

Preface

The APHRS was founded in 2008 with the goal of establishing infrastructure in Asia-Pacific countries for basic and clinical research in the field of arrhythmia, in order to promote multinational research, and to provide systematic education opportunities for young researchers and clinicians who hope to specialize in this field .

In pursuit of this goal, the APHRS developed a White Book in 2010, collecting extensive basic statistical data and other information on the current status of interventional therapies for cardiac arrhythmia in Asia-Pacific countries, the need for which has been sorely felt in the region for years.

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

The APHRS White Book reports the most updated and comprehensive information on current situation 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 more. I first presented such data across 7 countries in the scientific session of APHRS 2012, and the next year the Society published the first edition of the APHRS White Book during the scientific session of APHRS 2013. Since then, the APHRS White Book has been updated each year. With the continuous efforts of the Society in the past 5 years, the

APHRS White Book has gained increasing attention from researchers and clinicians across Asia-Pacific countries and regions.

This year, my colleagues and I are proud to the Fifth Edition of the APHRS White Book. This new edition presents data from 19 countries and regions, expanded from the 15 countries and regions in the last edition to reflect the addition of 4 member states: Brunei Darussalam, Cambodia, Sri Lanka, and Mongolia. As always, data collection is mostly the result of voluntary participation of each county or region's representative Society of Pacing and Electrophysiology or Heart Rhythm Society. In some other Asia-Pacific countries, there are currently no registries or the data is limited. As such, the APHRS White Book marks the beginnings of an international registry compiled by collaborative efforts between countries, which may also encourage the adoption of a systematic approach to collect data on arrhythmia therapies in each country. My fellow members and I hope for more Asia-Pacific countries and regions to participate in the Sixth edition of APHRS White Book.

With the release of this Fifth 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, with special thanks to my team, for their devotion and hard work on the APHRS White Book.



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

Acknowledgements

As a member of APHRS and the chief editor of this book, I would like to express my great appreciation for all who made possible the publication of the Fifth edition of the APHRS White Book. I owe particular thanks to the Immediate Past president of APHRS, Professor Wee Siong TEO, who also led the preparation of this edition of the APHRS White Book. I would like to thank our board members for their great support of this work.

My deep gratitude also goes to all contributors, the national Societies of Pacing and Electrophysiology and the national Heart Rhythm Societies of 19 member countries or regions of APHRS. Without their voluntary collection of data, this book would never have been completed. In particular, I am very glad to welcome our four new member countries, whose participation gave us great support in continuing our work. In addition, I'd like to thank Ms. Shigeno, and Mr. Jimmy Yap, the secretary of APHRS, who helped collect data from member countries and regions. Finally, I would like to express my appreciation for the members of my working group, Dr. Xiaohan Fan and Ms. Na Lin, who performed secondary research to verify and establish the quantitative and qualitative information contained in the book.



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

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(January 1-December 31, 2017)



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Country/Region: PR. China

1. Statistics

	2013	2014	2015	2016
Population(thousand) ¹	1349586	1367820	1367820	1382710
Hospitals	24709	25860	25906	27587
Beds(per 100,000 population) ²	468.41	482.59	482.59	511.00
Physicians(per 1,000 population) ²	1.67	1.74	1.74	2.21
Nurses(per 1,000 population) ²	2.05	2.20	2.20	2.36
GDP (US\$, billions) ³	9,469.12	10,356.51	10,982.829	11,218.281
Total expenditure on health as % GDP ²	5.39%	5.55%	5.55%	6.0%
Government expenditure on health as %	30.1%	30.0%	30.0%	30.88%
Insured citizens (%)	70%	70%	70%	70%
SCD patients	0.54m	0.54m	0.54m	0.54m
Heart failure patients	4.5m	4.5m	4.5m	4.5m
AF patients	6m	8m	8m	8m

1. www.census.gov

2. www.who.int

3. www.imf.org

4. www.stats.gov.cn

2. Pacemaker

	2013	2014	2015	2016
Total Pacemakers	51752	59735	65785	73080
New implants	43917	48273	57683	62508
Replacements	7835	8305	8102	10572
Single-chamber	17706	17199	20393	21066
Dual-chamber	33753	35856	45392	51588
Sick sinus syndrome	26318	27294	26253	37202
AV block	20240	21262	21177	29107
Implanting Centers	933	963	955	995
Implanting Physicians	3000	3000	3000	3000
National Registry	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

3. Cardiac resynchronization therapy

	2013	2014	2015	2016
Total CRTs	2198	2753	3092	3560
CRT-P	959	1057	1330	1426
CRT-P new implants	840	754	1052	1095
CRT-P replacements/upgrade	119	180	278	331
CRT-D	1220	1234	1762	2078
CRT-D new implants	1066	873	1456	1609
CRT-D replacements/upgrade	154	254	306	469
Ischemic	542	528	866	1188
Non-ischemic	1656	1571	2226	2372
Implanting Centers	353	383	374	396
Implanting Physicians	3000	3000	3000	3000
National Registry	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

4. Implantable cardioverter defibrillator

	2013	2014	2015	2016
Total ICDs	1903	2333	2851	3317
ICD new implants	1745	1864	2601	2986
ICD replacements	158	199	250	331
Single-chamber	1300	1295	1939	2183
Dual-chamber	603	622	912	1134
Primary prevention	855	894	1197	1693
Secondary prevention	1048	1022	1654	1624
Implanting Centers	323	368	363	408
Implanting Physicians	3000	3000	3000	3000
National Registry	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

5. Interventional electrophysiology

	2013	2014	2015	2016
Ablation procedures	83450	101063	117021	132504
SVT ablation procedures	50990	54481	53176	73702
AVNRT	25588	27036	26916	36708
AVRT/WPW	21809	21653	20383	28318
AFL (RA isthmus dependent)	1781	3136	3074	4734
AT	1812	2656	2803	3942
VT/VPC	478	494	-	-
Idiopathic	423	476	-	-
Structural	16	18	-	-
AF ablation procedures	14752	17352	24545	30574
Ablation centers	737	773	759	805
AF ablation centers	345	390	341	383
Structural VT ablation centers	-	-	-	-
Ablation physicians	2000	2000	-	-
AF ablation physicians	-	-	-	-
Structural VT ablation physicians	-	-	-	-
National Registry	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

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	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of reimbursement, limited financial resources	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Lack of referral	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of trained personnel	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Low awareness of guidelines	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of operators	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

7. Source

Chinese Society of Pacing and Electrophysiology (CSPE)

Country/Region: Brunei Darussalam

1. Statistics

	2013	2014	2015	2016
Population (thousand)	406	412	417	420
Hospitals	6	6	6	6
Beds	983*	999*	1143*	1165*
Physicians	656	700	739	739
Nurses	2596	2734	2756	2742
GDP (US\$, billions)	16.3	15.6	12.8	-
Total expenditure on health as % GDP	1.62	1.72	2.17	-
Government expenditure on health (US\$)	265,000,000	269,000,000	278,000,000	-
Insured citizens (%)	-	-	-	-
SCD patients	-	-	-	-
Heart failure patients	-	-	-	-
AF patients	-	-	-	-

* excludes beds in private hospitals

2. Pacemaker

	2013	2014	2015	2016
Total Pacemakers	43	40	69	65
New implants	33	33	55	52
Replacements	10	7	14	13
Single-chamber	10	8	11	17
Dual-chamber	33	32	58	48
Sick sinus syndrome	-	-	-	-
AV block	-	-	-	-
Implanting Centers	2	2	2	2
Implanting Physicians	3	3	5	5
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. Cardiac resynchronization therapy

	2013	2014	2015	2016
Total CRTs	23	19	16	14
CRT-P	1	4	2	0
CRT-P new implants	1	4	2	0
CRT-P replacements/upgrade	0	0	0	0
CRT-D	22	15	14	14
CRT-D new implants	13	8	6	5
CRT-D replacements/upgrade	9	7	8	9
Ischemic	11	5	2	7
Non-ischemic	11	10	12	7
Implanting Centers	2	2	2	2
Implanting Physicians	2	2	2	2
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. Implantable cardioverter defibrillator

	2013	2014	2015	2016
Total ICDs	14	13	26	14
ICD new implants	10	12	23	13
ICD replacements	4	1	3	1
Single-chamber	6	0	2	0
Dual-chamber	8	13	24	14
Primary prevention	9	7	12	10
Secondary prevention	5	6	14	4
Implanting Centers	2	2	2	2
Implanting Physicians	2	2	5	5
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2013	2014	2015	2016
Total lead extraction procedures	3	2	4	0
Hospitals performed lead extraction	1	1	1	1
Cardiologists performing lead extraction	1	1	1	1
Surgeons performing lead extraction	0	0	0	0
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6. Interventional electrophysiology

	2013	2014	2015	2016
Ablation procedures	77	94	103	109
SVT ablation procedures	42	18	24	26
AVNRT	-	-	13	14
AVRT/WPW	-	-	3	6
AFL(RA isthmus dependent)	-	-	4	5
AT		-	-	5
VT/VPC	1	-	-	4
Idiopathic	-	-	-	
Structural	-	-	-	
AF ablation procedures	34	76	79	52
Ablation centers	-	-	-	-
AF ablation centers	1	1	1	1
Structural VT ablation centers	1	1	1	1
Ablation physicians	-	-	-	-
AF ablation physicians	1	1	2	2
Structural VT ablation physicians	1	1	1	1
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of reimbursement, limited financial resources	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of referral	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of trained personnel	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Low awareness of guidelines	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of operators	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8. Source

Name of national working group or arrhythmia body

Cardiac Society, Brunei Darussalam

Ministry of Health, Brunei Darussalam

Department of Economic Planning and Development, Prime Minister's Office, Brunei Darussalam

Country/Region: Cambodia

1. Statistics

	2013	2014	2015	2016
Population(thousand) ¹	-	-	15,577.899	15,827.241
Hospitals	-	-	-	-
Beds	-	-	-	-
Physicians	-	-	-	-
Nurses	-	-	-	-
GDP (US\$, billions)	-	-	-	-
Total expenditure on health as % GDP	-	-	-	-
Government expenditure on health (US\$)	-	-	-	-
Insured citizens (%)	-	-	-	-
SCD patients	-	-	-	-
Heart failure patients	-	-	-	-
AF patients	-	-	-	-

¹, www.census.gov

2. Pacemaker

	2013	2014	2015	2016
Total Pacemakers	100	125	161	211
New implants	98	120	155	202
Replacements	2	5	6	9
Single-chamber	48	59	81	95
Dual-chamber	50	61	74	107
Sick sinus syndrome	53	73	69	95
AV block	45	47	86	107
Implanting Centers	1	1	1	2
Implanting Physicians	1	1	1	1
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. Cardiac resynchronization therapy

	2013	2014	2015	2016
Total CRTs	2	2	2	3
CRT-P	2	2	2	2
CRT-P new implants	-	-	-	-
CRT-P replacements/upgrade	-	-	-	1
CRT-D	-	-	-	1
CRT-D new implants	-	-	-	1
CRT-D replacements/upgrade	-	-	-	-
Ischemic	-	-	-	-
Non-ischemic	-	-	-	-
Implanting Centers	1	1	1	2
Implanting Physicians	1	1	1	1
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. Implantable cardioverter defibrillator

	2013	2014	2015	2016
Total ICDs	-	-	4	4
ICD new implants	-	2	4	4
ICD replacements	-	-	-	-
Single-chamber	-	2	2	2
Dual-chamber	-	-	2	2
Primary prevention	-	-	-	-
Secondary prevention	-	-	4	4
Implanting Centers	-	1	1	1
Implanting Physicians	-	1	1	1
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2013	2014	2015	2016
Total lead extraction procedures				
Hospitals performed lead extraction				
Cardiologists performing lead extraction				
Surgeons performing lead extraction				
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6. Interventional electrophysiology

	2013	2014	2015	2016
Ablation procedures	78	101	152	185
SVT ablation procedures				
AVNRT	12	25	32	42
AVRT/WPW	0	0	0	0
AFL(RA isthmus dependent)	22	27	35	60
AT	21	26	59	59
VT/VPC	0	0	0	0
Idiopathic	23	23	26	24
Structural	0	3	0	0
AF ablation procedures	0	0	0	1
Ablation centers	-	-	-	-
AF ablation centers	1	1	1	1
Structural VT ablation centers	-	-	-	-
Ablation physicians	1	1	1	1
AF ablation physicians	-	-	-	-
Structural VT ablation physicians	-	-	-	-
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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	some	some		
Individual	ok	ok	ok	ok

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

	1	2	3	4	5
Lack of centers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of reimbursement, limited financial resources	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of referral	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of trained personnel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Low awareness of guidelines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of operators	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8. Source

Name of national working group or arrhythmia body

Country/Region: Hong Kong SAR

1. Statistics

	2013	2014	2015	2016
Population (thousand) ¹	7,219	7,266	7,324	7,375
Hospitals	53	53	53	53
Beds	35,790	36,965	38,287	39,090
Physicians	13,203	13,417	13,726	14,013
Nurses	34,597	35,821	37,670	39,178
GDP (US\$, billions)	272.481	274.948	307.3	308.28
Total expenditure on health as % GDP	2.17%	2.64%	2.95%	3.23%
Government expenditure on health (US\$)	5,905 mil	7,269mil	9,051 mil	9,949 mil
Insured citizens (%)	-	-	-	-
SCD patients	-	-	-	-
Heart failure patients	-	-	-	-
AF patients	-	-	-	-

1. www.census.gov

2. Pacemaker

	2013	2014	2015	2016
Total Pacemakers	537	762	695	752
New implants	470	620	594	625
Replacements	67	142	101	127
Single-chamber	-	-	-	-
Dual-chamber	-	-	-	-
Sick sinus syndrome	-	-	-	-
AV block	-	-	-	-
Implanting Centers	-	-	-	-
Implanting Physicians	-	-	-	-
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. Cardiac resynchronization therapy

	2013	2014	2015	2016
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	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. Implantable cardioverter defibrillator

	2013	2014	2015	2016
Total ICDs	79	110	102	174
ICD new implants	57	77	60	99
ICD replacements	22	33	42	75
Single-chamber	-	-	-	-
Dual-chamber	-	-	-	-
Primary prevention	-	-	-	-
Secondary prevention	-	-	-	-
Implanting Centers	-	-	-	-
Implanting Physicians	-	-	-	-
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2013	2014	2015	2016
Total lead extraction procedures	-	-	-	-
Hospitals performed lead extraction	-	-	-	-
Cardiologists performing lead extraction	-	-	-	-
Surgeons performing lead extraction	-	-	-	-
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6. Interventional electrophysiology

	2013	2014	2015	2016
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	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of reimbursement, limited financial resources	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of referral	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of trained personnel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Low awareness of guidelines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of operators	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8. Source

Name of national working group or arrhythmia body

Country/Region: India

1. Statistics

	2013	2014	2015	2016
Population (bn)	1.252	1.267 ¹	1.311	1.326
Urban Hospitals (Govt. only)	13,761	14,432 ²	-	-
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	-	2,250
Total expenditure on health as % GDP	4.0%	3.9% ⁴	-	2.5%
Government expenditure on health as %	33.1%	21% ⁴	-	-
Insured citizens (in Millions)	410	550	-	-
SCD patients ⁵ (in Thousands)	627	700 ⁵	-	NA
Heart failure patients ⁶ (in Millions)	2.31	~4.6 ⁶	-	~8–10mn
AF patients (mn)	12.7	15.8	-	-

2. Pacemaker

	2013	2014	2015	2016
Total Pacemakers	36,322	32747	31230	35794
New implants	85.8%	80%	70%	75%
Replacements	14.4%	20%	30%	25%
Single-chamber	14,477	18386	17066	19440
Dual-chamber	21,846	14361	14161	16354
Sick sinus syndrome	25%	25%	20%	25%
AV block	65%	75%	80%	75%
Implanting Centers	888	930	945	970
Implanting Physicians	1500	1535	1540	1560
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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/>

3. Cardiac resynchronization therapy

	2013	2014	2015	2016
Total CRTs	1830	2935	2147	2728
CRT-P	1157	1005	784	944
CRT-P new implants	90%	88%	88%	88%
CRT-P replacements/upgrade	10%	12%	12%	12%
CRT-D	1331	951	1363	1784
CRT-D new implants	90%	88%	85%	82%
CRT-D replacements/upgrade	10%	12%	15%	18%
Ischemic	-	65%	-	-
Non-ischemic	-	35%	-	-
Implanting Centers	300	315	315	345
Implanting Physicians	360	380	380	395
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. Implantable cardioverter defibrillator

	2013	2014	2015	2016
Total ICDs	2963	2540	3061	3664
ICD new implants	-	-	-	85%
ICD replacements	-	-	-	15%
Single-chamber	2030	1755	1907	2464
Dual-chamber	933	785	1154	1200
Primary prevention	20%	30%	30%	40%
Secondary prevention	80%	70%	70%	60%
Implanting Centers	340	350	355	~380
Implanting Physicians	440	475	484	500
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2013	2014	2015	2016
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	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6. Interventional electrophysiology

	2013	2014	2015	2016
Ablation procedures	13707	16349	19370	22900
SVT ablation procedures	9179	10555	12033	14400
AVNRT	4436	5128	5846	7500
AVRT/WPW	3143	3618	4125	5000
AFL (RA isthmus dependent)	630	713	813	900
AT	970	1096	1249	1000
VT/VPC	3768	4792	6035	7100
Idiopathic	1324	1638	1998	3000
Structural	2444	3154	4037	4100
AF ablation procedures	760	1002	1303	1400
Ablation centers	126	143	160	176
AF ablation centers	20	24	28	30
Structural VT ablation centers	69	78	89	93
Ablation physicians	95	102	109	135
AF ablation physicians	27	33	40	41
Structural VT ablation physicians	51	63	72	83
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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	25	25	30	15
Insurance	15	15	10	10
Public insurance	10	10	7	7
Private insurance	5	5	3	3
Individual	60	65	60	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	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of reimbursement, limited financial resources	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Lack of referral	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of trained personnel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Low awareness of guidelines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Lack of operators	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8. Source

Name of national working group or arrhythmia body

Country/Region: Indonesia

1. Statistics

	2013	2014	2015	2016
Population (thousand) ¹	248,422	252,101	255.461	260,580
Hospitals	2,228	2,486	2,406	2,147
Beds	238,373	269,791	269,791	-
Physicians	90,444	157,393	157,393	186,091
Nurses	288,405	281,111	281,111	-
GDP (US\$, billions)	868.30	870.00	861.93	861.9
Total expenditure on health as % GDP	3.1%	-	2.8	2.9
Government expenditure on health (US\$)	91.66	96.54	94.49	299
Insured citizens (%)	76.18	-	78.0	65
SCD patients	No data	-	-	-
Heart failure patients	0.3%	-	-	-
AF patients	9.8%	-	-	-

¹. www.census.gov

2. Pacemaker

	2013	2014	2015	2016
Total Pacemakers	573	717	707	1017
New implants	542	688	657	972
Replacements	27	29	50	45
Single-chamber	357	436	405	541
Dual-chamber	216	281	302	476
Sick sinus syndrome	224	341	393	350
AV block	349	376	314	667
Implanting Centers	11	12	16	40
Implanting Physicians	20	23	76	86
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. Cardiac resynchronization therapy

	2013	2014	2015	2016
Total CRTs	38	55	67	81
CRT-P	16	40	32	34
CRT-P new implants	27	40	27	30
CRT-P replacements/upgrade	2	0	4	4
CRT-D	4	15	35	47
CRT-D new implants	9	14	28	41
CRT-D replacements/upgrade	0	1	7	6
Ischemic	27	37	25	38
Non-ischemic	11	18	12	43
Implanting Centers	3	4	16	10
Implanting Physicians	10	11	23	16
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. Implantable cardioverter defibrillator

	2013	2014	2015	2016
Total ICDs	21	19	24	38
ICD new implants	19	19	21	28
ICD replacements	2	0	3	10
Single-chamber	15	18	16	28
Dual-chamber	5	0	8	10
Primary prevention	15	12	2	8
Secondary prevention	5	6	43	30
Implanting Centers	7	7	15	10
Implanting Physicians	20	23	23	20
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2013	2014	2015	2016
Total lead extraction procedures	1	5	7	7
Hospitals performed lead extraction	2	2	2	5
Cardiologists performing lead extraction	2	2	2	8
Surgeons performing lead extraction	0	0	0	0
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6. Interventional electrophysiology

	2013	2014	2015	2016
Ablation procedures	382	416	491	740
SVT ablation procedures	157	174	268	395
AVNRT	69	75	115	190
AVRT/WPW	48	48	107	138
AFL (RA isthmus dependent)	25	31	31	48
AT	15	20	15	19
VT/VPC	5	12	147	268
Idiopathic	60	80	47	247
Structural	2	4	8	21
AF ablation procedures	48	39	65	77
Ablation centers	6	6	9	11
AF ablation centers	2	3	5	6
Structural VT ablation centers	2	2	2	6
Ablation physicians	-	-	22	18
AF ablation physicians	-	-	7	14
Structural VT ablation physicians	-	-	5	10
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Lack of reimbursement, limited financial resources	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Lack of referral	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of trained personnel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Low awareness of guidelines	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of operators	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8. Source

Name of national working group or arrhythmia body:
Indonesian Heart Rhythm Society (InaHRS)

Country/Region: Japan

1. Statistics

	2013	2014	2015	2016
Population (thousand) ¹	127298	127083	126990	126933
Hospitals (per 100,000 population)	6.71	6.71	6.69	6.68
Beds	1695210	1691450	1611026	1559901
Physicians (per 1,000 population) ²	2.38	2.38	2.39	2.45
Nurses (per 1,000 population) ²	7.98	7.99	8.41	8.56
GDP (US\$, billions) ³	5040.95	5008.57	4990.57	4758.75
Total expenditure on health as % GDP ³	7.3%	8.0%	7.6%	8.33%
Government expenditure on health as % ⁴	-	-	-	-
Insured citizens (%)	-	-	-	-
SCD patients	-	-	-	-
Heart failure patients	108700	1200000	1254300	1254300
AF patients	902521	1000000	1000000	1000000

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

2.<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=

3.<http://www.nikkei.com/biz/report/gdp/529000000000000/106>

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

2. Pacemaker

	2013	2014	2015	2016
Total Pacemakers	59487	57678	57337	58693
New implants	39290	39398	39292	40318
Replacements	20197	18280	17935	18375
Single-chamber	11676	11304	11109	10928
Dual-chamber	46876	45325	46118	47765
Sick sinus syndrome	-	-	-	-
AV block	-	-	-	-
Implanting Centers	-	-	-	-
Implanting Physicians	-	-	-	-
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. Cardiac resynchronization therapy

	2013	2014	2015	2016
Total CRTs	4260	4405	4575	4722
CRT-P	935	1049	1167	1188
CRT-P new implants	-	-	729	817
CRT-P replacements/upgrade	-	-	438	371
CRT-D	3325	3356	3408	3534
CRT-D new implants	2217	2139	2147	2179
CRT-D replacements/upgrade	1108	1217	1261	1355
Ischemic	-	-	-	-
Non-ischemic	-	-	-	-
Implanting Centers	-	-	-	-
Implanting Physicians	-	-	-	-
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

4. Implantable cardioverter defibrillator

	2013	2014	2015	2016
Total ICDs	6373	5830	5780	6367
ICD new implants	3775	3650	3822	4208
ICD replacements	2598	2108	1958	2159
Single-chamber	1308	1440	1345	1627
Dual-chamber	5065	4289	4435	4740
Primary prevention	-	-	-	-
Secondary prevention	-	-	-	-
Implanting Centers	-	-	-	-
Implanting Physicians	-	-	-	-
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2013	2014	2015	2016
Total lead extraction procedures	-	-	-	-
Hospitals performed lead extraction	-	-	-	-
Cardiologists performing lead extraction	-	-	-	-
Surgeons performing lead extraction	-	-	-	-
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6. Interventional electrophysiology

	2013	2014	2015	2016
Ablation procedures	46000	59000	63000	65000
SVT ablation procedures	15000	15000	14500	15000
AVNRT	-	-	-	-
AVRT/WPW	-	-	-	-
AFL (RA isthmus dependent)	-	-	-	-
AT	-	-	-	-
VT/VPC	6000	6000	5500	6000
Idiopathic	-	-	-	-
Structural	-	-	-	-
AF ablation procedures	25000	38000	43000	45000
Ablation centers	550	490	480	690
AF ablation centers	350	400	400	450
Structural VT ablation centers	-	-	-	-
Ablation physicians	1600	1800	1800	2000
AF ablation physicians	1000	1200	1300	1500
Structural VT ablation physicians	-	-	-	-
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of reimbursement, limited financial resources	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of referral	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of trained personnel	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Low awareness of guidelines	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of operators	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8. Source

Name of national working group or arrhythmia body
Japanese Heart Rhythm Society

Country/Region: Malaysia

1. Statistics

	2013	2014	2015	2016
Population (Thousand)	29,714.7	30,097.9	30,331.0	31,700.00
Hospitals	141	142	145	146
Beds	39,728	40,126	42,056	42,100
Physicians	46,916	51,453	53,132	53,225
Nurses	89,167	92,681	103,465	104,500
GDP (RM)	37,542	44,748	46,812	48,918
Total expenditure on health as % GDP	4.40	4.53	4.51	4.5
Government expenditure on health as %	52.73	51.96	50.12	50.2
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	2016
Total Pacemakers	577	659	755	460
New implants	430	482	569	345
Replacements	147	177	186	115
Single-chamber	255	285	299	155
Dual-chamber	322	374	456	305
Sick sinus syndrome	151	172	218	218
AV block	183	216	356	235
Implanting Centers	18	35	38	38
Implanting Physicians	54	101	122	122
National Registry	☑	☑	☑	☑

3. Cardiac resynchronization therapy

	2013	2014	2015	2016
Total CRTs	121	173	203	163
CRT-P	57	78	102	53
CRT-P new implants	36	45	68	23
CRT-P replacements/upgrade	21	33	34	30
CRT-D	64	95	101	110
CRT-D new implants	39	58	77	63
CRT-D replacements/upgrade	25	37	24	47
Ischemic	65	102	131	77
Non-ischemic	56	71	72	86
Implanting Centers	11	13	16	16
Implanting Physicians	17	24	31	31
National Registry	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

4. Implantable cardioverter defibrillator

	2013	2014	2015	2016
Total ICDs	119	143	201	158
ICD new implants	89	108	167	88
ICD replacements	30	35	34	90
Single-chamber	72	96	135	117
Dual-chamber	47	47	66	41
Primary prevention	29	49	65	69
Secondary prevention	90	94	136	89
Implanting Centers	11	18	21	21
Implanting Physicians	17	24	28	28
National Registry	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2013	2014	2015	2016
Total lead extraction procedures	-	-	16	12
Hospitals performed lead extraction	-	-	3	2
Cardiologists performing lead extraction	-	-	6	6
Surgeons performing lead extraction	-	-	3	5
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

6. Interventional electrophysiology

	2013	2014	2015	2016
Ablation procedures	506	612	793	664
SVT ablation procedures	297	328	362	443
AVNRT	179	201	226	193
AVRT/WPW	118	127	136	49/63
AFL (RA isthmus dependent)	46	94	86	92
AT	31	54	51	46
VT/VPC	75	116	181	127
Idiopathic	53	63	121	92
Structural	22	53	60	35
AF ablation procedures	57	89	113	94
Ablation centers			5	5
AF ablation centers	0	2	4	5
Structural VT ablation centers	0	1	2	2
Ablation physicians	4	7	9	5
AF ablation physicians	3	5	6	5
Structural VT ablation physicians	3	4	4	5
National Registry	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

7. Management

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

Payment (%)	Pacemaker	ICD	CRT	Ablation
Government	60	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	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Lack of reimbursement, limited financial resources	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of referral	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of trained personnel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Low awareness of guidelines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Lack of operators	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

8 Data source

UMMC, Penang Hospital Heart Centre, IJN, UiTM, PPUKM, SGH, QEH2, Pantai Medical Centre

Country/Region: Mongolia

1. Statistics

	2013	2014	2015	2016
Population (thousand) ¹	2,930.3	2,995.9	3,057.8	3027.4
Hospitals	16	13	13	-
Beds	19,860	20,576	21,720	-
Physicians	8,923	9,300	9,563	-
Nurses	10,150	10,948	11,357	-
GDP (US\$, billions)	1.17	1.226	1.18	-
Total expenditure on health as % GDP	-	-	-	-
Government expenditure on health (US\$)	4,118,652.6	3,951,611.3	3,622,815	
Insured citizens (%)	-	-	-	-
SCD patients	-	-	-	-
Heart failure patients	-	-	-	-
AF patients	-	-	-	-

¹, www.census.gov

2. Pacemaker

	2013	2014	2015	2016
Total Pacemakers	-	-	113	123
New implants	-	-	93	118
Replacements	-	-	20	5
Single-chamber	-	-	-	-
Dual-chamber	-	-	-	-
Sick sinus syndrome	-	-	-	-
AV block	-	-	-	-
Implanting Centers	-	-	1	1
Implanting Physicians	-	-	1	3
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. Cardiac resynchronization therapy

	2013	2014	2015	2016
Total CRTs	-	-	1	3
CRT-P	-	-	1	3
CRT-P new implants	-	-	1	3
CRT-P replacements/upgrade	-	-	-	-
CRT-D	-	-	-	-
CRT-D new implants	-	-	-	-
CRT-D replacements/upgrade	-	-	-	-
Ischemic	-	-	-	-
Non-ischemic	-	-	1	3
Implanting Centers	-	-	1	1
Implanting Physicians	-	-	1	1
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. Implantable cardioverter defibrillator

	2013	2014	2015	2016
Total ICDs	-	-	-	-
ICD new implants	-	-	-	-
ICD replacements	-	-	-	-
Single-chamber	-	-	-	-
Dual-chamber	-	-	-	-
Primary prevention	-	-	-	-
Secondary prevention	-	-	-	-
Implanting Centers	-	-	-	-
Implanting Physicians	-	-	-	-
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2013	2014	2015	2016
Total lead extraction procedures	-	-	-	-
Hospitals performed lead extraction	-	-	-	-
Cardiologists performing lead extraction	-	-	-	-
Surgeons performing lead extraction	-	-	-	-
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6. Interventional electrophysiology

	2013	2014	2015	2016
Ablation procedures	-	-	-	38
SVT ablation procedures	-	-	-	38
AVNRT	-	-	-	18
AVRT/WPW	-	-	-	20
AFL(RA isthmus dependent)	-	-	-	-
AT	-	-	-	-
VT/VPC	-	-	-	-
Idiopathic	-	-	-	-
Structural	-	-	-	-
AF ablation procedures	-	-	-	-
Ablation centers	-	-	-	1
AF ablation centers	-	--	-	1
Structural VT ablation centers	-	-	-	1
Ablation physicians	-	-	-	1
AF ablation physicians	-	-	-	1
Structural VT ablation physicians	-	-	-	1
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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	80%	-	80%	80%
Insurance	-	-	-	-
Public insurance	-	-	-	-
Private insurance	-	-	-	-
Individual	20%	-	20%	20%

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

	1	2	3	4	5
Lack of centers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Lack of reimbursement, limited financial resources	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Lack of referral	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of trained personnel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Low awareness of guidelines	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of operators	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8. Source

Name of national working group or arrhythmia body
State Third Central Hospital, National Cardiac Center
Mongolian Heart Rhythm Society

Country/Region: Myanmar

1. Statistics

	2015	2016
Population (thousand)	51480	51480
Hospitals (implanting)	8	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	2016
Total pacemakers	485	515
New implants	475	495
Replacements	10	20
Single-chamber	470	474
Dual-chamber	15	41
Sick sinus syndrome	218	249
AV block	257	266
Implanting Centers	8	8
Implanting Physicians	8	15
National Registry	<input type="checkbox"/>	<input type="checkbox"/>

3. Cardiac resynchronization therapy

	2015	2016
Total CRTs	18	4
CRT-P	6	2
CRT-P new implants	6	2
CRT-P replacements / upgrade		
CRT-D	12	2
CRT-D new implants	12	2
CRT-D replacements/upgrade		
Ischaemic	18	4
Non-ischaemic		
Implanting Centers	2	3
Implanting physicians	2	3
National Registry	<input type="checkbox"/>	<input type="checkbox"/>

4. Implantable cardioverter defibrillator

	2015	2016
Total ICDs	16	21
ICD new implants	16	19
ICD replacements		2
Single-chamber	11	17
Dual-chamber	5	4
Primary prevention	0	5
Secondary prevention	16	16
Implanting Centers	3	4
Implanting physicians	3	4
National Registry	<input type="checkbox"/>	<input type="checkbox"/>

5. Lead extraction

	2015	2016
Total lead extraction procedure	-	-
Hospitals performed lead extraction	-	-
Cardiologists performing lead extraction	-	-
Surgeons performing lead extraction	-	-
National Registry	-	-

6. Interventional Electrophysiology

	2015	2016
Ablation procedures	530	618
SVT ablation procedures	481	561
AVNRT	240	318
AVRT/WPW	237	223
AFL (RA isthmus dependent)	3	17
AT	1	3
VT/PVC	46	44
Idiopathic	46	44
Structural	-	-
AF ablation procedures	3	13
Ablation centers		
AF ablation centers	1	1
Structural VT ablation centers	-	-
Ablation physicians		
AF ablation physicians	1	1
Structural VT ablation physicians	-	-
National Registry	<input type="checkbox"/>	<input type="checkbox"/>

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 %	100 %	100 %	-

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

	1	2	3	4	5
Lack of centers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Lack of reimbursement, limited financial resources	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Lack of referral	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of trained personnel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Low awareness of guidelines	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of operators	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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	2016
Population (thousand) ¹	4511	4550	4600	4693
Hospitals (<i>includes every small hosp.</i>)	184	184	184	184
Beds (<i>includes every small hosp.</i>)	27000	27000	12880	10793
Physicians	14686	14808	14678	14700
Nurses	42400	45293	52729	53000
GDP(US\$, billions) ²	179.8	191.7	173.75	185
Total expenditure on health as % GDP ²	8.9%	9%	10%	10%
Government expenditure on health as % ²	77%	77%	80%	80%
Insured citizens (%)	30%	30%	30%	30%
SCD patients	3500	3500	3500	3700
Heart failure patients	25000	25000	26000	30000
AF patients	-	-	-	-

1. www.census.gov

2. www.imf.org

2. Pacemaker

	2013	2014	2015	2016
Total Pacemakers	2200	2240	2470	2492
New implants	1850	1817	2010	1933
Replacements	350	423	460	526
Single-chamber	750	750	960	730
Dual-chamber	1350	1490	1510	1598
Sick sinus syndrome	-	-	-	-
AV block	-	-	-	-
Implanting Centers	12	12	12	12
Implanting Physicians	31	31	36	38
National Registry	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

3. Cardiac resynchronization therapy

	2013	2014	2015	2016
Total CRTs			210	309
CRT-P			90	150
CRT-P new implants		68	70	89
CRT-P replacements/upgrade		17	20	61
CRT-D			120	159
CRT-D new implants	75	79	100	107
CRT-D replacements/upgrade	20	19	20	52
Ischemic				
Non-ischemic				
Implanting Centers	6	6	6	6
Implanting Physicians	13	14	20	22
National Registry	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

4. Implantable cardioverter defibrillator

	2013	2014	2015	2016
Total ICDs	560	624	625	638
ICD new implants	435	499	500	448
ICD replacements	125	125	125	100
Single-chamber	-	-	-	-
Dual-chamber	-	-	-	-
Primary prevention	207	-	-	-
Secondary prevention	228	-	-	-
Implanting Centers	6	7	7	7
Implanting Physicians	13	14	18	22
National Registry	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2013	2014	2015	2016
Total lead extraction procedures	-	-	32	33
Hospitals performed lead extraction	-	-	2	2
Cardiologists performing lead extraction	-	-	3	3
Surgeons performing lead extraction	-	-	0 (support)	Support
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6. Interventional electrophysiology

	2013	2014	2015	2016
Ablation procedures	720	1267	1290	1482
SVT ablation procedures	410	788	813	881
AVNRT	-	266	293	322
AVRT/WPW	-	194	182	151
AFL (RA isthmus dependent)	-	260	252	331
AT	-	68	86	77
VT/VPC	60	141	76	135
Idiopathic	25	78	40	94
Structural	35	14	36	41
AF ablation procedures	230	355	363	405
Ablation centers				
AF ablation centers	4	6	8	8
Structural VT ablation centers	4	4	4	4
Ablation physicians				
AF ablation physicians	7	8	9	12
Structural VT ablation physicians	7	7	9	12
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of reimbursement, limited financial resources	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of referral	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Lack of trained personnel	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Low awareness of guidelines	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of operators	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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	2016
Population (million) ¹	-	182	182	182.5
Hospitals	-	-	-	-
Beds(per thousand)	-	0.6	0.6	0.6
Physicians	-	0.5 /1000	05/1000	05/1000
Nurses	-	-	-	-
GDP (US\$, billions)	-	246.88	246	247
Total expenditure on health as % GDP	-	3.2	3.5	3.5
Government expenditure on health (US\$)	-	-	-	4%
Insured citizens (%)	-	0.1%	0.1%	0.1%
SCD patients	-	-	-	-
Heart failure patients	-	-	-	-
AF patients	-	-	1%	0.5%

¹. www.census.gov

2. Pacemaker

	2013	2014	2015	2016
Total Pacemakers	-	2222	2700	3450
New implants	-	2000	2400	3000
Replacements	-	222	300	450
Single-chamber	-	70%	70%	80%
Dual-chamber	-	30%	30%	20%
Sick sinus syndrome	-	20%	20%	20%
AV block	-	80%	80%	80%
Implanting Centers	-	25	27	29
Implanting Physicians	-	50	62	70
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. Cardiac resynchronization therapy

	2013	2014	2015	2016
Total CRTs	-	45	76	137
CRT-P	-	30	56	102
CRT-P new implants	-	-	-	97
CRT-P replacements/upgrade	-	-	3	5
CRT-D	-	-		35
CRT-D new implants	-	15	20	35
CRT-D replacements/upgrade	-	-	-	-
Ischemic	-	90%	90%	90%
Non-ischemic	-	10%	10%	10%
Implanting Centers	-	4	5	6
Implanting Physicians	-	6	-	7
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. Implantable cardioverter defibrillator

	2013	2014	2015	2016
Total ICDs	-	-	-	-
ICD new implants	-	100	112	150
ICD replacements	-			
Single-chamber	-	90%	90%	92%
Dual-chamber	-			
Primary prevention	-	20%	20%	18%
Secondary prevention	-	80%	80%	82%
Implanting Centers	-	5	6	8
Implanting Physicians	-	7	8	8
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2013	2014	2015	2016
Total lead extraction procedures	-	-	-	-
Hospitals performed lead extraction	-	-	-	-
Cardiologists performing lead extraction	-	-	-	-
Surgeons performing lead extraction	-	-	-	-
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6. Interventional electrophysiology

	2013	2014	2015	2016
Ablation procedures	-	-	-	-
SVT ablation procedures	700	-	765	870
AVNRT	60%	-	61%	63%
AVRT/WPW	25%	-	24%	25%
AFL (RA isthmus dependent)	4%	-	5%	5%
AT	2%	-	2%	7%
VT/VPC	6%	-	6%	8%
Idiopathic	3%	-	3%	7%
Structural	-	-		
AF ablation procedures	0	-	5	10
Ablation centers		-	1	8
AF ablation centers	1	-	1	2
Structural VT ablation centers	1	-	1	1
Ablation physicians		-	1	
AF ablation physicians		-	1	2
Structural VT ablation physicians	1	-	1	1
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Lack of reimbursement, limited financial resources	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Lack of referral	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of trained personnel	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Low awareness of guidelines	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of operators	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8. Source

Name of national working group or arrhythmia body
Pakistan Heart Rhythm Society

Country/Region: Philippines

1. Statistics

	2013	2014	2015	2016
Population (thousand) *	98,393	100,096	102,435	103,796
Hospitals	1840	1921	1974	1823
Beds (per 100,000 population)	100	100	1	1.02
Physicians (per 1,000 population) **	1.2	1.5	1.15	1.16
Nurses (per 1,000 population) ***	-	6	6	6
GDP (US\$, billions) ****	272.02	284.58	291.97	
Total expenditure on health as % GDP	4.4%	4.4%	4.7%	4.71
Government expenditure on health as %	27%	31.6%	34.3%	10.1
Insured citizens (%)	-	80%	80%	33%
SCD patients	-	-	43/100,000	-
Heart failure patients	-	-	No data	
AF patients	-	-	0.2%	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	2016
Total Pacemakers	1389	1528	1049	1225
New implants	631	677	913	973
Replacements	102	87	136	252
Single-chamber	378	395	523	584
Dual-chamber	278	369	526	637
Sick sinus syndrome	-	-	-	353
AV block	-	-	-	64
Implanting Centers	36	37	42	98
Implanting Physicians	84	100	95	160
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. Cardiac resynchronization therapy

	2013	2014	2015	2016
Total CRTs	18	17	28	34
CRT-P	2	2	2	7
CRT-P new implants	2	0	2	2
CRT-P replacements/upgrade	0	2	0	0
CRT-D	16	15	26	26
CRT-D new implants	15	12	21	22
CRT-D replacements/upgrade	1	3	5	4
Ischemic	-	-	-	4
Non-ischemic	-	-	-	2
Implanting Centers	10	23	21	16
Implanting Physicians	13	15	18	5
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. Implantable cardioverter defibrillator

	2013	2014	2015	2016
Total ICDs	48	52	53	104
ICD new implants	44	50	44	84
ICD replacements	4	2	9	20
Single-chamber	-	20	38	55
Dual-chamber	-	32	15	49
Primary prevention	-	-	-	15
Secondary prevention	-	-	-	89
Implanting Centers	10	23	21	7
Implanting Physicians	13	15	18	6
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2013	2014	2015	2016
Total lead extraction procedures	-	-	-	-
Hospitals performed lead extraction	-	-	-	-
Cardiologists performing lead extraction	-	-	-	-
Surgeons performing lead extraction	-	-	-	-
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6. Interventional electrophysiology

	2013	2014	2015	2016
Ablation procedures	82	77	97	151
SVT ablation procedures	-	-	68	29
AVNRT	25	25	38	62
AVRT/WPW	37	33	28	25
AFL (RA isthmus dependent)	2	3	1	1
AT	3	1	1	0
VT/VPC	-	-	22	17
Idiopathic	9	6	19	8
Structural	2	3	3	2
AF ablation procedures	7	6	7	13
Ablation centers	-	-	3	4
AF ablation centers	1	1	1	1
Structural VT ablation centers	1	1	1	1
Ablation physicians	-	-	10	-
AF ablation physicians	4	6		-
Structural VT ablation physicians	2	6	6	-
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of reimbursement, limited financial resources	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Lack of referral	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of trained personnel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Low awareness of guidelines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Lack of operators	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

8. Source

Name of national working group or arrhythmia body:

Philippine Heart Rhythm Society, Inc.

Other Source: Medtronic, Phils.

Country/Region: Singapore

1. Statistics

	2013	2014	2015	2016
Population (thousand)	5,399.2	5,469.7	5,535.0	5,607.3
Hospitals	25	26	26	26
<i>a. Public Sector</i>	15	15	16	16
- Acute Hospitals	7	7	8	8
- Specialty Centres	8	8	8	8
<i>b. Private Sector</i>	10	11	10	10
- Acute Hospitals	9	10	10	10
- Other Hospitals	1	1	0	0
Beds	10,969	11,230	11,794	12,229
<i>a. Public Sector</i>	9,387	9,602	10,078	10,511
- Acute Hospitals	7,192	7,467	7,943	8,376
- Specialty Centres	2,195	2,135	2,135	2,135
<i>b. Private Sector</i>	1,582	1,628	1,716	1,718
- Acute Hospitals	1,562	1,610	1,716	1,718
- Other Hospitals	20	18	0	0
Physicians	10,953	11,733	12,459	12,967
<i>a. Public Sector</i>	6,661	7,330	7,909	8,358
<i>b. Private Sector</i>	3,678	3,790	3,914	3,979
<i>c. Not in active Practice</i>	614	613	636	630
Nurses/Midwives	36,075	37,618	39,005	40,561
- Registered Nurses	27,556	28,864	29,894	31,615
- Enrolled Nurses	8,273	8,528	8,931	8,781
- Registered Midwives	246	226	180	165
Advanced Practice Nurses	117	145	172	197
GDP (US\$, billions)				
Government Health Expenditure (as % of GDP) ³	1.6	1.9	-	-
Government Health Expenditure (as % of Total Government Expenditure)	10.8	11.9	-	-
Insured citizens (%)	-	-		
SCD patients	-	-		
Heart failure patients	-	-		
AF patients	-	-		

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

2. Pacemaker

	2013	2014	2015	2016
Total Pacemakers	610	646	698	827
- New implants	513	540	530	580
Replacements/Upgrades	76	83	98	126
Others	21	23	70	121
- Single-chamber	160	162	141	145
Dual-chamber	433	470	488	588
Not applicable	17	14	60	94
- Sick sinus syndrome	319	316	344	391
AV block*	164	188	182	219
Implanting Centers	5	5	5	5
Implanting Physicians	~ 20	~26	~19	~18
National Registry	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

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

* 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	2016
Total CRTs	129	147	154	166
- CRT-P	19	12	24	26
CRT-P new implants	12	8	12	10
CRT-P replacements/upgrade	6	3	12	15
Others	1	1	-	1
- CRT-D	110	135	129	140
CRT-D new implants	77	90	98	94
CRT-D replacements/upgrade	29	41	25	39
Others	4	4	6	7
- Ischemic	77	99	82	87
Non-ischemic	15	11	11	46
Implanting Centers	5	5	5	5
Implanting Physicians	~14	~18	~17	~16
National Registry	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

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

4. Implantable cardioverter defibrillator

	2013	2014	2015	2016
Total ICDs	293	289	332	339
- ICD new implants	249	238	274	239
ICD replacements/upgrade	35	37	40	57
Others	9	14	18	43
- Single-chamber	245	239	273	272
Dual-chamber	44	39	50	45
Others	4	11	9	22
- Primary prevention	183	184	211	225
Secondary prevention	109	105	121	114
Others	1	-	-	-
Implanting Centers	5	5	5	5
Implanting Physicians	~15	~22	~17	~17
National Registry	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

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

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2013	2014	2015	2016
Total lead extraction procedures	8	35	27	48
Hospitals performed lead extraction	~2	~4	~5	~4
Cardiologists performing lead extraction	~4	~10	~11	~14
Surgeons performing lead extraction	-	~1	-	~2
National Registry	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Inclusive of Explantation of PPM / ICD

6. Interventional electrophysiology

	2013	2014	2015	2016
Ablation procedures	541	659	707	764
SVT ablation procedures	-	-	-	-
AVNRT	141	160	171	201
AVRT/WPW	115	123	112	134
AFL (RA isthmus dependent)	96	136	139	146
AT	38	46	41	38
VT/VPC	42	51	63	45
Idiopathic	-	-	-	-
Structural	-	-	-	-
AF ablation procedures	82	101	115	132
Others	27	42	66	68
Ablation centers	2	3	3	3
AF ablation centers	2	2	2	2
Structural VT ablation centers	2	3	3	3
Ablation physicians	~14	~17	~16	~18
AF ablation physicians	-	-	-	-
Structural VT ablation physicians	-	-	-	-
National Registry	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

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

7. Management

National certification for physicians	<input type="checkbox"/> PM	<input type="checkbox"/> CRT	<input type="checkbox"/> ICD	<input type="checkbox"/> Ablation
National accreditation for centers	<input checked="" type="checkbox"/> PM	<input checked="" type="checkbox"/> CRT	<input checked="" type="checkbox"/> ICD	<input checked="" type="checkbox"/> Ablation
Guidelines followed	<input type="checkbox"/> National	<input checked="" type="checkbox"/> U.S.	<input checked="" type="checkbox"/> Europe	<input type="checkbox"/> 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	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of reimbursement, limited financial resources	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of referral	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of trained personnel	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Low awareness of guidelines	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of operators	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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	2016
Population (thousand) ¹	51266	51314	50293	51619
Hospitals ²	-	-	66,896	68,476
Beds (per 100,000 population) ²	1,068	1181	1,341	1,327
Physicians (per 1,000 population) ²	2.16	2.2	2.4	2.3
Nurses (per 1,000 population) ²	5.45	5.6	6.4	6.8
GDP (US\$, billions) ³	1,449.49	1,421.31	1,321.2	1,404.30
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	100
SCD patients	28,342 OHCA	-	-	-
Heart failure patients		-	-	-
AF patients	800,000	-	-	-

1. www.census.gov

2. www.who.int

3. www.imf.org

2. Pacemaker

	2013	2014	2015	2016
Total Pacemakers	3890	4259	4480	5007
New implants	3280	3349	3224	4319
Replacements	610	910	1256	688
Single-chamber	1189	1125	1058	2126
Dual-chamber	2701	2594	3397	2881
Sick sinus syndrome	43.7%	1846	2283	1371
AV block	56.3%	2420	2343	1817
Implanting Centers	146	157	122	-
Implanting Physicians	156	184	210	91
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. Cardiac resynchronization therapy

	2013	2014	2015	2016
Total CRTs	166	190	265	281
CRT-P	16	14	18	24
CRT-P new implants	9	9	10	14
CRT-P replacements/upgrade	7	5	8	10
CRT-D	150	176	247	257
CRT-D new implants	125	157	207	204
CRT-D replacements/upgrade	25	19	40	53
Ischemic	17.9%	43	22	15
Non-ischemic	82.1%	110	186	213
Implanting Centers	6	11	14	
Implanting Physicians	7	12	15	71
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. Implantable cardioverter defibrillator

	2013	2014	2015	2016
Total ICDs	667	800	1015	1113
ICD new implants	580	680	844	887
ICD replacements	67	120	171	226
Single-chamber	401	472	651	544
Dual-chamber	246	328	364	569
Primary prevention	347	199	324	195
Secondary prevention	288	532	627	638
Implanting Centers	96	-	77	
Implanting Physicians	-	-	95	80
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2013	2014	2015	2016
Total lead extraction procedures	-	30	-	41
Hospitals performed lead extraction	-	-	-	47
Cardiologists performing lead extraction	-	30	-	47
Surgeons performing lead extraction	-	-	-	0
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6. Interventional electrophysiology

	2013	2014	2015	2016
Ablation procedures	6875	7059	7026	5617
SVT ablation procedures	4380	4829	464	2921
AVNRT	1866	2263(46.86%)	2321	1905
AVRT/WPW	1523	1613(33.41%)	1681	1259
AFL (RA isthmus dependent)	502	694(14.37%)	941	620
AT	489	259(5.36%)	394	279
VT/VPC	512	360	283	407
Idiopathic	85.8%	332(92.28%)	354	282
Structural	14.2%	28(7.72%)	34	68
AF ablation procedures	1983	1870	2097	2324
Ablation centers	53	66	74	39
AF ablation centers	34	39	50	39
Structural VT ablation centers	19	21	24	28
Ablation physicians	-	-	-	68
AF ablation physicians	31	46	-	64
Structural VT ablation physicians	19	24	-	46
National Registry	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>

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	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of reimbursement, limited financial resources	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of referral	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of trained personnel	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Low awareness of guidelines	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of operators	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8. Source

KHRS (Korean Heart Rhythm Society)

Country/Region: **SRI LANKA**

1. Statistics

	2013	2014	2015	2016
Population (thousand) ¹	20579	20771	20966	21158
Hospitals	629	624	631	634
Beds	80,104	79,975	80,581	80,768
Physicians (MO s)	-	17595	18243	18487
Nurses	-	38295	42420	45363
GDP (US\$, billions)	-	80.74	81.32	82.87
Total expenditure on health as % GDP	-	1.78	1.66	1.81
Government expenditure on health (US\$)	-	-	-	6.22%
Insured citizens (%)	-	-	-	-
SCD patients	-	-	-	-
Heart failure patients	-	-	-	-
AF patients	-	-	-	-

¹, www.census.gov

2. Pacemaker

	2013	2014	2015	2016
Total Pacemakers	1284	1092	1138	1268
New implants	1153	1006	1064	1187
Replacements	131	86	74	81
Single-chamber	972	824	843	936
Dual-chamber	312	268	295	332
Sick sinus syndrome	410	347	366	406
AV block	872	745	771	861
Implanting Centers	10	10	10	11
Implanting Physicians	09	09	10	12
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. Cardiac resynchronization therapy

	2013	2014	2015	2016
Total CRTs	14	16	21	18
CRT-P	11	08	15	10
CRT-P new implants	8	07	12	07
CRT-P replacements/upgrade	3	01	03	03
CRT-D	3	4	3	4
CRT-D new implants	3	3	2	3
CRT-D replacements/upgrade	-	1	1	1
Ischemic	03	04	05	04
Non-ischemic	11	12	16	14
Implanting Centers	03	03	04	04
Implanting Physicians	03	03	04	05
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. Implantable cardioverter defibrillator

	2013	2014	2015	2016
Total ICDs	45	42	36	48
ICD new implants	-	-	-	-
ICD replacements	-	-	-	-
Single-chamber	-	-	-	-
Dual-chamber	-	-	-	-
Primary prevention	-	-	-	-
Secondary prevention	-	-	-	-
Implanting Centers	04	04	05	06
Implanting Physicians	03	03	04	05
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2013	2014	2015	2016
Total lead extraction procedures	-	-	-	-
Hospitals performed lead extraction	-	-	-	-
Cardiologists performing lead extraction	-	-	-	-
Surgeons performing lead extraction	-	-	-	-
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6. Interventional electrophysiology

	2013	2014	2015	2016
Ablation procedures	359	464	513	402
SVT ablation procedures	221	247	304	263
AVNRT	122	138	171	156
AVRT/WPW	93	102	121	91
AFL(RA isthmus dependent)	03	02	05	10
AT	03	05	07	06
VT/VPC	138	157	209	139
Idiopathic	138	157	209	139
Structural	-	-	-	-
AF ablation procedures	-	-	-	-
Ablation centers	04	03	04	04
AF ablation centers	-	-	-	-
Structural VT ablation centers	-	-	-	-
Ablation physicians	03	03	05	06
AF ablation physicians	-	-	-	-
Structural VT ablation physicians	-	-	-	-
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Lack of reimbursement, limited financial resources	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Lack of referral	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Lack of trained personnel	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Low awareness of guidelines	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of operators	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8. Source

Name of national working group or arrhythmia body

Sri Lanka Heart Association

Country/Region: Taiwan

1. Statistics

	2013	2014	2015	2016
Population (thousand)	23373	23433	23492	23,540
Hospitals	495	497	486	494
Beds	159,422	161,491	162,163	133,335
Physicians	43,556	44,539	44,006	43,961
Nurses	145,172	147,773	148,223	126,458
GDP (US\$, billions)	511.293	529.587	523.009	529,676
Total expenditure on health as % GDP	6.6	6.6	6.19	5.94
Government expenditure on health as %	37	30	6.83	6.92
Insured citizens (%)	100	100	99	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	2016
Total Pacemakers	4156	4734	5916	6661
New implants	3056	3642	75%	78%
Replacements	1100	1092	25%	22%
Single-chamber	1162	1312	24%	24%
Dual-chamber	2994	3422	76%	76%
Sick sinus syndrome	2380	2440	59%	62%
AV block	1537	1563	41%	38%
Implanting Centers	103	96	104	108
Implanting Physicians	~175	234	435	484
National Registry	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

3. Cardiac resynchronization therapy

	2013	2014	2015	2016
Total CRTs	162	207	265	331
CRT-P	132	158	182	238
CRT-P new implants	104	122	58%	68%
CRT-P replacements/upgrade	28	36	42%	32%
CRT-D	30	49	83	93
CRT-D new implants	24	40	67%	67%
CRT-D replacements/upgrade	6	9	33%	33%
Ischemic	33	25	46%	24%
Non-ischemic	129	92	54%	76%
Implanting Centers	41	24	55	51
Implanting Physicians	~175	46	105	117
National Registry	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

4. Implantable cardioverter defibrillator

	2013	2014	2015	2016
Total ICDs	379	458	583	649
ICD new implants	308	378	71%	82%
ICD replacements	71	80	29%	18%
Single-chamber	112	136	32%	37%
Dual-chamber	266	322	68%	63%
Primary prevention	0	0	1%	1%
Secondary prevention	379	458	99%	99%
Implanting Centers	42	40	59	67
Implanting Physicians	~175	71	130	177
National Registry	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2013	2014	2015	2016
Total lead extraction procedures	-	12	-	-
Hospitals performed lead extraction	-	6	-	-
Cardiologists performing lead extraction	-	8	-	-
Surgeons performing lead extraction	-	2	-	-
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

6. Interventional electrophysiology

	2013	2014	2015	2016
Ablation procedures	2754	3740	3861	4345
SVT ablation procedures	~1910	2309	2812	2983
AVNRT	~1130	1126	1447	1466
AVRT/WPW	~515	620	785	764
AFL (RA isthmus dependent)	~250	450	436	547
AT		113	144	175
VT/VPC	160	463	493	685
Idiopathic	70	248	386	402
Structural	80	186	107	81
AF ablation procedures	434	531	556	596
Ablation centers	10	-	37	36
AF ablation centers	5	-	13	16
Structural VT ablation centers	3	-	10	8
Ablation physicians	-	57	81	47
AF ablation physicians	-	34	47	38
Structural VT ablation physicians	-	28	22	32
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

7. Management

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

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

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

	1	2	3	4	5
Lack of centers	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of reimbursement, limited financial resources	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Lack of referral	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of trained personnel	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Low awareness of guidelines	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of operators	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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=43390

Country/Region: Thailand

1. Statistics

	2013	2014	2015	2016
Population	67,367,943	67,091,120	67,959,357	68,146,609
Hospitals	583	1318 (1002 public)	1318	583
Beds(per 100,000 population)	210(2010)	210(as 2010)	210(as 2010)	2.1 beds/1,000 population (2010)
Physicians	0.3:1000	0.3:1000	0.3:1000	0.39 physicians/1,000 population (2010)
Nurses	2.8:1000	2.8:1000	2.8:1000	2.07:1000 (2010)
GDP (US\$, billions)	365.97	373.536		USD406 billion
Total expenditure on health as % GDP	4.3%(2009)	4.6%	6.5%(2014)	
Government expenditure on health as %	-	-	77% of healthcare (2011)	6.5% of GDP (2014)
Insured citizens (%)	99.5%	99.5%		100
SCD patients	-	-	-	-
Heart failure patients	95,390/year extrapolated	-	-	-
AF patients	3.6/1000 (1999)	-	-	-

2. Pacemaker

	2013	2014	2015	2016
Total Pacemakers	2401	3078	2963	3046
New implants	2198	2834	2728	2897
Replacements	203	244	235	149
Single-chamber	33.65%	35.9%	26.2%	33%, 2 micra
Dual-chamber	64.93%	62.86%	73.8%	68%
Sick sinus syndrome	43.34%	43.9%	40.1%	49%
AV block	47.15%	42.64%	51.2	51%
Implanting Centers	55	70	70	85
Implanting Physicians	115	115	120	140
National Registry	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

3. Cardiac resynchronization therapy

	2013	2014	2015	2016
Total CRTs	99	123	139	111
CRT-P		42		111
CRT-P new implants			24	78
CRT-P replacements/upgrade				
CRT-D				
CRT-D new implants	99	81	115	226
CRT-D replacements/upgrade				
Ischemic				
Non-ischemic				
Implanting Centers	55		70	
Implanting Physicians	115		120	20
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

4. Implantable cardioverter defibrillator

	2013	2014	2015	2016
Total ICDs	662	700	837	960
ICD new implants		627	761	841
ICD replacements	71	73	76	119
Single-chamber	77.34%	78.47%	78.8	72% 2 S-ICD
Dual-chamber	7.7%	8.61%	6.1	13%
Primary prevention				
Secondary prevention				
Implanting Centers	55		70	70
Implanting Physicians	115		120	
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2013	2014	2015	2016
Total lead extraction procedures	-	-	-	-
Hospitals performed lead extraction	-	2	1	1
Cardiologists performing lead extraction	-	4	-	1
Surgeons performing lead extraction	-	-	-	-
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6. Interventional electrophysiology

	2013	2014	2015	2016
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	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of reimbursement, limited financial resources	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Lack of referral	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Lack of trained personnel	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Low awareness of guidelines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Lack of operators	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8. Source

Name of national working group or arrhythmia body

Country/Region: Vietnam

1. Statistics

	2013	2014	2015	2016
Population (thousand) ¹	89,760	90,700	93,448	94,444
Hospitals	1.063	1.069	-	-
Beds	897.600	954.165	-	-
Physicians	68,6000	71,8000	-	-
Nurses	98,3000	102,000	-	-
GDP (US\$, billions)	153	178	-	200
Total expenditure on health as % GDP	-	-	-	-
Government expenditure on health (US\$)	-	-	-	-
Insured citizens (%)	69.5	70.8	78	80
SCD patients	-	-	-	-
Heart failure patients	-	-	-	-
AF patients	-	-	-	-

¹. www.census.gov

2. Pacemaker

	2013	2014	2015	2016
Total Pacemakers	2470	2740	2.722	2.588
New implants	-	-	-	-
Replacements	-	-	-	-
Single-chamber	1.631	1.482	1.658	1.214
Dual-chamber	839	1.258	916	1.185
Sick sinus syndrome	-	-	-	-
AV block	-	-	-	-
Implanting Centers	28	30	32	37
Implanting Physicians	60	66	74	98
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

3. Cardiac resynchronization therapy

	2013	2014	2015	2016
Total CRTs	42	55	59	76
CRT-P	38	45	49	65
CRT-P new implants	-	-	-	-
CRT-P replacements/upgrade	-	-	-	-
CRT-D	4	10	10	11
CRT-D new implants	-	-	-	-
CRT-D replacements/upgrade	-	-	-	-
Ischemic	-	-	-	-
Non-ischemic	-	-	-	-
Implanting Centers	9	10	12	8
Implanting Physicians	22	24	32	24
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

4. Implantable cardioverter defibrillator

	2013	2014	2015	2016
Total ICDs	81	90	89	73
ICD new implants	-	-	-	-
ICD replacements	-	-	-	-
Single-chamber	74	72	77	58
Dual-chamber	7	18	12	15
Primary prevention	-	-	-	-
Secondary prevention	-	-	-	-
Implanting Centers	16	20	20	12
Implanting Physicians	32	40	40	30
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

5. Lead Extraction

Lead extractions procedures and number of centers that performed lead extraction

	2013	2014	2015	2016
Total lead extraction procedures	-	-	-	-
Hospitals performed lead extraction	-	-	-	-
Cardiologists performing lead extraction	-	-	-	-
Surgeons performing lead extraction	-	-	-	-
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6. Interventional electrophysiology

	2013	2014	2015	2016
Ablation procedures	1823	1964	2100	2958
SVT ablation procedures	-	-	-	-
AVNRT	796	936	976	837
AVRT/WPW	435	442	444	868
AFL (RA isthmus dependent)	28	50	36	35
AT	28	24	30	35
VT/VPC	520	494	574	1183
Idiopathic	-	-	-	-
Structural	-	-	-	-
AF ablation procedures	16	18	24	79
Ablation centers	-	-	-	19
AF ablation centers	12	14	16	6
Structural VT ablation centers	-	-	-	-
Ablation physicians	-	-	-	36
AF ablation physicians	4	8	12	14
Structural VT ablation physicians	-	-	-	-
National Registry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

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	40 – 60%	<40%	<40%	>80%
Public insurance	40 – 60%	<40%	<40%	>80%
Private insurance	N/A	N/A	N/A	N/A
Individual	-	-	-	-

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

	1	2	3	4	5
Lack of centers	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of reimbursement, limited financial resources	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of referral	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of trained personnel	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Low awareness of guidelines	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of operators	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

8. Source

Name of national working group or arrhythmia body

The APHRS White Book: Fifth edition

-The current status of cardiac electrophysiology in APHRS member countries

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President, Chinese Society of Arrhythmias

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 joint effort of our board members, the Fifth edition of APHRS White Book was finally released with data from 19 countries and regions, including four new participants: Brunei Darussalam, Cambodia, Mongolia, and Sri Lanka. The other 15 countries and regions having provided their data for last editions include: China mainland, Hong Kong, India, Indonesia, Japan, Korea, Malaysia, Myanmar, New Zealand, Pakistan, Philippines, Singapore, Taiwan, Thailand, and Vietnam. 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, 2015 and 2016 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 19 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 2016, and the device implantation rates or catheter ablation rates and centers in 2016.

3. Permanent Pacemaker Implantation

3.1 Increase in pacemaker implantation

As shown in Figure 1, the increasing trend in the implantation of permanent pacemaker was seen in 16 of the 19 countries and regions in 2016 as compared with 2015. The implantation of pacemaker kept to maintain above 10% of increasing rate in China, India, South Korea, Philippines, Taiwan, Indonesia, Singapore, Pakistan, Cambodia and Sri Lanka, and about 8%-9% of increasing rate in Hong Kong and Mongolia. In Indonesia, Cambodia and Pakistan region, the increasing rate significantly went up to 43.85%, 31.06% and 27.78% in 2016 as compared to the increasing rate of -1.4%, 28.8% and 21.5% in 2015, respectively. And for Hong Kong, India, Japan, Philippines, and Thailand, the implantation of pacemaker demonstrated a significant increasing rate, different from that of decreased implantation rate last year. In contrast, the implantation of permanent pacemaker decreased in Malaysia and Vietnam were with decreased implantation rate for the second year running in 2016. And for Brunei Darussalam, the permanent pacemaker implantation rate was slightly decreased.

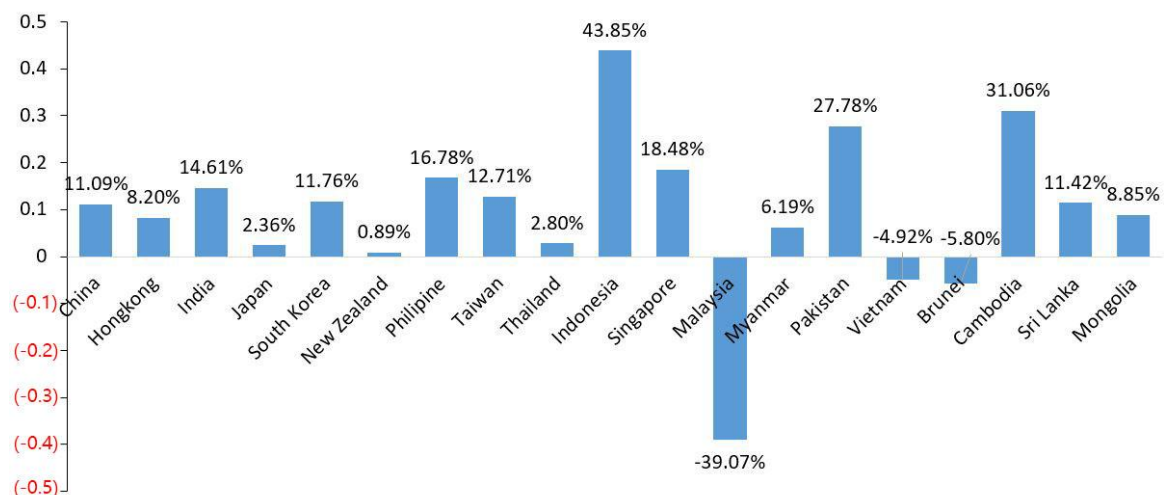


Figure 1: Increasing rate of pacemaker implantation in 2016 as compared with 2015

3.2 Pacemaker implantation rate

As shown in Table 1, data in 2016 were analyzed by evaluating pacemaker implantation rates. Across the 19 countries and regions, the pacemaker implantation rate per million inhabitants showed similar trend to that in last year with the highest reported implantation rate in Japan (462.4) and New Zealand (531.0) and the lowest in Indonesia (2.8). The pacemaker implantation rates per million inhabitants were also low in Myanmar (10.0), Philippines (11.8), Malaysia (14.5), and Pakistan (18.9). The large gap in the number of pacemaker implanting center per million inhabitants still remained among the 19 countries and regions. In data for 2016, Brunei jumped as the top one region where had the highest implanting centers per million inhabitants (4.8), while the second groups with high pacemaker implanting centers per million inhabitants were Taiwan (4.6) and New Zealand (2.6). The countries with lowest density of implanting centers in 2016 data were Indonesia (0.06), Cambodia (0.1), Pakistan (0.2), Myanmar (0.2), Mongolia (0.3) and Vietnam (0.4). Other countries remained similar level to that in 2015. Although the reported data in 2016 did not differ significantly from that in 2015, our analysis still found a significant change as compared to last several years. One major difference from last year is that pacemaker implantation rate was shown an increased trend in most of Asia-Pacific countries and regions. Other data provided similar information. For example, China and Japan are still the countries that had the highest total number of pacemaker implantations in 2016. 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 19 countries and regions were Hong Kong, New Zealand, Japan, Korea and, Taiwan. The countries with highest implantation rate per million inhabitants were also Japan, New Zealand and Taiwan.

4. ICD and Cardiac Resynchronization Therapy devices (CRT)

4.1 The implantation of ICD in 2016

Similar to data last year, the increasing trend of implantation of ICD was observed in 14 APHRS countries and regions in 2016 as compared with 2015 (Figure 2). Most Asia-Pacific countries and region kept an increasing trend in ICD implantation. And the implantation rates of ICD were significantly increased in Philippines, Hong Kong and Indonesia as compared to last year. Philippine was the country with the highest increasing rate (96.23%). China, India, Korea, Japan, Taiwan, and Thailand kept the increasing trend about 10% in ICD implantation. Of all the countries and regions, Japan is still the country with highest ICD implant cases, India and China take the second and third place, which were about half implantation of Japan. The ICD implant was still rare in some Asia-Pacific countries like Indonesia (38), Myanmar (21). New data from Sri Lanka (48), Brunei (14) and Cambodia (4) showed rare ICD implantation.

We also analyzed the data on ICD primary or secondary prevention from 11 countries: China,

India, Korea, Taiwan, Indonesia, Singapore, Malaysia, Myanmar, Pakistan, Brunei, and Cambodia. The use of ICD for primary prevention in China, India and Malaysia increased slightly (from 42% to 51%, from 30% to 40% and from 32.3% to 43.7%, respectively). Indonesia, Myanmar and Brunei were with significant increase in ICD primary implantation (from 8.3% to 21.1%, from 0% to 23.8% and from 46.2% to 71.4%, respectively). Singapore and Brunei were the countries having the highest ratio of primary prevention in Asia-Pacific countries and regions (66.4% and 71.4%, respectively). Similar to last year, Taiwan still had only 1% of ICD implantation for primary prevention. However, ICD primary implantation in Korea decreased sharply (from 31.9% to 17.5%).

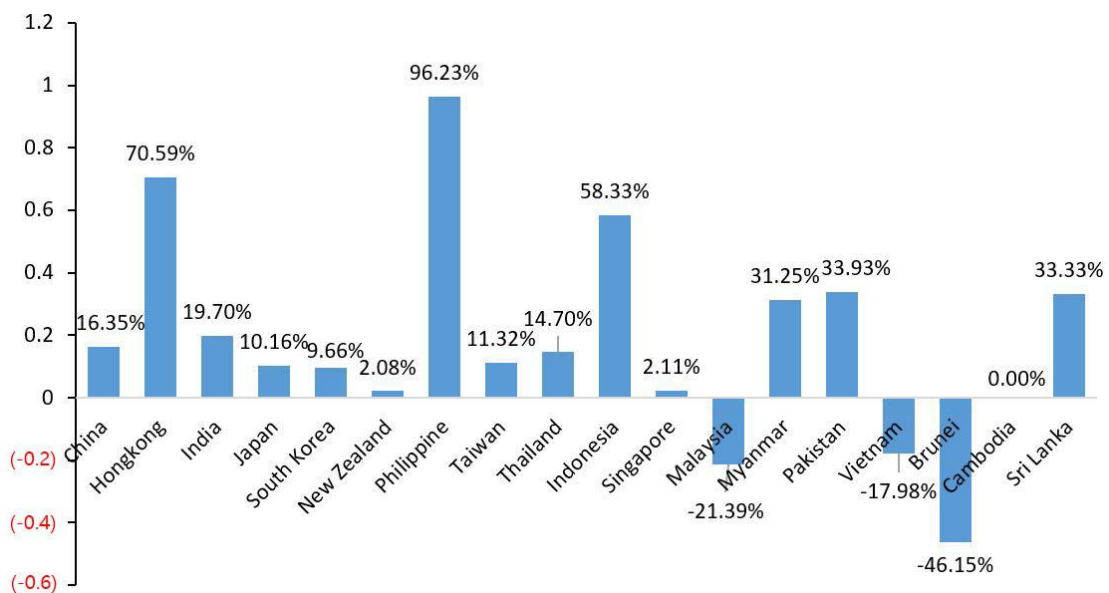


Figure 2: Increasing rate of ICD implantation in 2016 as compared with 2015

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 (60.5) and Japan (50.2) were the other countries with high ICD implants/million. Some countries kept increasing ICD implants/million, including Taiwan (27.6), Hong Kong (23.5), and Thailand (14.1), India (2.7). Countries with low ICD implants/million were Philippines (1.0), Indonesia (0.1), Pakistan (0.8), and Myanmar (0.4). China mainland and Indonesia were shown the same implantation rate as last year. For the new added countries, Brunei was shown with the highest ICD implantation rate/million inhabitants (33.6). Cambodia and Sri Lanka were with low ICD implants/million. The available data also showed a large gap among the 18 countries and regions in the number of ICD implanting center per million inhabitants. In 2016 data, the countries with more than 1 ICD implanting centers per million inhabitants were Taiwan (2.8), New Zealand (1.5), Vietnam (1.3)

and Thailand (1.0). The other countries and regions with less than 1 implanting centers per million inhabitants included Singapore (0.9), Malaysia (0.7), India (0.3), China mainland (0.3), Sri Lanka (0.3), Myanmar (0.08), Philippines (0.07), Cambodia (0.06), Indonesia (0.04) and Pakistan (0.04).

4.3 CRT utilization in Asia-Pacific area

In 2016, the rising trend in CRT implant still remains in 13 among the data from 18 Asia-Pacific countries and regions, except for Thailand, Myanmar, Brunei, and Sri Lanka with decreased CRT implantation. Especially for Myanmar, the decreasing rate was up to 77.78% (see Figure 3). Still in 2016, the countries with total number of CRTs implantation more than 1000 were Japan (4722), India (2728), and China mainland (3560), and those with CRT implantation between 100 and 1000 were Taiwan (331), New Zealand (309), Thailand (304), South Korea (281), Singapore (166), Malaysia (163), and Pakistan (137). Countries with the increase rates of CRT implant more than 20% in 2016 included Thailand (118.7%), Pakistan (80.26%), New Zealand (47.14%), Vietnam (28.81%), India (27.06%), Taiwan (24.91%), Philippines (21.43%) and Indonesia (20.90%). New included countries were also shown an increase trend in CRT implantation, for example, Cambodia (from 2 to 3) and Mongolia (from 1 to 3) (Figure 3). China mainland had an increase of 15.14%, and other 3 countries and regions were with an increase below 10%, including Japan (3.21%), South Korea (6.04%), and Singapore (7.79%). In contrast, 5 countries and region presented as minus increase in CRT implantation, including Malaysia (-19.70%), Myanmar (-77.80%), Brunei (-12.5%) and Sri Lanka (-14.29%). Besides Cambodia and Mongolia, the total number of CRT implant was also relative low in 4 countries and regions, including Philippines (34), Sri Lanka (18), Brunei (14) and Myanmar (4), although some of them had been demonstrated as an increasing trend.

The CRT implantation rate per million inhabitants in 2016 seemed to be increased as compared to last year. However, still a great heterogeneity was seen similar to last year, from as low as 0.08-0.8/million (Myanmar, Cambodia, Indonesia, Philippines and Vietnam) to as high as 65.8/million in New Zealand, 37.2 in Japan, and 29.6 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 11.3 in 2015 to 14.1 in 2016), Korea (from 5.3 in 2015 to 5.4 in 2016), China mainland (from 2.3 in 2015 to 2.6 in 2016), India (from 1.7 in 2015 to 2.1 in 2016) except for a decreasing trend in Malaysia (from 5.4 in 2015 to 5.1 in 2016), and the implantation rate in Thailand kept unchanged. There was also significant variability in the ratio of CRT-D/CRT-P implants. The number of "CRT implant centers" in 13 countries and regions were analyzed. Most of the Asia-Pacific countries and regions were with more than 50% CRT-D implantation rate, in which Singapore were shown with the highest CRT-D/total CRT ratio (84.3%). CRT-D implantation rate between 50% to 80% were shown in 8 countries and regions, including Philippines (76.5%), Thailand (74.3%), Malaysia (67.5%), Cambodia (66.7%), India (65.4%), China mainland (58.4%), Indonesia (58.0%), New Zealand (51.4%), Myanmar (50.0%). However, CRT-D

implant rate was less than 30% in 4 countries and regions, including Taiwan (28.1%), Pakistan (25.5%), Vietnam (14.5%). In 2016 data, the countries and regions with more than 1 CRT implanting centers per million inhabitants were Taiwan (2.2), New Zealand (1.3) and Thailand (1.0), while that in most of other countries were between 0.05 to 0.5. CRT implanting centers per million inhabitants were 0.89 in Singapore, 0.29 in China and 0.26 in India.

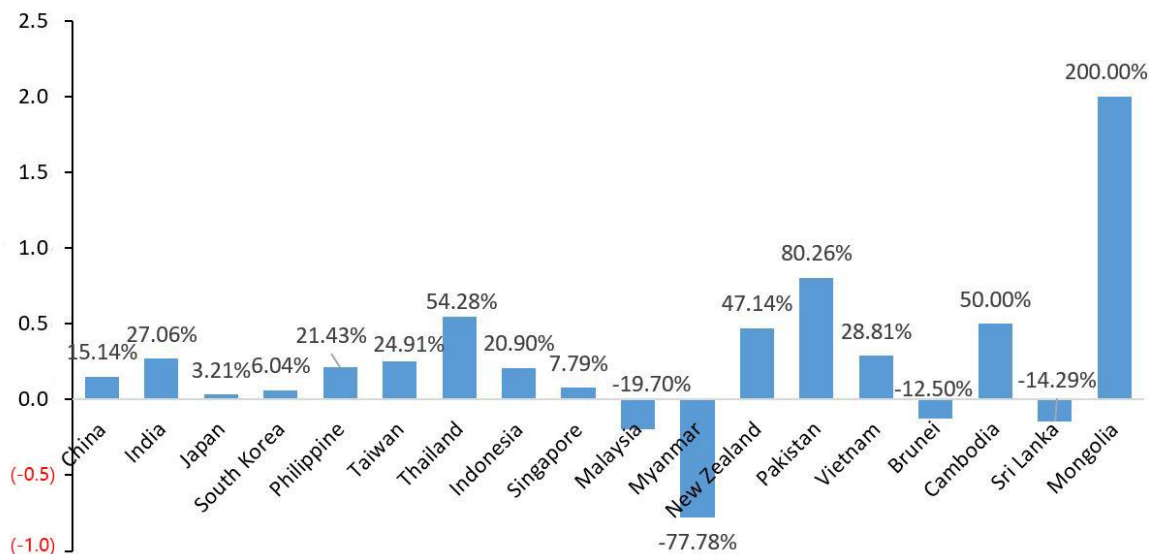


Figure 3: Increasing rate of CRT implantation in 2016 as compared with 2015

5. Catheter Ablation

5.1 General information of Catheter Ablation

We received data about catheter ablation from 17 countries and regions (still no data in Hong Kong and Thailand) in 2016. China mainland was still the country having the highest cases receiving catheter ablations (132504). Japan and India were the other countries with high cases of 65000 and 22900. The ablation procedures in other 14 countries and regions were less than 10000. An increasing trend was observed in ablation procedures across 10 countries. Philippines, Indonesia and Vietnam were the countries with the highest ablation increasing rate (55.7%, 50.7% and 40.9%, respectively). There were 5 countries and regions with an increasing rate between 10% and 20%, including China (13.2%), India (18.2%), Taiwan (12.5%), Myanmar (16.6%), and New Zealand (14.9%). The increasing rate in Japan (3.2%) and Singapore (8.1%) were relatively low as compared with other countries. However, South Korea (-20.1%) and Malaysia (-16.3%) demonstrated a significant decrease in catheter ablation.

5.2 Ablation procedure rates

Table 2 is shown the ablation procedures per million inhabitants in 17 countries and regions.

Since data in past several years were not available for some countries (Brunei, Cambodia, Sri Lanka, Pakistan and Mongolia), we finally analyzed data from 12 countries and regions. An increasing trend in ablation rate was observed in 10 countries and regions except for South Korea and Malaysia. Japan was the country which continued having increasing ablation procedures per million inhabitants, from 464.6 in 2014 to 496.2 in 2015, and then to 512.1 in 2016. New Zealand was the second with highest increment ablation procedures per million inhabitants (from 280.4 to 315.8). Countries having more than one hundred ablation procedures per million inhabitants included Brunei (259.5), Taiwan (184.6), Singapore (136.4), and South Korea (108.8). Philippines (1.5) and Indonesia (2.8) had the lowest ablation procedures per million inhabitants. In China mainland, the ablation procedures/ million inhabitants increased from 73.9 in 2014 to 85.6 in 2015, and to 95.8 in 2016. Regarding ablation centers per million inhabitants in 2016, the highest density was recorded in Japan (5.4) and the lowest in Indonesia (0.02) and Myanmar (0.01).

5.3 Atrial fibrillation (AF) catheter ablation

We had the data of AF ablation from 16 countries and regions this year although still no data were available in Hong Kong, Pakistan and Thailand. In 2016, AF ablation procedures increased almost in all countries except for Malaysia. Japan was still the country with the highest number of AF ablation procedures (45000 cases). The cases of AF ablation in China increased from 18616 in 2014 to 24545 in 2015, and to 30574 in 2016. As shown in Table 2, the AF ablation rate per million inhabitants was increased from 338.6 to 354.56 in Japan, which was the highest among APHRS member countries and regions. Indonesia (0.04), Cambodia (0.06), and Philippines (0.13) were the countries with the lowest AF ablation rate. Regarding the ratio of AF ablation/total ablation, there was also a large gap among 16 countries and regions, with highest ratio of AF ablation/total ablation in Japan (69.2%), and lowest AF ablation ratio in Cambodia (0.5%), Indonesia (1.5%). And the AF ablation ratio was 23.0% in China mainland, 41.3% in Korea, and 13.7% in Taiwan, and 27.3% in New Zealand.

6. Conclusion and future work

This edition of APHRS White book had made a great progress with collection of data from 19 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. These data also highlight significant inequalities covering all arrhythmia interventional therapies in Asia-Pacific countries. The overview of these data indicated that more supervision, cardiac education training and guideline implementation are needed to promote the development of arrhythmia interventional therapy. The APHRS White Book needs indispensable support and participation of all member countries in Asia-Pacific regions. The APHRS White book may serve as motivation for these countries to adopt a systematic approach to key data on arrhythmia therapy

in the future.

Table 1. The CIEDs implantation rates and implanting centers per million inhabitants for the year 2016 in 16 Asia-Pacific countries and regions

Countries and regions	Pacemaker implantation rate/ million inhabitants	Pacemaker implanting centers / million	ICD implantation rate/ million inhabitants	CRT implantation rate/ million inhabitants	ICD/CRT implanting centers / million
Mainland China	52.9	0.7	2.4	2.6	0.3
Hong Kong	102.0	No data	23.5	No data	No data
India	27.0	0.7	2.7	2.1	0.3
Indonesia	2.8	0.06	0.1	0.3	0.06
Japan	462.4	no data	50.2	no data	no data
Malaysia	14.5	1.2	5.0	5.1	0.7
New Zealand	531.0	2.6	135.9	no data	1.5
Pakistan	18.9	0.2	0.8	0.8	0.04
Philippines	11.8	0.9	1.0	0.3	0.2
Singapore	147.5	0.9	60.5	29.6	0.9
South Korea	97.0	no data	21.6	5.4	no data
Taiwan	283.0	4.6	27.6	14.0	2.8
Thailand	44.7	1.2	14.1	2.0	no data
Myanmar	10.0	0.2	0.4	0.08	0.08
Vietnam	27.4	0.4	0.8	0.8	0.1
Brunei	155.9	4.8	33.6	33.6	4.8
Cambodia	13.3	0.1	0.3	0.2	0.1
Sri Lanka	59.9	0.5	2.3	0.9	0.3
Mongolia	40.2	0.3	no data	1.0	0.3

Table 2 The ablation procedure rate and centers per million inhabitants for the year 2016 in 19 Asia-Pacific countries and regions

Countries and regions	Ablation procedure rate/ million inhabitants	Ablation centers/ million inhabitants	AF ablation rate/ million inhabitants	AF ablation centers/ million inhabitants	AF ablation/ ablation procedure
China mainland	95.8	0.58	22.1	0.3	23.0%
Hong Kong	No data	No data	No data	No data	No data
India	17.3	0.13	1.1	0.02	6.1%
Indonesia	2.8	0.04	0.04	0.02	10.41%
Japan	512.1	5.4	354.5	3.5	69.23%
Malaysia	20.9	0.2	3.0	0.2	14.16%
New Zealand	315.8	no data	86.3	1.7	27.33%
Pakistan	4.8	0.04	0.05	0.01	1.14%
Philippines	1.5	0.04	0.1	0.01	8.61%
Singapore	136.2	0.5	23.6	0.4	17.28%
South Korea	108.8	0.8	45.0	0.8	41.37%
Taiwan	184.6	1.5	25.3	0.7	13.72%
Thailand	No data	No data	No data	No data	No data
Myanmar	12.0	no data	0.3	0.02	2.10%
Vietnam	31.3	0.2	0.8	0.06	2.67%
Brunei	259.5	no data	124.7	2.4	47.71%
Cambodia	11.7	no data	0.06	0.06	0.54%
Sri Lanka	19.0	0.2	no data	no data	no data
Mongolia	12.6	0.3	no data	0.3	no data

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/>