The European Society of Cardiology Atlas of Cardiology: rational, objectives, and methods

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The need to develop better policies for increasing the efficiency and effectiveness of cardiac care and for reducing the burden of cardiovascular disease, necessitates the availability of data on the economic, political, and organizational aspects of cardiac care. The European Society of Cardiology has started collecting such data together with the National Cardiac Societies from across Europe. In particular, descriptive and quantitative data concerning the economy, demographics, socioeconomics, health status, health system, and health policies are gathered for every single member country of the European Society of Cardiology, alongside data concerning the number of cardiac care physicians, hospitals, beds, laboratories, interventions, and reimbursement figures. These data will be helpful in an effort to understand in more depth the dynamics of healthcare systems from a cardiology perspective and to identify trends, disparities, gaps, and best practice models, all of which will be useful for making recommendations to improve decision and policy making concerning the cardiac care field at national and cross national level.

Keywords
Cardiac care economics • Cardiac care policy • Cardiac care data

Introduction

The aim of modern healthcare systems is to warrant equal, uncomplicated and timely access to effective, safe, qualitative, and cost-effective healthcare services. Nonetheless, due to demographic, epidemiological, social, technological, and economic trends, this has become a quite challenging and complex endeavour. Healthcare systems have rapidly evolved over the years to become large, multifaceted, and dynamic institutions, with significant impact not only for health but also for employment and the economy in general. Healthcare expenditure nowadays represents the biggest government spending item in most countries, absorbing from 5 to 12% of GDP and it is constantly escalating, as a result of population ageing, unhealthy life styles, higher expectations for better services, costly developments in the medical technology field, unit cost inflation, inefficiency, and suboptimal use of resources.

The aforementioned pose an urgent and vivid need for improving health system organization, performance and outcomes in order to make healthcare systems sustainable in the long run. This need has been reinforced further in the context of the recent economic and financial crisis, which weighted heavily on fiscal positions, and made it clear that urgent action is crucial to meet the rapidly growing demand for better healthcare. Against this background, most of the European countries, independently of their economic and health system status, are now undertaking major reforms in healthcare field. State efforts are both sensitized and supported by international institutions such as the European Commission (EC), the World Health Organization (WHO), and the Organization for the Economic Cooperation and Development (OECD). The many different emerging policies and tools applied to the organization, management, and financing of healthcare systems, inevitably have profound direct and indirect impacts upon the practice of cardiology and cardiologists, making their involvement in this field inevitable to ensure their quality, effectiveness, and fairness.

Moreover, the last few decades have witnessed a remarkable decline in cardiovascular disease (CVD) mortality rates, due to developments in science, technology, and the population control of cardiovascular risk factors. However, despite the achievements, CVD still remains the leading cause of burden for patient health, for healthcare systems, and for economies altogether. Furthermore, obesity and diabetes prevalence rates are experiencing alarming trends and alongside prevailing life style patterns and the aging of the population exercise pressures on the prevalence of CVD and the associated burden. In addition, it is noticeable that there are significant within and cross-country variations and inequalities in the financing, organization, access, delivery, quality, effectiveness, and comprehensiveness, of cardiac care. Sadly, in many regions and countries across Europe suboptimal patterns of cardiac care are still present. Undoubtedly, the aforementioned make it evident that further data and subsequently intervention is needed to improve the
Rational for the European Society of Cardiology Atlas of Cardiology

Health economics and cardiovascular disease

The most recent global burden of disease study indicated that, despite its quite significant contribution in the life expectancy gains attained in the period from 1990 to 2013, CVD still remains the leading cause of death worldwide and this is especially the case in high-income countries. The age standardized death rate per 100 000 people has fallen by 22% (95% CI: 24.5–19.1) between 1990 and 2013 and reached 293.2 (95% CI: 180.4–306.1). Never-
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1990 and 2013 ischaemic heart disease raised from being 4th to being the number 1 individual cause globally of years of life lost (YLLs), while cerebrovascular disease ranked 3rd, hypertension 24th, cardiomyopathy 31st, and other CVDs 33rd, amongst 240 causes of death.1 In Europe almost universally across countries, ischaemic heart disease was the leading single cause of YLLs followed by either lung cancer or stroke interchangeably.

Moreover, when adding on top of YLLs, the years lived with disability, to estimate disability-adjusted life years (DALYs), CVD worldwide is still the leading cause, accounting for 295.01 (95% CI: 273.1–309.6) million DALYs, out of a total of 2.490 (95% CI: 2.349–2.637) billion and in almost all European countries ischaemic heart disease has raised from the fourth place in 1990 to become the leading or second leading single cause of DALYs amongst 290 diseases, and it is noteworthy to mention that it affects even younger age groups (Figure 1).2

Hence, CVD is associated with significant morbidity and mortality and as such it is also a leading cause of economic burden, making it a considerable health problem from an economic perspective. Specifically, it has been estimated that the economic burden of CVD across the European Union member states may be as high as €169 billion on an annual basis, which corresponds to the annual Gross Domestic Product of a medium size country.3 Productivity losses accounted for 21% of the total cost and informal care for 17%, respectively. Healthcare accounted for ~62% of the total burden and there were significant differences across countries in terms of the services expensed in the management of cardiac disease in the different facets of the healthcare system.3 Moreover, the burden of the disease was associated with socioeconomic and health system variables. Therefore, there are economic perspectives for burden of CVD and there is a need for studying its impact on health systems and economies and for providing evidence on the drivers and the interventions necessary to diminish it. In this light, there is a need for data and new actions, which will be focused on the level of the healthcare system and economy overall, rather than healthcare professionals.

Health policy and cardiovascular disease

Various studies by international organizations like the OECD (Figure 2) and others from the ESC have revealed significant deviations across countries in terms of cardiac care provision and cardiac care outcome indicators.4,5 Studies also reveal significant variations in the organizational features of healthcare systems and also in the policies undertaken in recent years as a response to the global economic crisis.6–9 Nonetheless, there is evidence that the features and policies defining the organization, funding, and delivery of healthcare affect the access, utilization, and adherence to medical services, and eventually also health outcomes, in the general case and specifically in the case of cardiovascular care.10–12 Therefore, given that health policies affect cardiac care and cardiac outcomes, there is a need for generating new data and insights specifically relevant to this medical field, to be able to support and improve decision and policy making. Being the leading organization in cardiology in Europe, ESC needs to be on the forefront of the endeavours and in a position to possess such data, to generate evidence and to provide, input, and feedback, as well as to energetically intervene in the medical policy and medical economics field.

The aforementioned are particular important given policy development trends at a national and supranational level. In particular, as a result of the healthcare system reforms implemented across European countries, a range of policy tools are presently being developed and implemented. One group involves policies regarding the funding and the economics of public healthcare and concerns areas such as budgets, contributions, user charges, taxation, and private health insurance.8 Another domain involves the volume and quality of financed healthcare and concerns policies focused on the areas such as benefits package, population coverage, reimbursement levels, health technology assessment, monitoring, and performance controls, strategic purchasing based on quality and patient
**Figure 1** Disability-adjusted life years lost in Europe by Disease and Age Group in 2010. Source: [http://www.healthdata.org](http://www.healthdata.org).

**Figure 2** Coronary revascularization procedures (2012 or nearest year). Source: OECD Health Statistics 2014, Eurostat Statistics Database.
outcomes, and rational prescribing and technology dispensing. Another domain of policy is focused on the cost of healthcare with focus on the prices of medical goods and drugs, health worker salaries, payments methods to providers, overhead cost management, and service reconfiguration. These emerging policy tools inevitably have relevance for the cardiology profession and begs for action in terms of monitoring and advising them.

Moreover, for many decades, health policy has been a national jurisdiction in the European region, even across European Union members states. However, given the importance of health and healthcare in social, political, and economic terms, the EC is stepping more vividly in the health and healthcare policy field. It has therefore recently developed a set of health and healthcare related policies and initiatives, which are being implemented through its network of different regulatory instruments, agencies, and funding initiatives. This focus reflects the premise that investing in health contributes to the objective of smart, sustainable, and inclusive growth and is a precondition for social cohesion and economic prosperity.

In this context, EC aspires to facilitate the creation of sustainable and optimal health systems, through supporting policies and reforms which ensure, across health systems, innovation and sustainability, access to high quality and safe healthcare, efficient use of public resources, and health promotion and disease prevention. It facilitates for example interventions on policy areas such as health technology assessment, medical devices and pharmaceuticals, clinical trials, evidence-based decision-making, health workforce, innovation and safety, chronic care management, quality of care, e-health, accreditation, networking, and many others quite relevant for cardiology.

In addition, it should be noticed that WHO in Europe, which covers quite similar number of countries with the ESC, is also emphasizing policies that are improving health for all, are reducing health inequalities, and are improving leadership and participatory governance for health. The main policy priority areas in this context concern: investing in health through a life-course approach, empowering people; tackling major health challenges of non-communicable and communicable diseases; strengthening people-centred health systems, public health capacity and emergency preparedness, surveillance, and response; and creating resilient communities and supportive environments. Clearly, there is a need from a medical professional point of view to follow and to be able to influence these agendas and initiatives with sound recommendations which are based on solid evidence.

In conclusion, the trends described above mean that a new environment is emerging rapidly, where multiple stakeholders are designing and implementing health policies, either at national or at international level, with an influence on the access, delivery, organization, funding, and eventually effectiveness of cardiac care. Thus, these developments have direct and indirect influence upon the medical profession and medical daily practice in the cardiology field. Moreover, despite advances in cardiovascular, there is still a significant burden, alongside health, on healthcare systems and economies and analysis of the drivers and the dynamics for better interventions generates necessities for new evidence. Additionally, there exist significant disparities and gaps in European healthcare systems across disease areas and more specifically in the cardiac care field. These need to be identified and addressed, based on examples taken from best practices. The aforementioned imply that data are needed regarding healthcare systems in general and also regarding cardiac care specifically. However, currently whilst health system and socioeconomic data are collected by international institutions for the 56 members countries covered by ESC, comprehensive data specific to cardiac care is missing. European Society of Cardiology therefore has decided to collect these data, to make them available for analysis in the context of the ESC Atlas of Cardiology, described below.

The European Society of Cardiology Atlas

Introduction

To facilitate the aim of the ESC to reduce the burden of CVD, the Health Policy Unit in Brussels is developing an extensive data set, to be used for promoting evidence-based health policy and practice in European cardiology, through the comprehensive analysis of the dynamics of health systems, the study and uncovering of efficient patterns and the facilitation of their wider dissemination, adoption, and utilization.

There is no other similar database concerning the ESC region. Some institutions have gathered cardiovascular outcomes data in the past (e.g. Euro Heart Network), but these data are outdated, incomplete, are not collected on an annual basis, and cover a limited number of the ESC countries. Others gather health system capacity and activity data (e.g. Eurostat, OECD, and WHO), but again even when the full range of ESC countries is covered, these data have limited if any references to the cardiovascular field. Other initiatives contain health system data and health policy information (e.g. WHO Health Systems and Policy Observatory) but again there is no particular focus in cardiology and full coverage of the ESC countries. The ESC Atlas of Cardiology contains for a significant number of European countries a wide range of data on cardiovascular care, collected directly by ESC and its constituency bodies, alongside data on economies, societies, health systems, and health policies collected from primary care sources.

Methodology of data collection

As indicated in Figure 3, the Atlas contains four sections with quantitative data and descriptive information. The first three sections are focused on the economy, political, socioeconomic, demographic, health, health determinant, health system, and health policy status of each of the included countries (see Table A1). The list of data collected is quite extensive, containing on the one hand variables which in the literature have been shown to have an association with health service and health outcome indicators and on the other hand, other variables for which such associations could be investigated for the first time in the context of cardiology. The list of variables considered was reviewed and was finalised by a task force set-up for this specific purpose. The quantitative data are collected from primary international sources, mainly the WHO and the World Bank, by the ESC health policy fellows, for the latest year available. Moreover, the ESC staff also undertakes literature searches and hence over the ESC staff also undertakes literature searches and hence
importantly their coexistence with the cardiovascular data collected by the ESC and the National Cardiac Societies (NCSs), contained in the last part of Atlas, which makes it possible to study the association between cardiology status and economic and health system determinants.

In particular, the last section of Atlas contains more than a hundred variables concerning the number of physicians, hospitals, beds, laboratories, interventions, services, reimbursement practices and tariffs, specifically for the case of cardiology for every country included in the Atlas. These data reflect the human and capital infrastructure and the main interventions provided in the different specialty areas of cardiology. The list of variables considered was reviewed and was finalized by a task force set-up for this purpose and are aligned with those collected by the American Heart Association, which undertakes similar exercise for the USA since 2009. These are collected from local sources by the different NCSs, for the latest year available and then are transferred to the ESC Policy Unit.

The ESC staff coordinates the project, undertakes data quality controls, collates the data, undertakes literature searches and data collection, completes analyses, and prepares country-specific reports and presentations and cross-country comparative analyses and reports.

Quality assurance

To warranty the quality and credibility of the data collected, the list of data and a related questionnaire was developed by experts, members of a task force set-up by the ESC leadership for this purpose, and this was later reviewed by internal ESC reviewers, by the five ESC Associations and by external experts from OECD during an informal meeting. Their feedback was discussed in a panel meeting to finalize the methods and data. Moreover, a manual, containing international definitions concerning all variables and completion guiding principles, was developed and was disseminated across to all NCSs to ensure consistency and reliability. A workshop was held with the data collectors to explain the processes and the data, and a supporting line was set up at the ESC office to respond to queries and handle data collection issues. Also, the data collection started first in a pilot phase with nine selected countries, representing a variety of settings, and then in the remaining ones to assess and improve the methods and the tools utilized.

Moreover, data collected are cross-checked with others from overlapping data sets, which are collected either by ESC Associations themselves or are available in the literature. Additionally, comparative indicators are constructed to identify unusual patterns and outliers and these are discussed with data collectors in each country. The sources of data contained are reported so that they can be traced. Data sets and all other material for each country are reviewed and approved by each NCS. Thereafter, every country profile and data are peer reviewed by two ESC-selected experts independent from the project, one from the reference country and one from another one. These are selected by a list prepared for this purpose and comprise individuals with involvement in the ESC affairs and similar cross national projects. Their comments are taken on board to produce the final data set and country profile.
Atlas components
The components of Atlas are outlined in Figure 4. The data and the descriptive information are readily available at an electronic format, the e-Atlas, which will shortly become available via an Internet site, in which authorised users may be able to access the data, to download them, and to produce custom tables and graphs. For every single country, there is also a standardized 25-page country profile and a standard 20-slide power point presentation, containing all the available information and data, which is prepared by the ESC policy fellows, each available to authorized users through the e-Atlas to download. Not only the quantitative data in the profile, but also the raw text can be accessed and tabulated in the e-Atlas. Finally, there is also a report with summary comparative data and benchmarking across countries and two-way and multi-way regression analyses investigating associations between system characteristics and policies and cardiac care resources, throughputs, and outcomes. As presented in Figure 5, these components will have great added value.

Countries included
The following ESC countries are considered at present: Czech Republic, Finland, Greece, Hungary, Israel, Kazakhstan, Poland, Portugal, Sweden, Spain, Bulgaria, FYROM, Iceland, Moldova, Estonia, Kyrgyzstan, Georgia, France, Italy, Ukraine, Slovakia, Austria, Turkey.

Figure 5 Added value of the European Society of Cardiology Atlas of Cardiology.

Figure 6 Users and uses of European Society of Cardiology Atlas of Cardiology.
Malta, Latvia, Lithuania, Switzerland, Luxemburg, Romania, Albania, Armenia, Azerbaijan, Bosnia and Herzegovina, Cyprus, Egypt, Ireland, Slovenia, Belgium, Serbia, Germany, Algeria, Belarus, Croatia, Kosovo, Lebanon, Montenegro, Morocco, and Tunisia. Also, the following countries will, mainly for logistic reasons, be included at a later stage: Norway, Netherlands, San Marino, Denmark, Libya, Syria, UK, and Russia.

Users and uses
Data and reports from the Atlas are readily available to the ESC leadership, to the NCSs, the ESC Associations, and to authorized external parties from the technology industry, financial institutions, academic, and research institutions, policy and governmental agencies, who may wish to assess and analyse them. The data may be used for multiple purposes. First to compare countries with each other and the run more sophisticated analyses to identify associations, trends, practices, disparities, and gaps. Data in the database may be combined with data from the ESC registries to study how system characteristics may influence clinical care and practice aspects. They can be used in health technology assessment, in market research, pipeline economic analysis, and actuarial analyses for public or private insurance agencies. Therefore, they consist a useful data set to be updated periodically (Figure 6).

Sustainability and development
The process outlined above represents the initial steps of the ESC to embark upon an endeavour to collect data that can be used to map the status and to highlight important determinants in the cardiac care field across its jurisdiction. Obviously, it is important to pursue the sustainability of this project and its quality improvement in terms of methods used and data collected. For this purpose, the methods, data, and analyses will be presented in special workshops to organizations like the EC and WHO and academic and industry groups, so us to get feedback on the steps needed to improve it further and to identify potential sources of funding which will safeguard its long-term sustainability.

Conclusions
Alongside its other established initiatives, ESC envisages to excel in the health economics, health policy, health technology assessment healthcare organization aspects of cardiac care. This will be realized by the gradual building up of internal capacity, expertise, and initiatives, in parallel with developing external relationships and partnerships. The in-house capacity development process and activities involve mainly the investment in collecting unique data sets and undertaking research initiatives to foster knowledge in the aforementioned fields. Up to the present, there was no single data set to combine data on the economics, policies, healthcare systems, and cardiology. The one presented here will make it possible for ESC and others to understand in more depth the dynamics of healthcare systems from a cardiology perspective, and to identify trends, disparities, gaps, and best practice models, all of which may be useful for making recommendations to improve decision and policy making concerning the cardiac care field.

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Conflict of interest: none declared.
### Social indicators
- Total population (in thousands)
- Population ages 0–14 (% of total population)
- Population ages 15–64 (% of total population)
- Population ages 65 and above (% of total)
- Population density (people per km² of land)
- Population annual growth (%)
- Population, female (% of total population)
- Median population age (years)
- Birth rate (per 1000 people)
- Death rate (per 1000 people)
- Fertility rate (children per female)
- Urban population (% of total population)
- Rural population (% of total population)
- Age dependency ratio, old (% of working-age pop)
- Age dependency ratio, young (% of working-age)
- Expenditure per student, primary (% GDP/capita)
- Expenditure per student, secondary (% GDP/capita)
- CO₂ emissions (metric tons per capita)
- Internet users (per 100 people)
- Food deficit (kcal/day per person)
- Literacy ratio in adults > 15, male (%)
- Literacy ratio in adults > 15, female (%)
- Net primary school enrolment ratio, male (%)
- Net primary school enrolment ratio, female (%)
- Cellular subscribers (per 100 people)

### Economic indicators
- Gross Domestic Product (GDP) (US$ billions)
- GDP annual growth (%)
- GDP per capita (US$)
- GDP per capita, Purchasing Power Parities
- Income share by the highest 10% (%)
- Income share by the lowest 10% (%)
- Annual inflation (%)
- Cash surplus/deficit (% of GDP)
- Cash surplus/deficit (National Currency Units (NCU) billions)
- Central government debt, total (% of GDP)
- Central government debt, total (NCU billions)
- Real interest rate (%)
- Labour force participation rate, male
- Labour force participation rate, female
- Labour force participation rate, total
- Unemployment, female
- Unemployment, male (% of male labour force)
- Unemployment, total (% of total labour force)
- Unemployment, youth female (% labour force)
- Unemployment, youth male (% labour force)
- Unemployment, youth total (% labour force)
- Currency exchange rate (in €)
- Total health expenditure (THE) (million US$)
- Government health expenditure (GGHE) (mil US$)
- Per capita public health funds (constant 2009 US$)
- Social security funds (million US$)
- Private health expenditure (PvHE) (million US$)
- Private insurance (million US$)
- Out of pocket expenditure (million US$)
- Overhead (per capita at PPP (NCU per US$))
- THE (per capita at PPP (NCU per US$))
- GGHE (per capita at PPP (NCU per US$))
- GGHE on inpatient care (% of GGHE)
- Total expenditure on inpatient care (% of THE)
- Prevention and public health services (% of THE)

### Health and risk factor indicators
- Life expectancy at birth, female (years)
- Life expectancy at birth, male (years)
- Life expectancy at age 60, female (years)
- Life expectancy at age 60, male (years)
- Infant mortality rate (per 1000 births)
- Life years lost, general & per cardiac cause (years)
- Life years lost per 100 000 persons (years)
- Life years lost with disability, general & per cardiac cause (years)
- Life years lost with disability per 100 000 persons (years)
- Disability-adjusted life year lost, general & per cardiac cause (years)
- Disability-adjusted life year lost per 100 000 persons (years)
- ASDR, ischaemic heart disease, male (per 100 000)
- ASDR, ischaemic heart disease, female (per 100 000)
- ASDR, cerebrovascular disease, male (per 100 000)
- ASDR, cerebrovascular disease, female (per 100 000)
- ASDR, hypertensive disease, male (per 100 000)
- ASDR, hypertensive disease, female (per 100 000)
- ASDR, myocardial infarction, female (per 100 000)
- ASDR, myocardial infarction, male (per 100 000)
- ASDR, accidents, female (per 100 000)
- ASDR, accidents, male (per 100 000)
- CV Mortality (% of total deaths, all ages)
- Cancer Mortality (% of total deaths, all ages)
- Age-adjusted death rate, suicide, male (per 100 000)
- Age-adjusted death rate, suicide female (per 100 000)
- Prevalence of smoking, male (% of adults)
- Prevalence of smoking, female (% of adults)
- Prevalence of diabetes (% of population aged 20–79)
- Prevalence of physical inactivity, male (% of adults)
- Prevalence of physical inactivity, female (% of adults)
- Prevalence of raised blood pressure, male (%)
- Prevalence of raised blood pressure, female (%)
- Prevalence of raised total cholesterol (≥ 6.2 mmol/L), male
- Prevalence of raised total cholesterol (≥ 6.2 mmol/L), female
- Prevalence of raised total cholesterol (≥ 6.0 mmol/L), male
- Prevalence of raised total cholesterol (≥ 6.0 mmol/L), female
- Prevalence of obesity (BMI ≥ 30), male (%)
- Prevalence of obesity (BMI ≥ 30), female (%)
- Prevalence of overweight (BMI ≥ 25), male (%)
- Prevalence of overweight (BMI ≥ 25), female (%)
- Total alcohol consumption, male (litre/person/year)
- Total alcohol consumption, female (litre/person/year)
- Daily vegetable consumption, male (% of population)
- Daily vegetable consumption, female (% of population)
- Daily fruit consumption, male (% of population)
- Daily fruit consumption, female (% of population)
### Table A1 Continued

**Cardiac data collected from the NCSs**

<table>
<thead>
<tr>
<th>Human and capital sources in cardiology</th>
<th>Cardiac health services provided</th>
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<tbody>
<tr>
<td>Physicians</td>
<td>Coronary angiographies</td>
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<tr>
<td>Physicians (per 000 persons)</td>
<td>Coronary angiographies (per 10 000 persons)</td>
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<tr>
<td>Nurses &amp; Midwifes</td>
<td>PCIs</td>
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<tr>
<td>Nurses &amp; Midwifes (per 000 persons)</td>
<td>PCIs (per 10 000 persons)</td>
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<tr>
<td>Dentists</td>
<td>Primary PCIs</td>
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<td>Dentists (per 000 persons)</td>
<td>Primary PCIs (per 10 000 persons)</td>
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<tr>
<td>Pharmacists</td>
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<td>Pharmacists (per 000 persons)</td>
<td>Pacemaker implantations (per 10 000 persons)</td>
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<tr>
<td>Medical graduates</td>
<td>ICD implantations</td>
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<tr>
<td>Medical graduates (per 000 persons)</td>
<td>ICD implantations (per 10 000 persons)</td>
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<tr>
<td>Medical students</td>
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<tr>
<td>Medical students (per 000 persons)</td>
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<tr>
<td>Cardiologists</td>
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<td>Cardiologists (per million persons)</td>
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<td>Cardiologists in training</td>
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<td>Cardiologists in training (per million persons)</td>
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<td>Electrophysiologists</td>
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<td>Electrophysiologists (per million persons)</td>
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<td>Interventional cardiologists</td>
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<td>Interventional cardiologists (per million persons)</td>
<td>P-CHD interventions (per million persons)</td>
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<td>Cardiac surgeons</td>
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<td>Cardiac surgeons (per million persons)</td>
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<td>Hospitals</td>
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<td>Hospitals (per million persons)</td>
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<td>Hospital beds</td>
<td>LVADs</td>
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<td>Hospital beds (per 000 persons)</td>
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<td>Heart transplantations (per million persons)</td>
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<td>Special cardiac care beds (per million persons)</td>
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<td>Centres undertaking primary PCIs</td>
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<td>Centres w primary PCIs (per million persons)</td>
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<td>Inpatient hospitalization for P-CHD interventions</td>
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<td>Centres implanting pacemakers (per million persons)</td>
<td>Inpatient hospitalization for CRT-P implantation</td>
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<td>Inpatient hospitalization for CRT-D implantation</td>
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<tr>
<td>Centres implanting ICDs (per million persons)</td>
<td>Inpatient hospitalization for P-CHD interventions</td>
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<tr>
<td>Centres implanting cardiac resynchronization pace makers (CRT-Ps)</td>
<td>Inpatient hospitalization for TVRI</td>
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<tr>
<td>Centres implanting CRT-Ps (per million persons)</td>
<td>Inpatient hospitalization for transapical valve replacement</td>
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<tr>
<td>Centres implanting cardiac resynchronization ICDs (CRT-Ds)</td>
<td>Inpatient hospitalization for CABG</td>
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<tr>
<td>Centres implanting CRT-Ds (per million persons)</td>
<td>Inpatient hospitalization for surgical valve replacement/repair</td>
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<tr>
<td>Centres undertaking transcatheter valve replacements (TVRI)</td>
<td>Inpatient hospitalization for ILRs</td>
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<tr>
<td>Centres undertaking TVRI (per million persons)</td>
<td>Inpatient hospitalization for LAVDs</td>
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<tr>
<td>Centres with percutaneous congenital heart interventions (P-CHD)</td>
<td>Inpatient hospitalization for heart transplantation</td>
</tr>
<tr>
<td>Centres undertaking P-CHD (per million persons)</td>
<td>Remote monitoring of PM, ICDs, CRT devices</td>
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<tr>
<td>Centres undertaking surgical CHD (S-CHD)</td>
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<td>Centres undertaking S-CHD (per million persons)</td>
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<tr>
<td>Cardiac surgery centres</td>
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<td>Cardiac transplantation centres</td>
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<td>Cardiac discharges (per million persons)</td>
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<td>Cardiac transplantation centres</td>
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<tr>
<td>Transplantation centres (per million persons)</td>
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References


