), Myanmar (16), and Philippines (53).

We again had the data on ICD primary or secondary prevention from 9 countries: China, India, Indonesia, Korea, Malaysia, Myanmar, Pakistan, Singapore, and Taiwan. The use of ICD for primary prevention in China decreased slightly (from 46.7% in 2014 to 42% in 2015). Singapore was the country having the highest ratio of primary prevention in Asia-Pacific countries and regions (63.7% in 2014, 63.6% in 2015). This year, Taiwan had 1% of ICD implantation for primary prevention as compared with 0 last year. The use of ICD for primary prevention remained similar to last year in these countries listed here: Pakistan (20%), India (30%), Korea (31.9%), Malaysia (32.3%). Indonesia had only 19 cases receiving ICD implant, and 12 cases were for primary prevention.

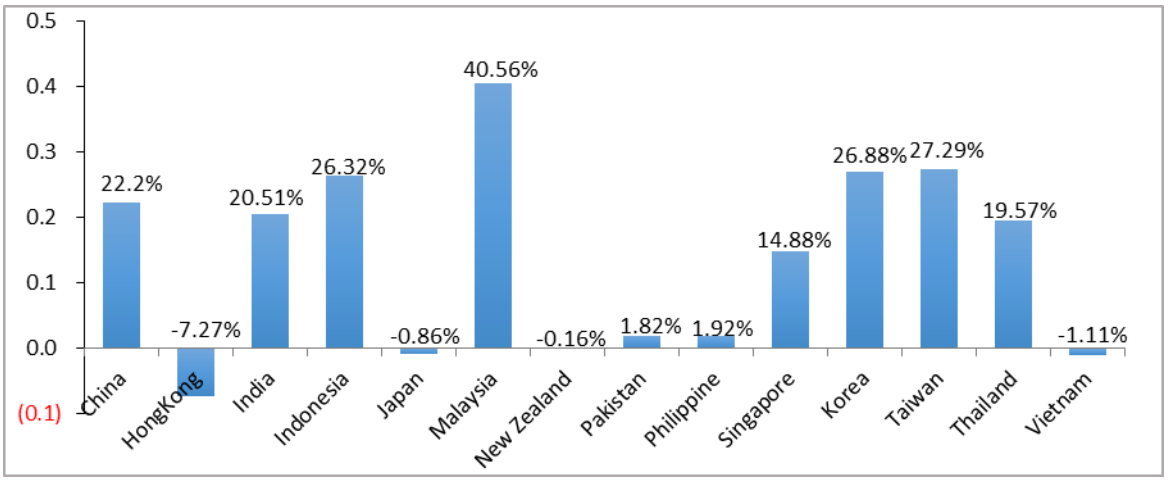

Figure 2: Increasing rate of ICD implantation in 2015 as compared with 2014

4.2 ICD implantation rate

As shown in table 1, New Zealand was still the Country with highest reported ICD implantation rate per million inhabitants (135.9). Singapore (60.0) and Japan (45.5) were the other countries with high ICD implants/million. Some countries kept increasing ICD implants/million, including Taiwan (24.8), Korea (20.2), Hong Kong (13.9), and Thailand (12.3), China mainland (2.1), Malaysia (6.7), India (2.4). Countries with low ICD implants/million were Philippines (0.5), Indonesia (0.1), Pakistan (0.6), and Myanmar (0.3). The available data also showed a large gap among the 15 countries and regions in the number of ICD implanting center per million inhabitants. In 2015 data, the countries with more than 1 ICD implanting centers per million inhabitants were Korea (1.6), Taiwan (2.5) and New Zealand (4.4). The other countries with less than 1 implanting

centers per million inhabitants included Singapore (0.9), India (0.3), China mainland (0.3), Indonesia (0.06), Pakistan (0.04), Myanmar (0.06), Vietnam (0.2), and Philippines (0.2).

4.3 CRT utilization in Asia-Pacific area

In 2015, the rising trend in CRT implant still remains in 12 among the data from 14 Asia-Pacific countries and regions, except for India with decreased CRT implantation (26.85%) (see Figure 3). Still in 2015, the countries with total number of CRTs implantation more than 1000 were Japan (4575), India (2147), and China mainland (3092). Countries with the increase rates of CRT implant more than 20% in 2015 included Indonesia (21.8%), Malaysia (68.8%), Philippines (64.7%), Korea (39.47%), and Taiwan (28.02%) (Figure 3). The other 7 countries and regions had an increasing rate of 10~20%, including China (12.3%), Thailand (13.0%), Malaysia (17.34%), and New Zealand (14.75%). The total number of CRT implant was 18 in Myanmar and 59 in Vietnam.

The CRT implantation rate per million inhabitants in 2015 seemed to be increased as compared to last year. However, still a great heterogeneity was seen similar to last, from as low as 0.3 – 0.6/million (Philippines, Pakistan, Indonesia, Myanmar, and Vietnam) to as high as 45.7/ million in New Zealand, 36 in Japan, and 27.8 in Singapore. And a slightly increasing trend continued was seen in the CRT implantation rate per million inhabitants in most Asia-Pacific countries and regions, including Taiwan (from 8.8 in 2014 to 11.3 in 2015), Korea (from 3.7 in 2014 to 5.3 in 2015), and China mainland (from 2.0 in 2014 to 2.3 in 2015), except for a decreasing trend in India (from 2.3 in 2014 to 1.7 in 2015). There was also significant variability in the ratio of CRT-D/CRT-P implants and the number of “CRT centers”.

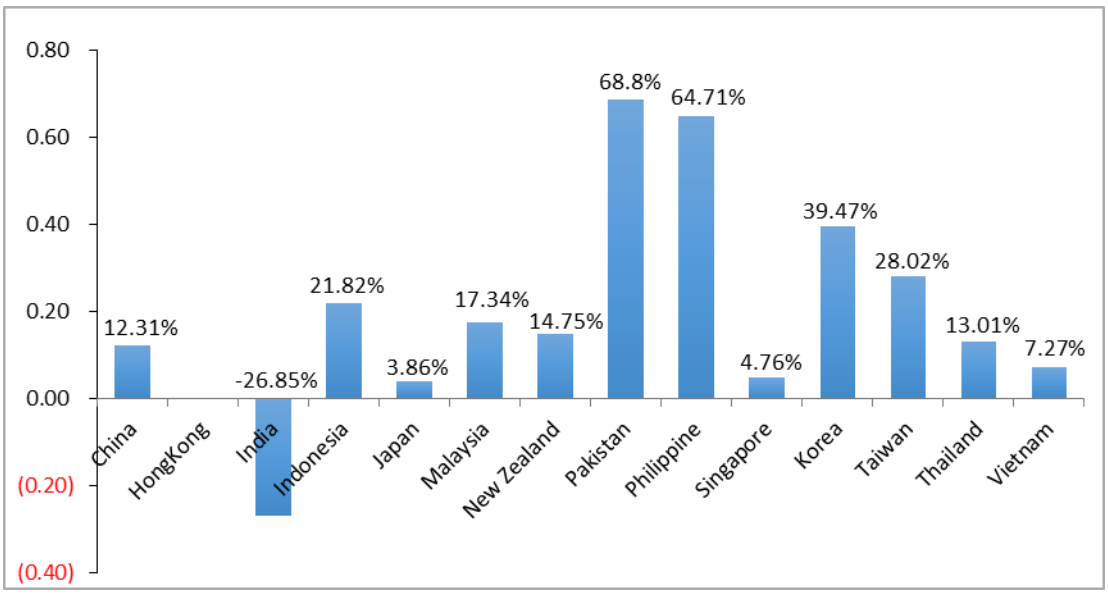

Figure 3: Increasing rate of CRT implantation in 2015 as compared with 2014

5. Catheter Ablation

5.1 General information of Catheter Ablation

We received data about catheter ablation from 13 countries and regions (still no data in Hong Kong and Thailand) in 2015. China mainland was still the country having the highest cases receiving catheter ablations (117021). Japan and India were the other countries with high cases of 63000 and 19370. The ablation procedures in other 10 countries and regions were less than 10 thousands. Also an increasing trend was observed in ablation procedures across all 11 countries and regions except for Philippines and South Korea. The increasing rates of ablations were varied from last year with 15.8% in China, 18.4% in India, 18.9% in Indonesia, 6.8% in Japan, 29.5% in Malaysia, 1.8% in New Zealand, 7.3% in Singapore, and 3.2% in Taiwan.

5.2 Ablation procedure rates

Table 2 are shown the ablation procedures per million inhabitants. Japan was the country which continued having increasing ablation procedures per million inhabitants, from 361.3 in 2013 to 464.6 in 2014, and then to 496.1 in 2015. New Zealand (280.4), Taiwan (164.4), Singapore (127.7), and South Korea (139.7) were countries having more

than one hundred ablation procedures per million inhabitants. Philippines (1.0) and Indonesia (1.9) had the lowest ablation procedures per million inhabitants. In China mainland, the ablation procedures/ million inhabitants increased from 61.8 in 2013 to 73.9 in 2014，and to 85.6 in 2015. Regarding ablation centers per million inhabitants in 2015, the highest density was recorded also in Japan (3.8) and the lowest in Pakistan (0.01) and Myanmar (0.02).

5.3 Atrial fibrillation (AF) catheter ablation

We had the data of AF ablation from 13 countries and regions this year although still no data were available in Hong Kong and Thailand. In 2015, AF ablation procedures increased almost in all countries except for Indonesia and Korea. Japan was still the country with the highest number of AF ablation procedures (43,000 cases). The cases of AF ablation in China increased from 18616 in 2014 to 24545 in 2015. As shown in Table 2, the AF ablation rate per million inhabitants was increased from 299.2 to 338.6 in Japan, which was the highest among APHRS member countries and regions. Pakistan (0.03), Myanmar (0.06), and Philippines (0.07) were the countries with the lowest AF ablation rate. Regarding the ratio of AF ablation/total ablation, there was also a large gap among 13 countries and regions, with highest ratio of AF ablation/total ablation in Japan (68.3%), and lowest AF ablation ratio in Pakistan (0.6%), Myanmar (0.6%). And the AF ablation ratio was 21.0% in China mainland, 29.8.4% in Korea, and 14.4% in Taiwan, and 28.1% in New Zealand.

6. Conclusion and future work

This edition of APHRS White book had made a great progress with collection of data from 15 APHRS countries and regions although some data were not available. Primary analysis of these data showed a growing trend in arrhythmia interventional treatment in most 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. 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 centres per million inhabitants for the year 2015 in 16 Asia-Pacific countries and regions

Countries and regions	Pacemaker implantation rate/ million inhabitants	Pacemaker implanting centres / million	ICD implantation rate/ million inhabitants	CRT implantation rate/ million inhabitants	ICD/CRT implanting centres / million
Australia	No data	No data	No data	No data	No data
Mainland China	48.1	0.7	2.1	2.3	0.3
Hong Kong	94.9	No data	13.9	No data	No data
India	24.6	0.7	2.4	1.7	0.3
Indonesia	2.8	0.06	0.1	0.3	0.06
Japan	451.5	No data	45.5	36.0	No data
Malaysia	24.9	1.3	6.6	6.7	0.7
New Zealand	537.0	2.6	135.9	45.7	4.4
Pakistan	14.8	0.2	0.6	0.3	0.04
Philippines	10.2	0.4	0.5	0.3	0.2
Singapore	126.1	0.9	60.0	27.8	0.9
South Korea	89.1	2.4	20.2	5.3	1.5
Taiwan	251.8	4.4	24.8	11.3	2.5
Thailand	43.6	1.0	12.3	2.1	12.3
Myanmar	9.4	0.2	0.3	0.4	0.06
Vietnam	29.1	0.3	1.0	0.6	0.2

Table 2 The ablation procedure rate and centres per million inhabitants for the year 2015 in 16 Asia-Pacific countries and regions

Countries and regions	Ablation procedure rate/ million inhabitants	Ablation centres/ million inhabitants	AF ablation rate/ million inhabitants	AF ablation centres/ million inhabitants	AF ablation/ ablation procedure
Australia	No data	No data	No data	No data	No data
China mainland	85.6	0.55	17.9	0.3	21.0%
Hong Kong	No data	No data	No data	No data	No data
India	15.3	0.13	1.0	0.02	6.7%
Indonesia	1.9	0.04	0.3	0.02	13.2%
Japan	496.1	3.8	338.6	3.2	68.3%
Malaysia	26.1	0.2	3.7	0.1	14.2%
New Zealand	280.4	2.6	78.9	1.7	28.1%
Pakistan	4.2	0.01	0.03	0.01	0.6%
Philippines	1.0	0.03	0.07	0.01	7.2%
Singapore	127.7	0.5	20.8	0.4	16.3%
South Korea	139.7	1.5	41.7	1.0	29.8%
Taiwan	164.4	1.6	23.7	0.6	14.4%
Thailand	No data	No data	No data	No data	No data
Myanmar	10.3	0.02	0.06	0.02	0.6%
Vietnam	22.5	No data	0.3	0.17	11.0%

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