Peer review in Arhythmology
The BeHRA databases
2018 report

BeHRA
Belgian Heart Rhythm Association

Different topics

- Pacemakers : BeHRA 1993-2010 and from 2011< Qermid
- ICDs : Qermid
- Cross sectional analysis with clinical endpoints
- ILR : BeHRA 2006-2014
- CRT : Qermid < 11/2012
  - EuroCRT survey II 2016 (9100 pat , 245 BE pat)
- Ablations : BeHRA < 2008 : on line
  - Special focus on AF ablations
- European comparisons

The PaceMaker database

- Leuven, Hugo Ector since 1993
- Voluntary registration
- Peer review in pacing indications 2004 (AR-KB)

- Quality criteria
  - N / center + population data
  - Incomplete data / center
  - Sss+AF/AVB / center
  - Replacements / Longevity

Belgian data published

- In cooperation with the college of cardiology

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ORIGINAL SCIENTIFIC PAPER

Check for updates

Quality assessment in Belgian arrhythmology: the Belgian heart rhythm association (BeHRA) databases

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[a]Department of Cardiology, Cliniques du Sud Luxembourg, Arlon, Belgium; [b]Department of Cardiology, Universite Catholique de Louvain, Brussels, Belgium; [c]Department of Cardiology, Katholieke Universiteit Leuven, Leuven, Belgium; [d]Federal Public Service Health Belgium, Brussels, Belgium; [e]Centre Hospitalier Universitaire de Charleroi, Charleroi, Belgium; [f]Jessa Ziekenhuis vwz, Hasselt, Belgium; [g]Department of Cardiology, UVC Brugmann, Brussels, Belgium

ABSTRACT
This report presents and discusses, on behalf of the Belgian College of Cardiology, the evolution of the peer review process in arrhythmology, focussing on pacemaker implantation. Data from the last 22 years are compared. The national annual increase in implants is around 1%, clinical patient characteristics remained stable over the years while dual chamber pacing was proportionally increasing. Analyses of the normalised sick sinus and complete atrioventricular block ratios revealed a quite homogenous practice between centres and patient district with the only exception of the two more crowded districts. Battery longevity and infection rate were also assessed. With an incidence of 1/1000 device-years follow-up, Belgium remains below accepted European levels.

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The Qermid PM database

- Since 2011 (n = 12.817)
- Data analysis by BeHRA
  - Replacements, ± electrode, reason, time to, ..
  - Pacing mode, global, by age, by sex, ...
  - ECG indications
  - N/hospital (4-423), N/physician
  - CRT related procedures (partial), endo/epi
- Quality parameters to be fine-tuned ± on-line
- Last full year available for review : 2016

Pacemakers in databases

	2011	2012	2013	2014	2015	2016
Totaal	12.916	13.029	13.199	13.232	12.877	12.640
Primo-implantatie	8.890	8.973	8.943	8.957	8.781	8.878
Vervanging (incl. voortijdige)	3.725	3.803	3.979	3.949	3.810	3.477
Toevoeging/vervanging elektrode(s)	301	253	277	326	286	285
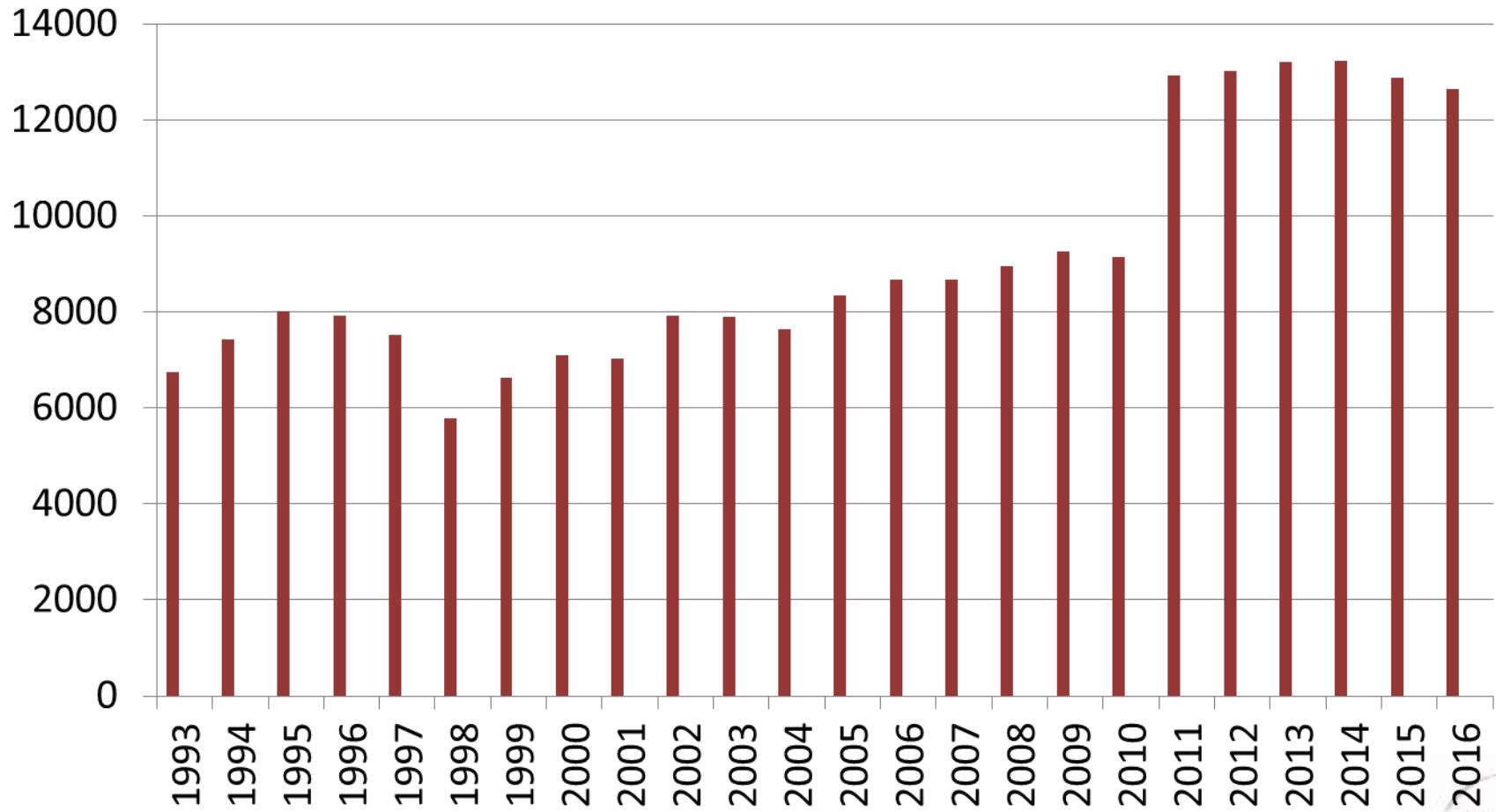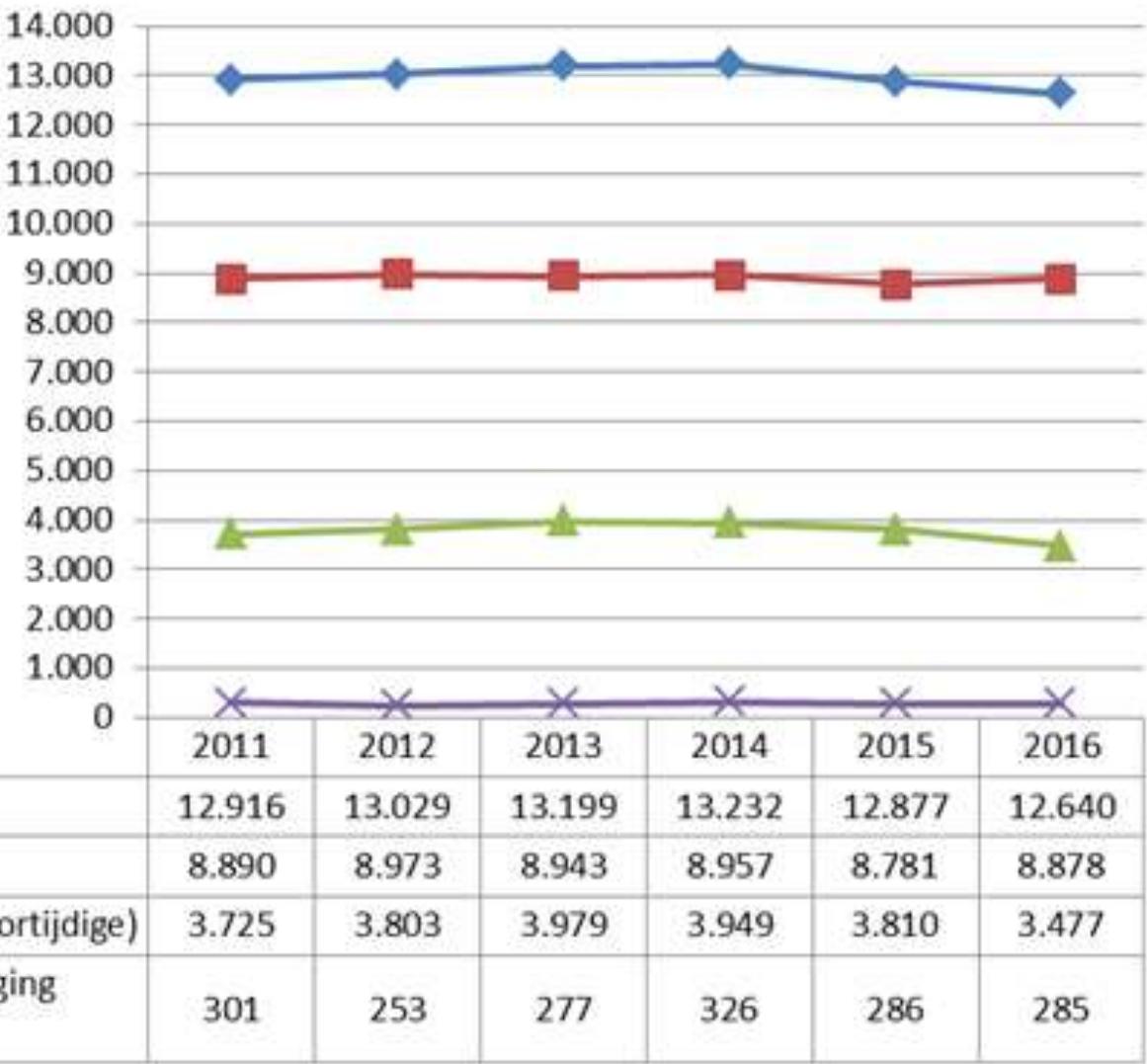
PM implantations in Belgium are not increasing
Even battery replacements are decreasing (increased battery longevity)

PM Patients in databases


Very stable population
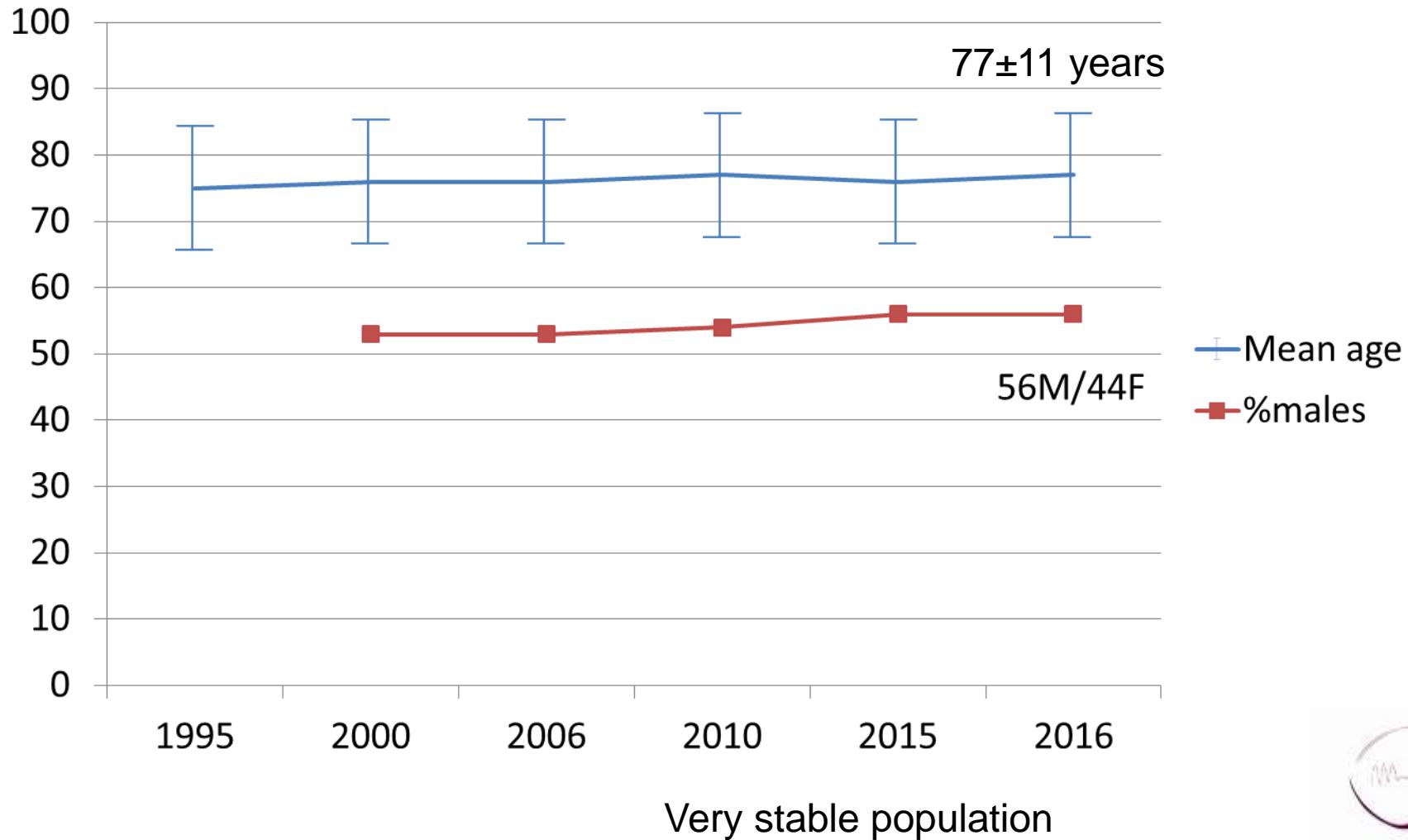
Comparison with the general Belgian population

Figuur 5a – Leeftijdspiramide België (2013)
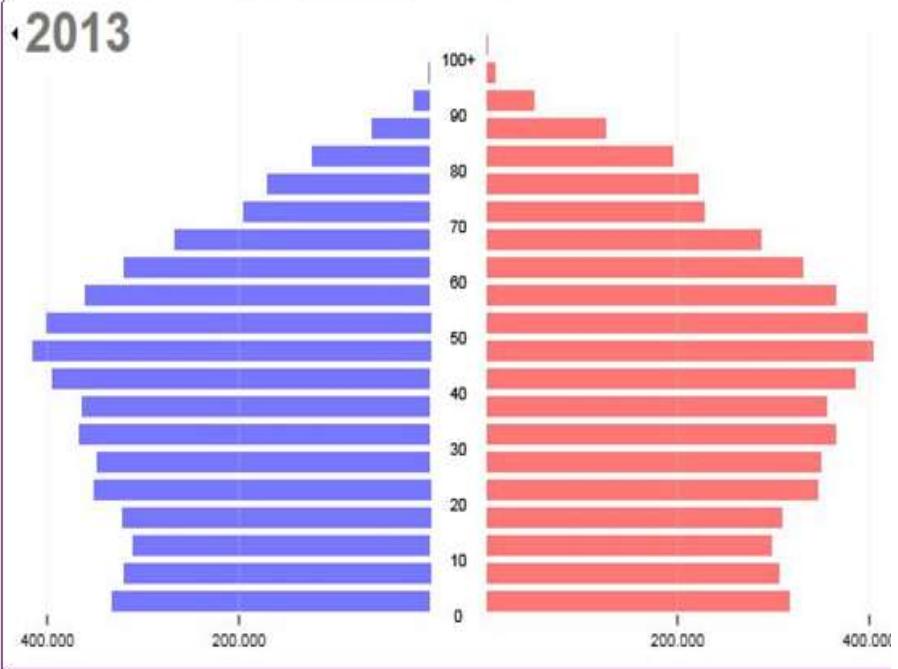
Figuur 5b – Leeftijdspiramide pacemakers (2016)

ECG indication

Very stable indications
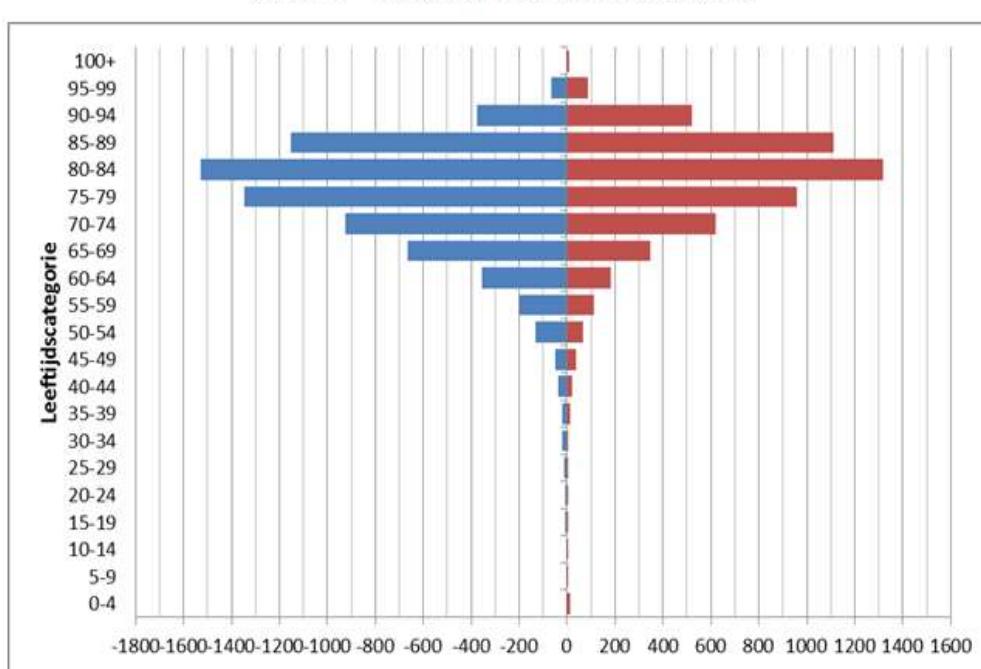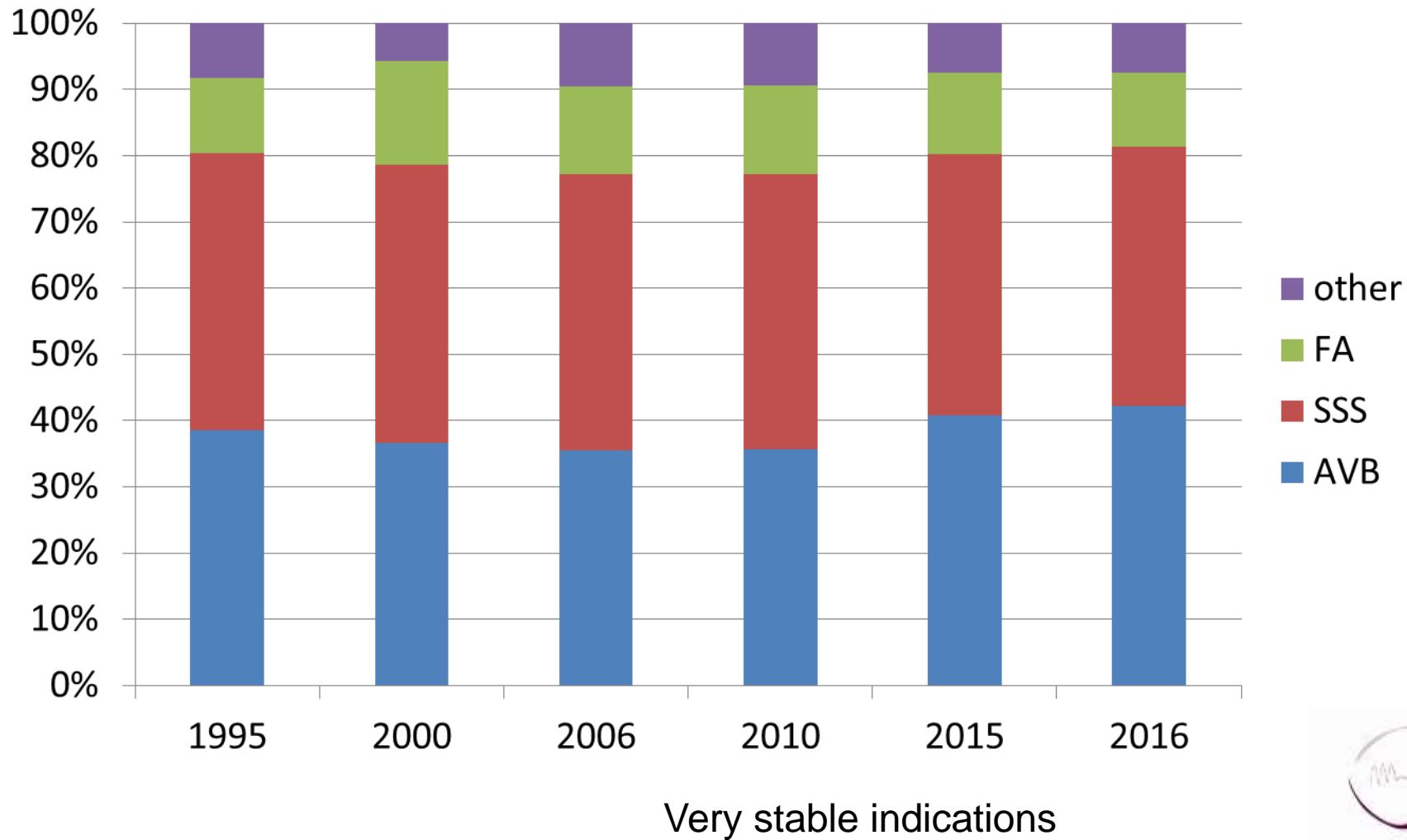
PM mode
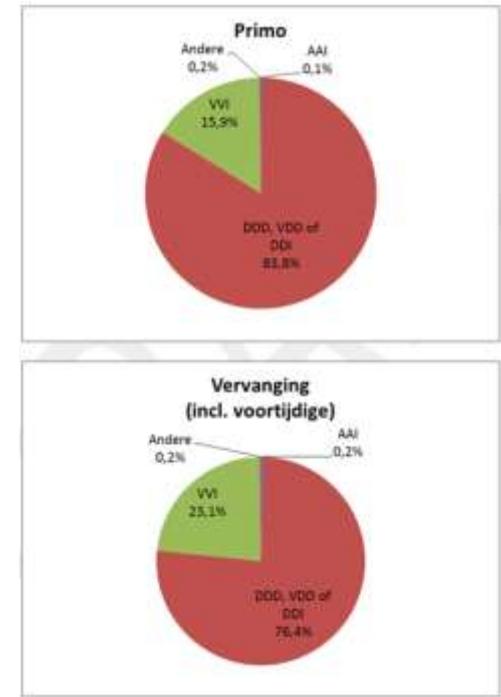
Continuing trends towards more DDD/DDDR pacemakers
VVI pacemakers = only 16% of all primo implants

Reason for Generator Replacement 2016
N = 3477

Littérature 0,8 – 5,7 % infections

2,3% Infections

3118 90%	85	77	81	9	17	78	3
Normal EOL	Symptoms	Premature EOL		Technical Defect		Elective	

1,1%
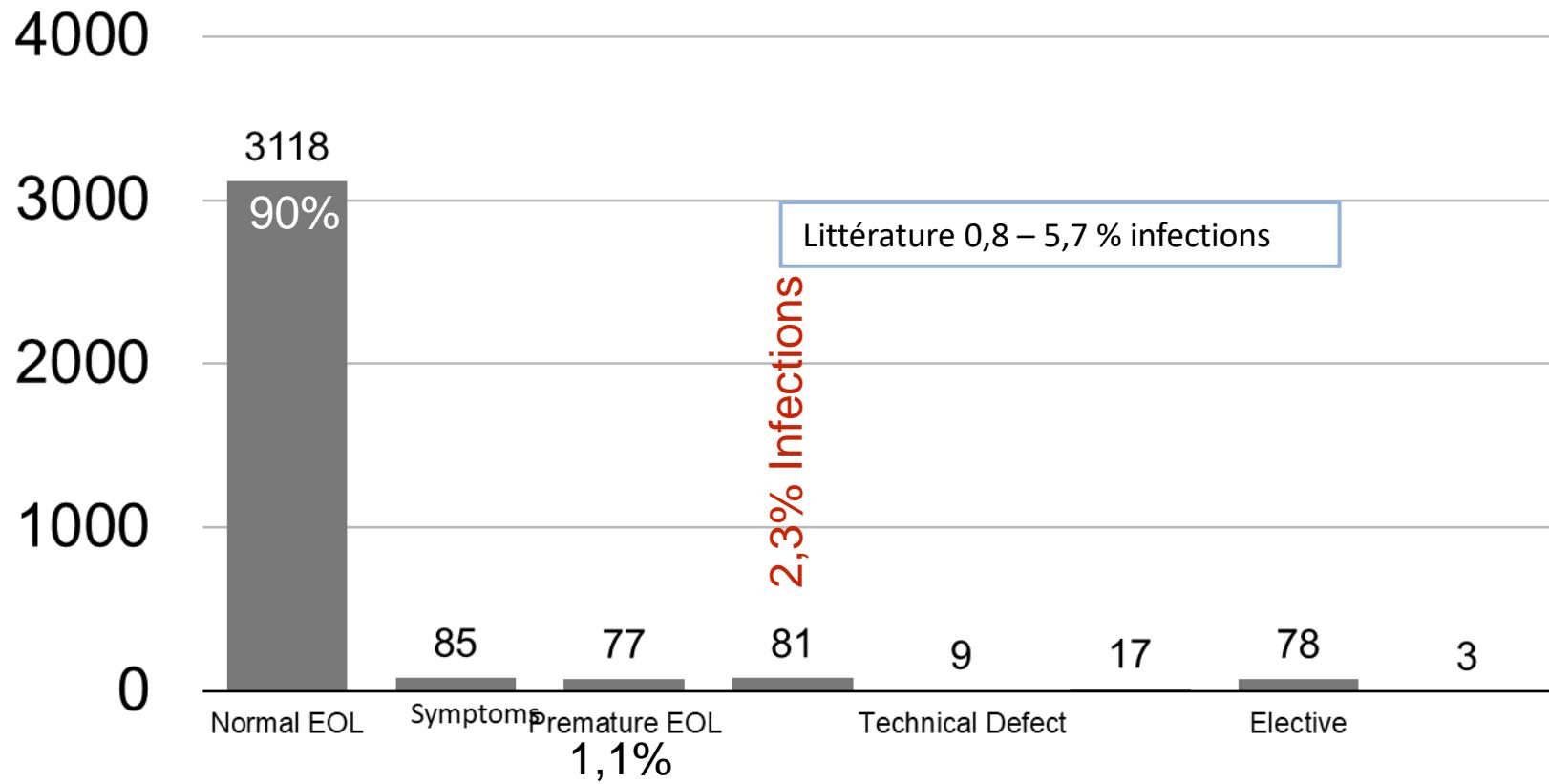
Low Annual PM replacement rate for Infection

Market shares

- St Jude Medical 33%

- Biotronik 26%

- Medtronic 23%

- Boston scientific 13%

- Sorin group 3%

- CRTP (with LV electrode) in database 2016 : 363 (2,9%)

Battery longevity (n days)
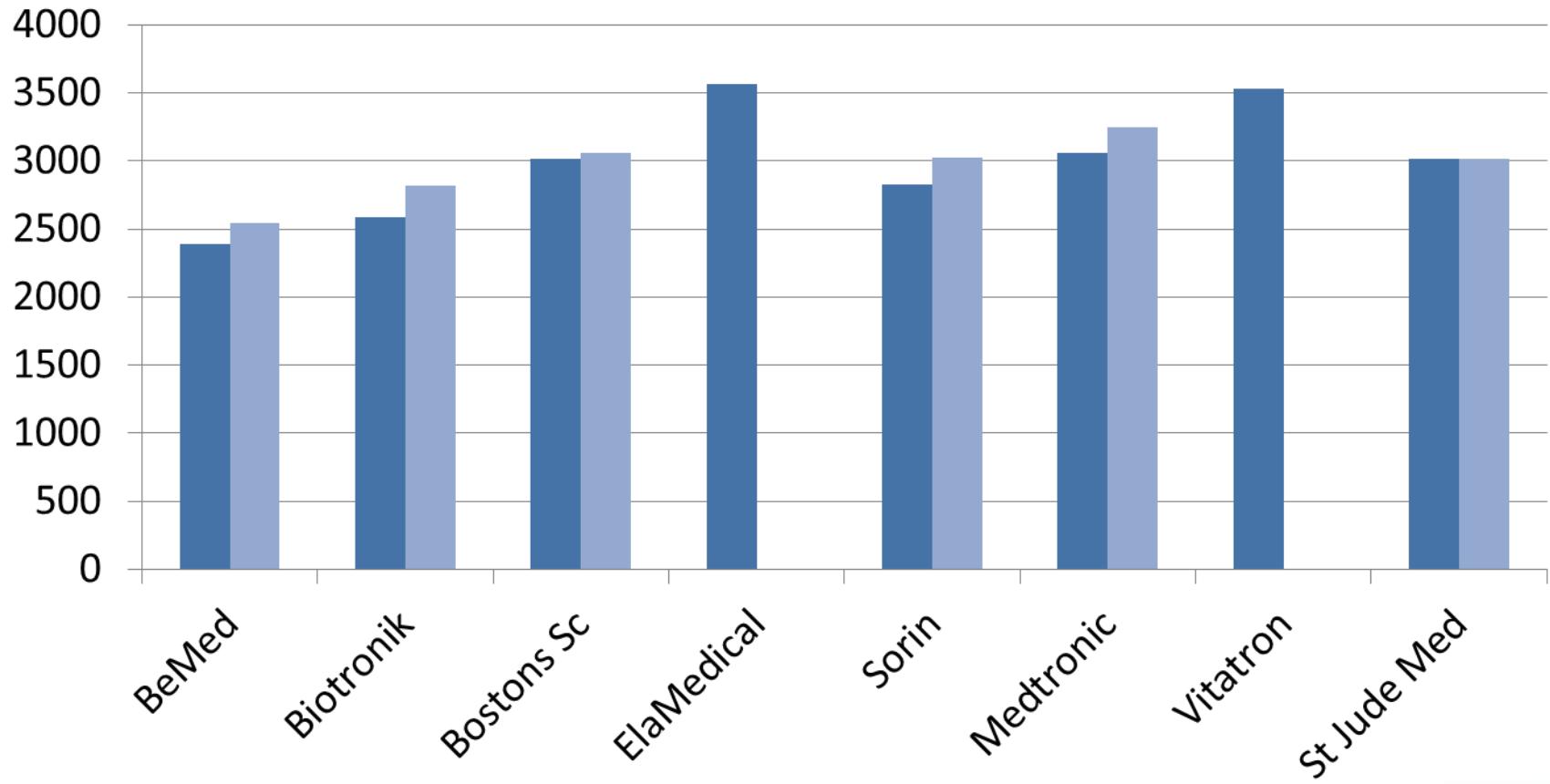
Mean : 8,1 ± 2,2 Years in 2015, 8,4 ± 2,3 in 2016

Battery longevity over the years
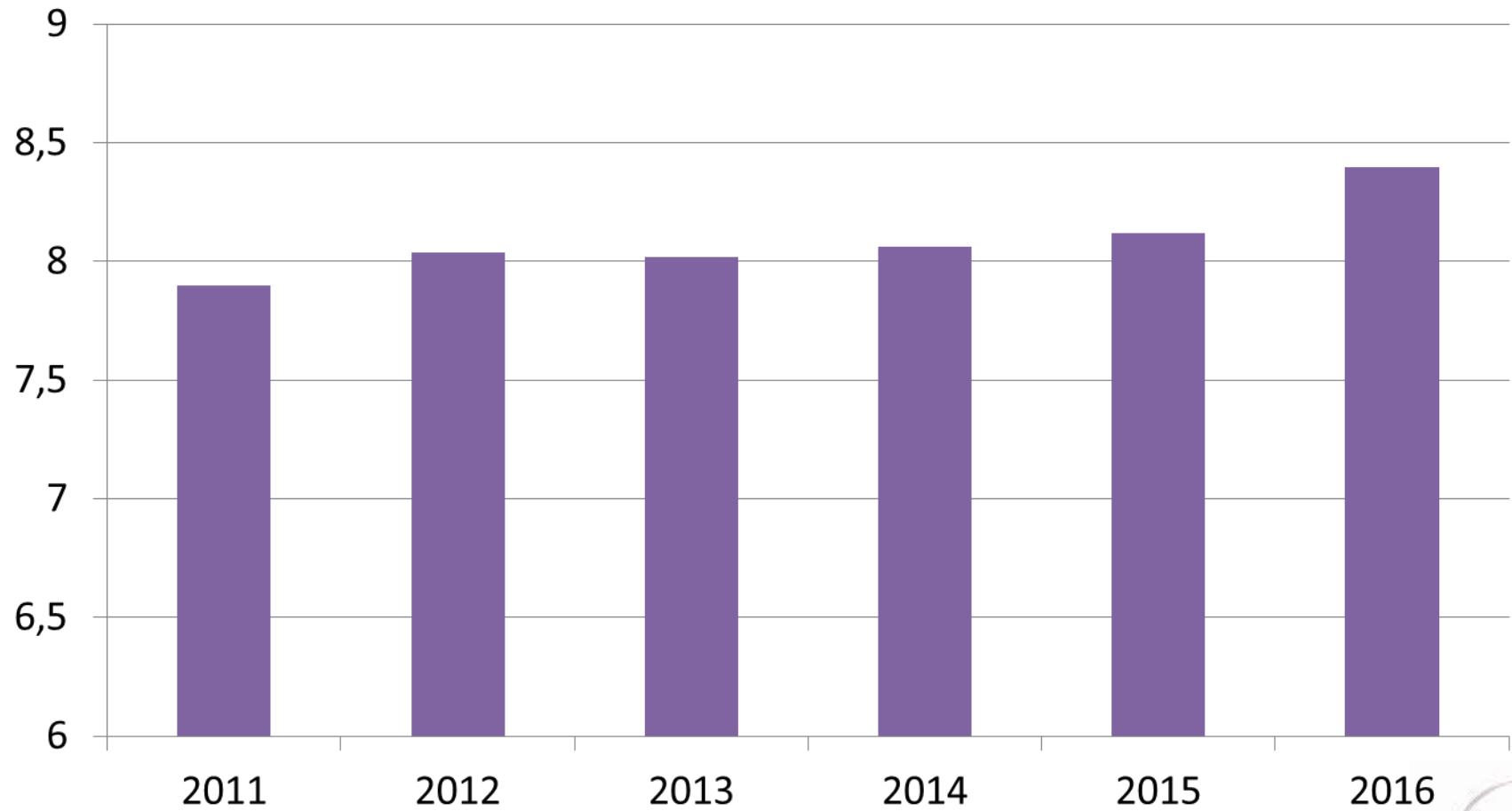
Tabel 33 – Aantal ziekenhuizen per aantal implantaties

Aantal implantaties	Jaar van implantatie					
	2011	2012	2013	2014	2015	2016
0-49	13	14	11	13	15	15
50-99	36	40	39	37	35	38
100-149	24	19	23	23	20	18
150-199	10	11	10	9	12	10
200-249	12	9	9	10	9	6
250-299	3	6	6	6	4	6
300-349	2	2	2	3	3	1
350-399	2	1	2	1	2	5
400-449		1	1	1	1	
Totaal	102	103	103	103	101	99

1 year overall Mortality data

After primo implant

year	1y deaths	primos	1y mortality
2011	840	8890	9,4%
2012	884	8973	9,9%
2013	796	8943	8,9%
2014	888	8957	9,9%
2015	795	8781	9,1%
2016	**781**	**8878**	**8,8%**

After replacement

year	1y deaths	primos	1y mortality
2011	345	3725	9,3%
2012	349	3803	9,2%
2013	372	3979	9,3%
2014	372	3949	9,4%
2015	358	3810	9,4%
2016	**316**	**3477**	**9,1%**

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ICD database

- Since 2001
- Registered by RIZIV >Qermid since 2009
- Data analysed during the « Conseils d'accord » with implanting centers only (23)
  - Total N - Primo/upgrade
  - Type A/type B – per center
  - Per center data (22 – 189)
  - Per age – Per indication – CRT ?
  - Battery live per brand
- Last full year available for review : 2017

Jaar	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Totaal	805	1.566	1.749	1.908	2.099	2.227	2.526	2.510	2.488	2.615	2.636
Primo	617	1.067	1.254	1.382	1.440	1.544	1.732	1.791	1.718	1.850	1.717
Vervanging	188	499	495	526	659	683	794	719	770	765	919
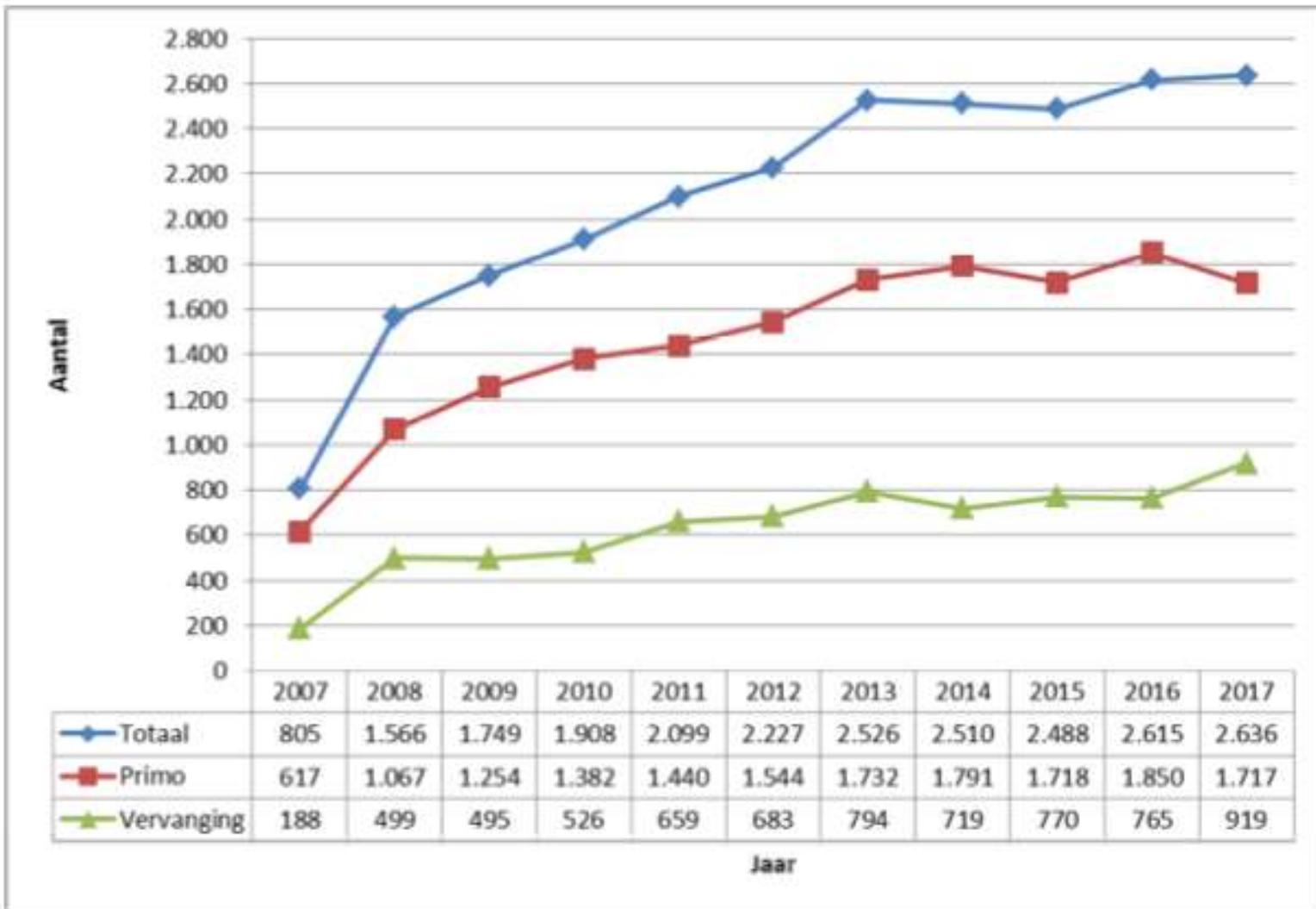
Stable n of indications, less primo-implants, more replacements
Global numbers (2564 reimbursed, 72 not reimbursed)

Center spécifications

- 23 centers
  - 2 centers >200 proc
  - 11 centers 100-200 proc
  - 10 centers < 100 proc
  - 2 centers < 50 proc
- 2,808 procedures
- 2,733 patients

Centrum	Primo	Vervanging	Toevoeging / vervanging elektrode(s)	Totaal
A	74	31	4	109 (3,9%)
B	104	64	6	174 (6,2%)
C	55	33	6	94 (3,3%)
D	54	10	2	66 (2,4%)
E	58	38	7	103 (3,7%)
F	78	23	10	111 (4,0%)
G	53	14	4	71 (2,5%)
H	64	27	8	99 (3,5%)
I	31	14	2	47 (1,7%)
J	27	12	4	43 (1,5%)
K	60	41	14	115 (4,1%)
L	68	24	5	97 (3,5%)
M	58	24	9	91 (3,2%)
N	53	22	7	82 (2,9%)
O	61	24	6	91 (3,2%)
P	74	57	10	141 (5,0%)
Q	94	43	7	144 (5,1%)
R	113	82	17	212 (7,5%)
S	97	64	12	173 (6,2%)
T	119	68	17	204 (7,3%)
U	95	71	8	174 (6,2%)
V	115	55	3	173 (6,2%)
W	112	78	4	194 (6,9%)
Totaal	1.717 (61,1%)	919 (32,7%)	172 (6,1%)	2.808 (100,0%)

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Patients specifications

- 78% M – 22 % F

Indications (for primo-implants)

- Secondary prevention : 39,5%

- Secondary prevention after SCD : 17%

- Primary prevention : 60,5%

Device specifications

- VVI-ICD : n = 803   31%

- DDD-ICD : n = 630   26%

- CRTD : n = 972   38%

- S-ICD : n = 159   6%

- 66% primoimplants – 34% replacements

Battery longevity (n days)
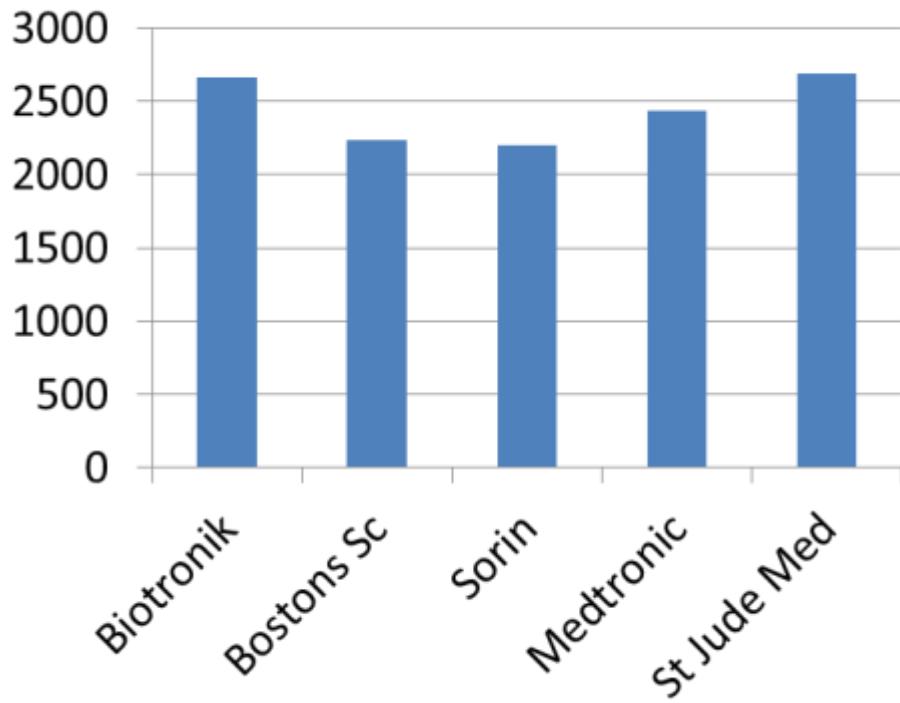
Mean : 7 ± 1,6 Years
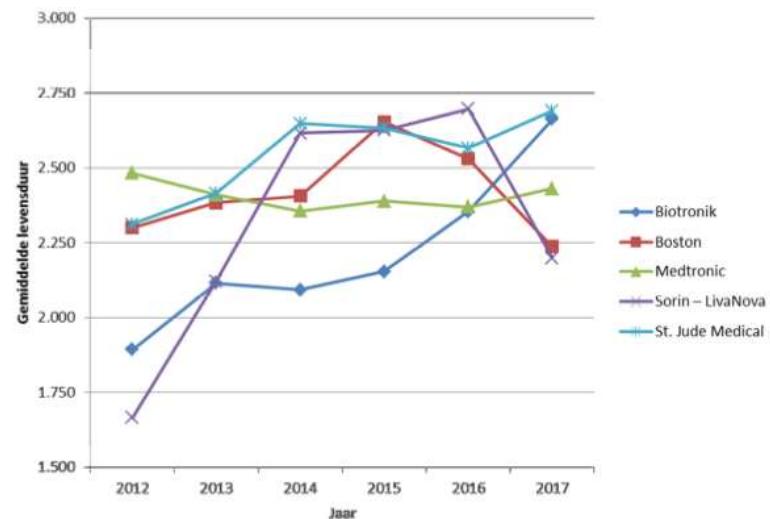
- Biotronik 26%
- St Jude Medical 25%
- Medtronic 24%
- Boston scientific 23%
- Sorin group 2%

Relation between mortality after ICD implantation and size of the implanting center

Hoffmann R.[1] , Haemers P.[2] , Foulon S.[2] , Voros G.[2] , Ector J.[2,3] , Garweg C.[2] , Willems R.[2,3]

1. KU Leuven; 2. Cardiology, University Hospitals of Leuven;
3. Department of Cardiovascular Sciences, KU Leuven

Introduction

The implantable cardioverter defibrillator (ICD) is a clinically well-established method to prevent sudden cardiac arrest. The cost-effectiveness of the ICD depends stronly on the post-implantation survival of the patient. We compared the 3-year mortality of ICD patients between implanting centers and determined which factors influenced this 3-year mortality.

Methods

We performed an analysis based on the RIZIV/INAMI report of 2016 regarding budget indicators of ICD based on data from 2013-2015. This report aggregates information for 23 belgian implanting centers. 3-year survival is based on implations in 2011-2013. Implanting centers were coded with a letter. A total of 4716 primo implantations in 23 centers were analyzed in this report. To determine whether a difference between implant centers was present, a χ^2 test was performed. A multivariate analysis using OLS regression was performed for 3 year mortality. Model selection was performed based on the bayesian information criterion (BIC).

Results

We found that the 3-year mortality was significantly different across hospitals in Belgium (average = 12,9%; range: 7,5-23,4 % ; p < 0,001).
Post hoc testing identified 2 implanting centers (° S,T) to have a significant lower 3y mortality, while 4 implanting centers (* C,D,J,N) reported a significantly higher average 3y mortality (table 2). After strict bonferroni correction this was reduced to 1 implanting center reporting decreased mortality (p = 0,002; T) and 1 implanting center reporting increased mortality (p < 0,001; J).

Figure 1
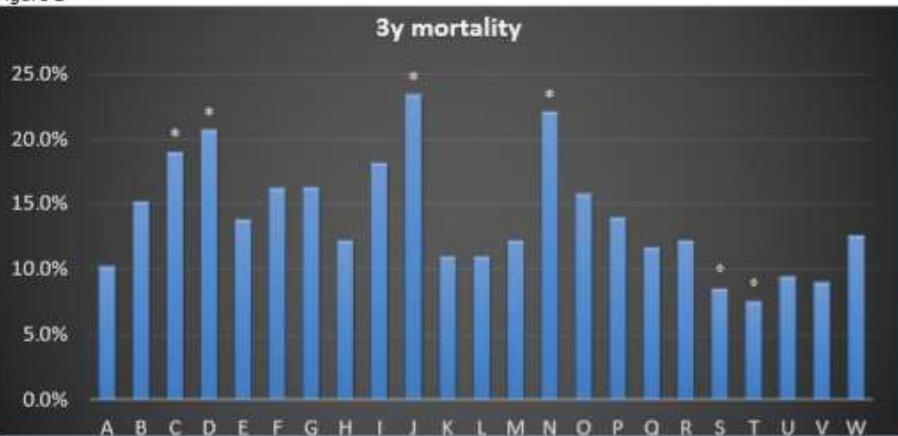
The factors we analysed as possible determinating factors for the 3 y mortality are summarized in Table 1. The results of the multivariate analysis are shown in table 2. A lower number of primo implantations, a higher number of infections and lower percentage of elective "primary prevention" indications were associated with a higher mortiltay. The number of patients that received a CRT-D with a QRS > 150ms was not significant but positively impacted the overall model. This final model was highly significant (p<0,001), and explained the variance well (adjusted $R^2 = 0,615$).

Table 1

parameters	average	standard deviation
number primo implantations	205,04	100,03
% elective indications	59,58%	8,66%
% QRS>150 in CRTD	80,55%	11,29%
% infection	0,69%	0,63%
% ICD/total cardiac interventions	21,36%	6,83%
% complications within 90 d	0,87%	0,51%
% CRTD in low EF	63,05%	16,52%
age in category 7	64,31	2,34

Table 2

Relative mortality(3y)	Coef.	P>|t|	95% CI
Number primo implantations	-0,120	< 0,001	[-0,167; -0,073]
% infections	3,370	0,002	[1,402; 5,337]
% elective indications	-0,159	0,039	[-0,308; -0,009]
% QRS>150/CRTD	-0,129	0,052	[-0,260; 0,001]

Conclusion: 3-year-mortality after ICD implantation significantly differs between Belgian hospitals. The larger the center (more primo-implantations), the lower the infection rate and a higher percentage of implants in primary prevention, the better survival in a center. These data need to be confirmed on the level of the individual patient since these differences may be caused by inter-patient differences and not so much by inter-hospital differences.

CRT in Belgium

Benchmarking Belgian CRT Practice against the Rest of Europe:
Insights from the ESC-CRT Survey II.

Anaïs Gauthey[1], Rik Willems[2], Yves Vandekerckhove[3], Wilfried Mullens[4], Liliana Stefan[5], Xavier Carryn[6], Dominique Blommaert[7], Georges Mairesse[8], Kenneth Dickstein[9,10], Camilla Normand[9], Cecilia Linde[11], Jean-Benoît le Polain de Waroux[1]

[1] Cliniques Universitaires St-Luc, Université Catholique de Louvain, Brussels; [2] UZ Gasthuisberg (Leuven); [3] AZ Sint Jan (Brugge-Oostende av); [4] Ziekenhuis Oost Limbourg (Genk); [5] CHR de la Citadelle (Liège); [6] Centre Hospitalier Régional Namur ; [7] Centre hospitalier universitaire UCL Namur (Godinne); [8] Cliniques du Sud-Luxembourg (ARLON); [9] Cardiology Division , University of Bergen, Norway ; [10] Stavanger University Hospital, Stavanger (Norway) ; [11] Heart and vessels theme, Karolinska University Hospital, Stockholm (Sweden).

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Patients characteristics

Variable	Belgian CRT survey II cohort (n=262)	CRT survey II total cohort (n=11088)	P value*
Age	69+/-11	69+/-11	ns
Female gender (%)	32.9	24.1	0.001
Non-ischemic cardiomyopathy	60.9	49.5	<0.001
NYHA class	33.2	37.7	ns
LBBB morphology	79.1	72.6	0.023
QRS duration ≥150ms	63,8	68,7	ns
Permanent AF (%)	8,9	17,5	<0.001

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Implantation procedure

	Belgian cohort (n=257)	CRT survey II total cohort (n= 10843)	P value*
Successful implantation (%)	97	97	ns
CRT-D implanted (%)	69	70	ns
Duration of the procedure (min)	112+/-54	100+/-46	<0.001
Mean fluoroscopy time (min)	19+/-13	18+/-17	0.009
Coronary venogram to guide LV implantation (%)	96	91	0.019
Phrenic nerve stimulation performed (%)	92	90	ns
LV lead position optimized (electrical delay such as QLV or QRS width) (%)	50	33	<0.0001
Complications (%)	6	6	ns

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Ablation database

- By BEHRA since 2008
- Compulsory registration
  - (yearly certificates to centers)
  - Certificate every 3 months since 2017
- Diagnosis, target, cardiopathy, succes, AAD pre-post, complications, sequellae, redos
- Total procedures in database : 62.089
- Last Full data at moment of analysis : 2017

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Various arrythmias in database

Rfdatabase arrhythmias. All data included

unknown
219 proc.(0.35%)

else
118 proc.(0.19%)

innap sinus tach.
25 proc.(0.04%)

vtach idiop.
1004 proc.(1.62%)

Vtach structural
1212 proc.(1.95%)

avnrt
10333 proc.(16.64%)

circus movement
tachy
2667 proc.(4.30%)

vfib
49 proc.(0.08%)

vpbs
1829 proc.(2.95%)

atrial
tachycardie/essv
2705 proc.(4.36%)

chronic afib
720 proc.(1.16%)

persistent afib
6197 proc.(9.98%)

none
614 proc.(0.99%)

type I flutter
13841 proc.(22.29%)

type II flutter
1867 proc.(3.01%)

paroxysmal afib
18688 proc.(30.10%)

Success rate (at end of procedure) :
RA flutter : 94,1 %
AVRT : 93,7%
His ablation : 96,1%
V arrhythmias : 80,2%
AF : 94%

Global data
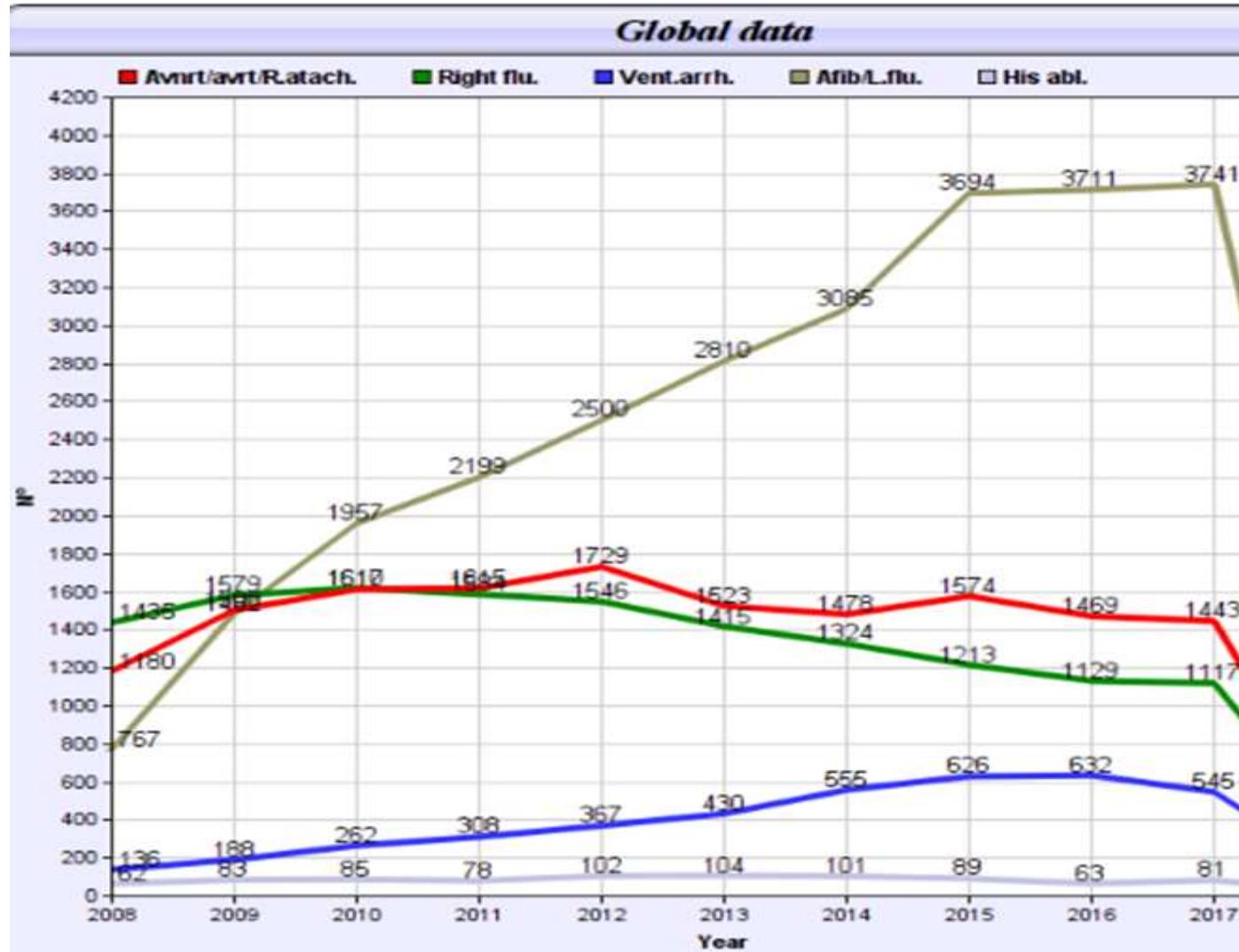
Decrease in A flutter and AVRT tachycardia ablations
Increase in AF and VT ablations

Special focus on AF

N of EP centers is not increasing.

Main indication for AF ablation is parox AF
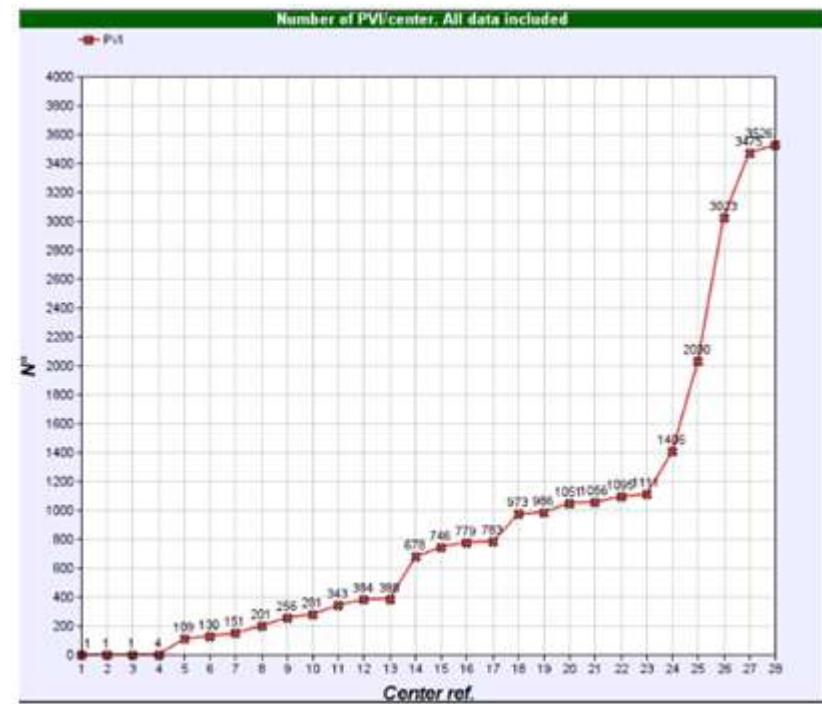
9 centers in Belgium have performed > 1,000 AF ablation
4 centers in Belgium have performed > 2,000 AF ablation
4 centers are not performing any AF ablations

European comparison

- EHRA white book (44 countries), published yearly
- Eucomed
- AF ablation EORP registry (J Brugada)
  - >pilot 2011, -> FU 2012, ->long term 2013
- AF general EORP registry (G Lipp)
  - >pilot in 2012, -> FU 2013-2014, -> long term 2014-2016 -> adherence to guidelines (AF III) 2018 onwards

PM implantations
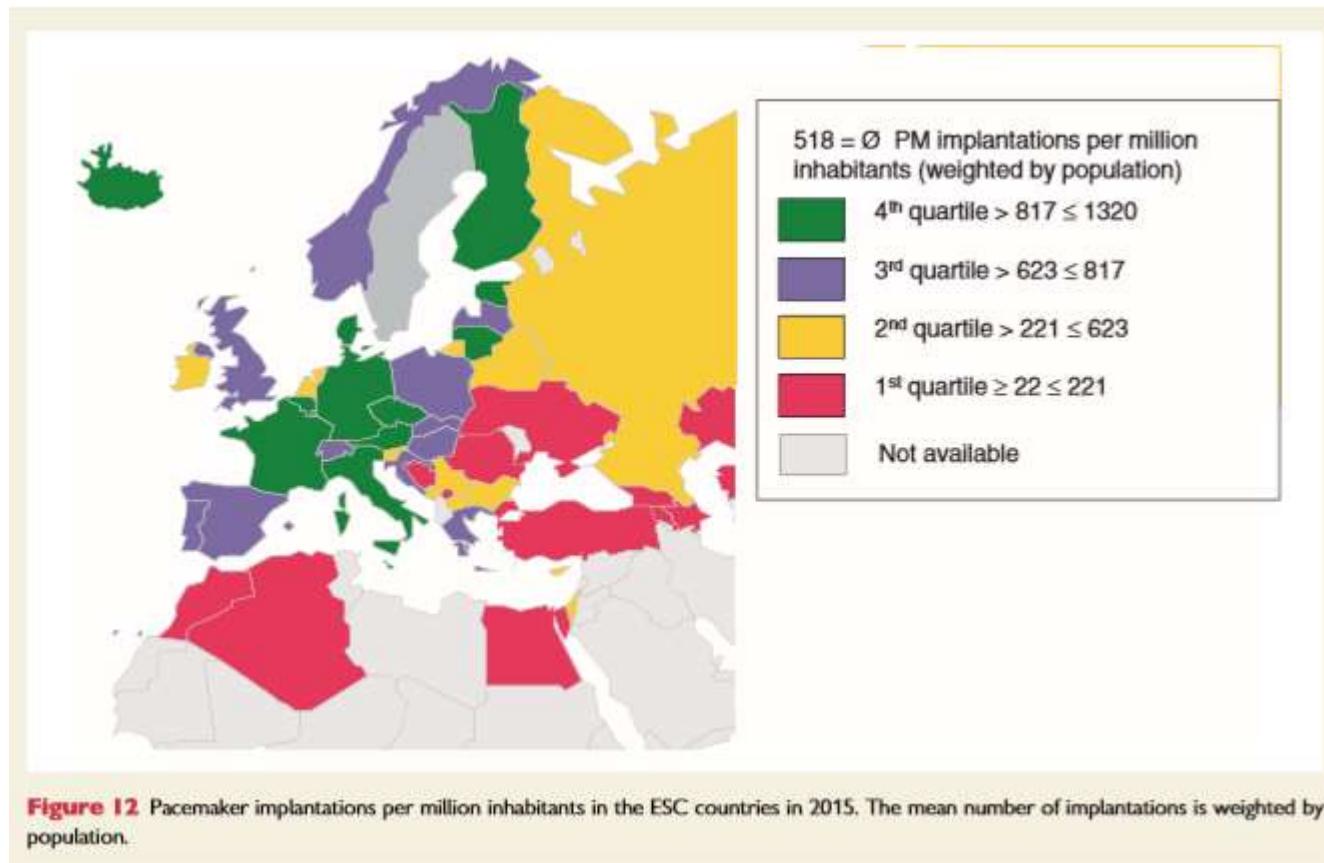
Figure 12 Pacemaker implantations per million inhabitants in the ESC countries in 2015. The mean number of implantations is weighted by population.

ICD implantations

Figure 27 Implantable cardioverter-defibrillator implantations in the ESC countries in 2015.

CRT implantations


Figure 42 Cardiac resynchronization therapy device implantations in the ESC countries in 2015.

Ablations

Figure 60 Catheter ablations in the ESC countries in 2015.

AF ablations

Figure 70 Atrial fibrillation ablations in the ESC countries in 2015.
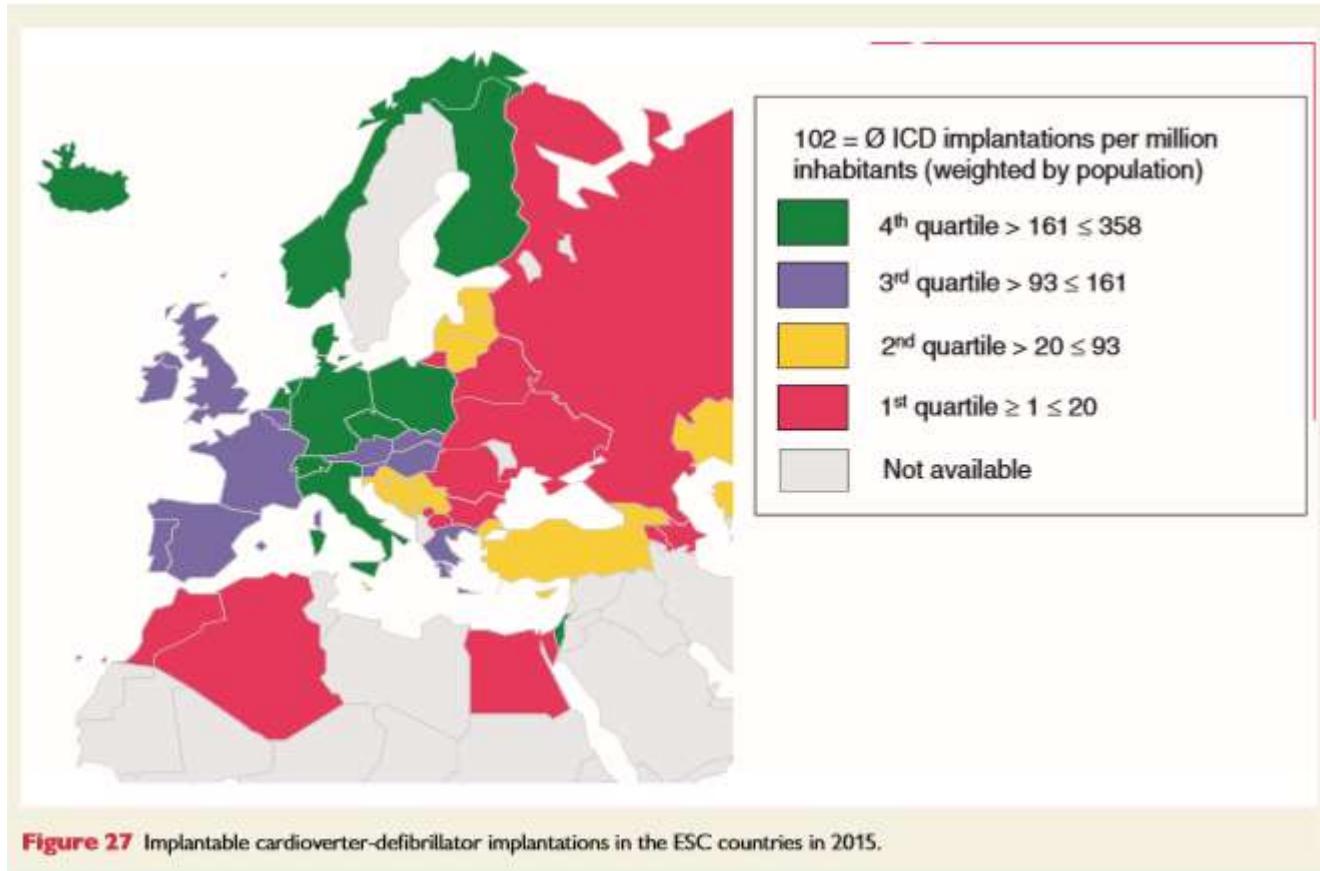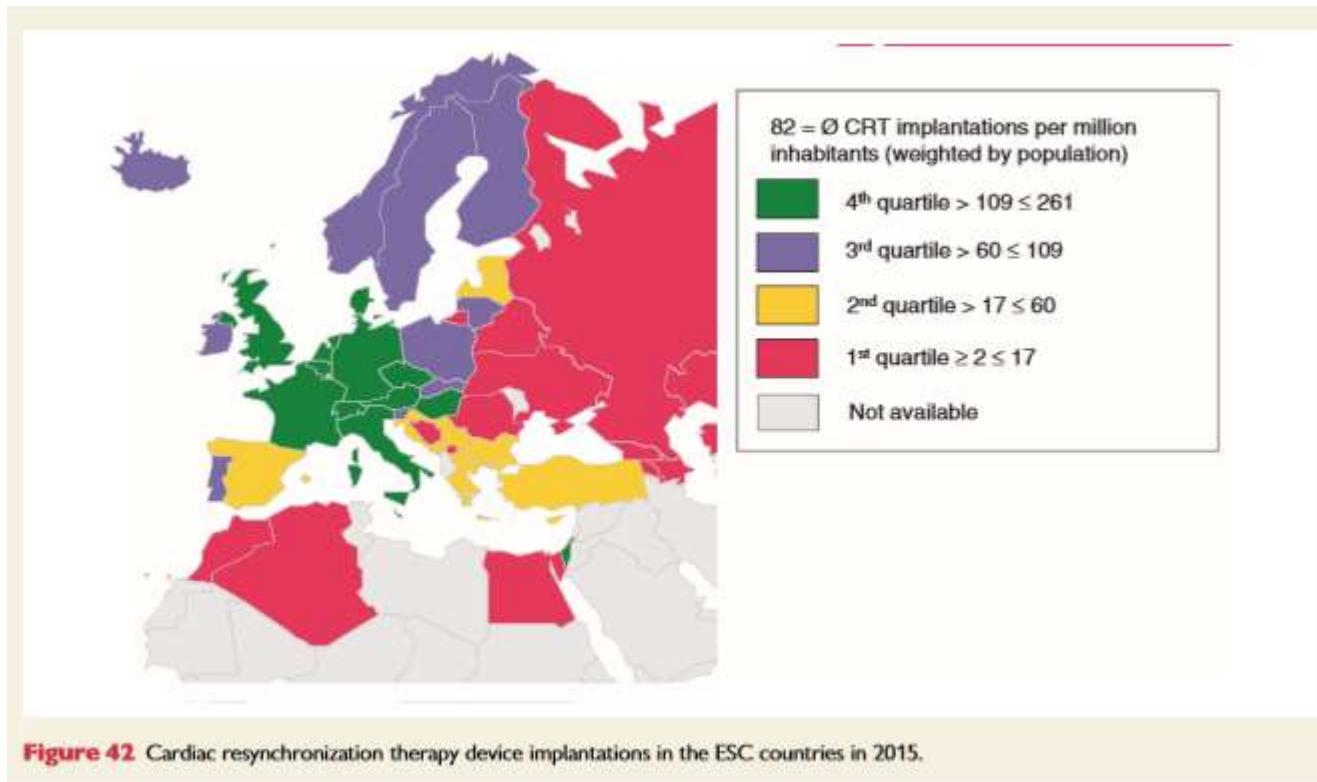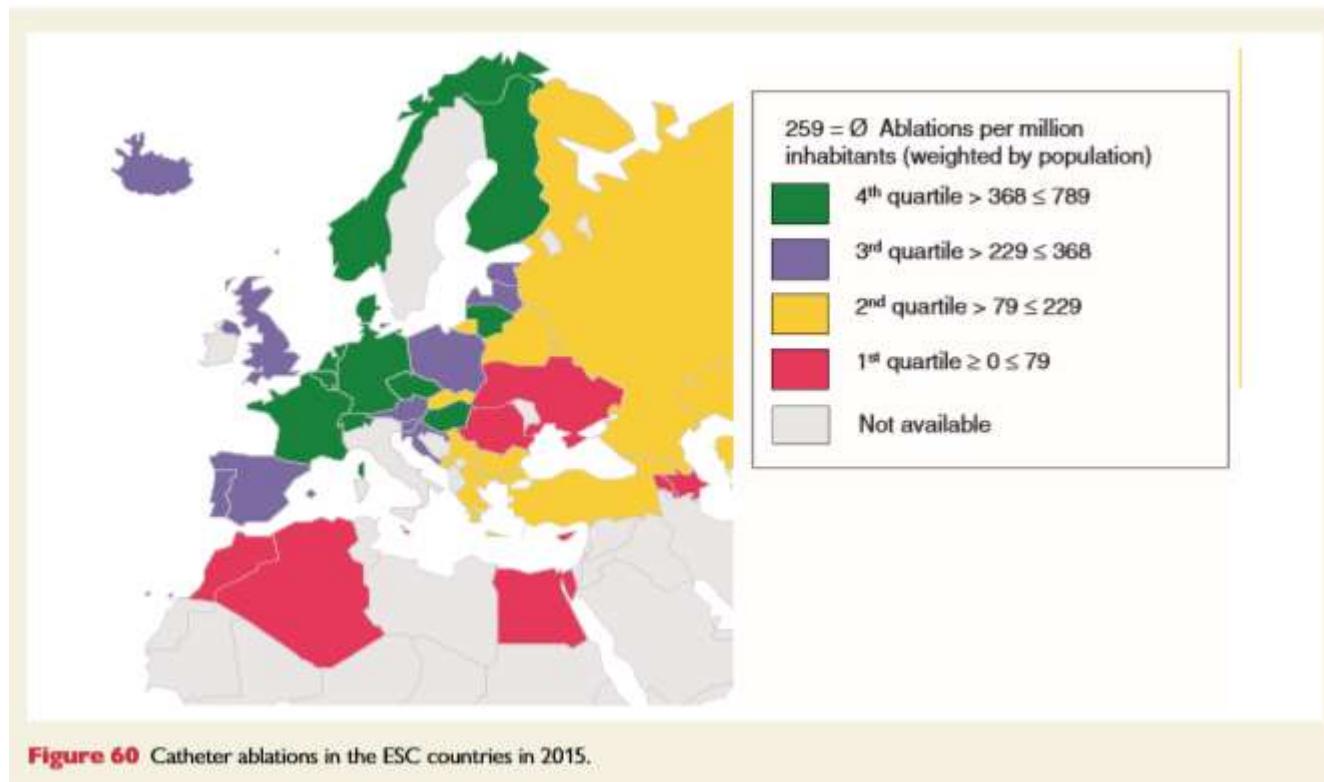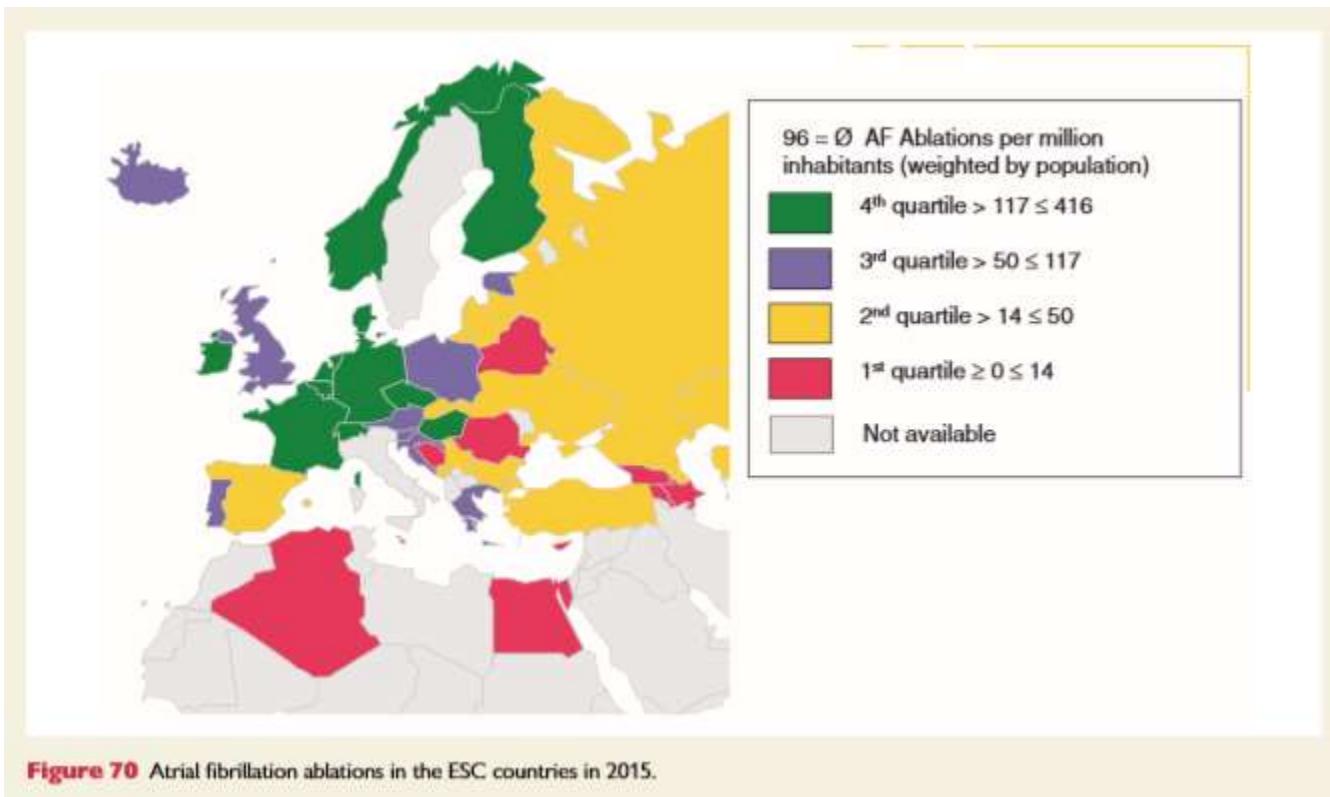
ICD implantations (per million people), 2016 or latest year
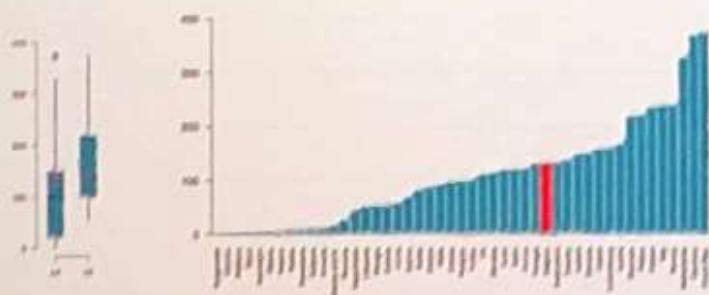
Belgium – 133;
median All countries – 100;
median High Income countries – 133

CRT-P implantations (per million people), 2016 or latest year
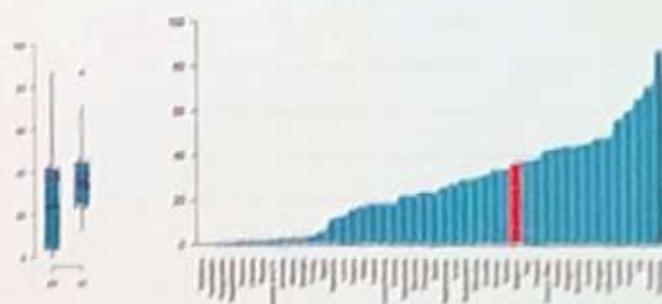
Belgium – 37.24;
median All countries – 24.15;
median High Income countries – 34.20

ESC
European Society
of Cardiology

Presentation at BSC 2019

Summary – CVD care and outcomes

- Belgium: **Economics**
  - High-income country
  - Within top 15 for health care expenditure per capita

- Belgian: **Infrastructure**
  - Excellent access to many CV technologies: PCI, PPM, EP, CTS, LVAD
  - Many capable hospitals
  - High numbers of cardiologists

- Belgium: **Outcomes**
  - Low cardiovascular mortality
  - Low years of life lost due to cardiovascular disease

Summary – CVD care and outcomes, however,

- Not all **health technologies** are equal
  - Lower rates of CRT, ICD, PPCI
  - Lower rates of congenital heart disease interventions
  - TAVI, whilst approaching the medium for high income countries, is comparably less than other technologies in Belgium

- Emerging **CV risk factors**
  - High rates of total cholesterol
  - High rates of physical inactivity

Presentation at BSC 2019

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Conclusions

- Good databases

- Homogenous practice

- Quality criteria

- Good availability of PM and ablation therapy in Belgium

- Improvable availability of ICD and CRT in Belgium

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- Budget 2018 : 41.500 €
  - Internet hosting website development
  - Database maintenance
  - Feedback to E centers
  - Data analysis, Meetings, secretariat, personnel, travel costs for meetings
  - Education and Awareness improvement
  - Organisation of socio-economical session at BHRM

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Many thanks to all contributors from BeHRA

- Prof Hugo ECTOR, Leuven
- Mr Rik NELEMANS, Leuven
- Dr Veronique MAHAUX, Liège
- Dr Thierry VERBEET, Bruxelles
- Dr Marnix GOETHALS, Roeselare
- Dr Georges H MAIRESSE, Arlon
- Dr Eddy VANAGT, Antwerpen
- Dr René TAVERNIER, Gent - Brugge
- Dr Yves VANDEKERCKHOVE, Brugge
- Prof JB LE POLAIN DE WAROUX, Bruxelles
- Dr Johan VIJGEN, Hasselt
- Dr Peter GOETHALS, Brussel
- Dr Wim ALVOET, Brussel
- Dr Ivan BLANKOFF, Charleroi
- Prof Rik WILLEMS , Leuven   and all implanting centers

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