Impact of the ICD on Sudden Cardiac Death across Europe
Introduction

- Few issues are more central to the ongoing debate about health care than concerns about cost and quality of medical care.

- Facilitation of equal access to therapy means that every single patient requiring a proven therapy should receive it.
What do we need?

- Scientific evidence (clinical studies)
- Identification of the patient (awareness of the problem)
- Budget to implement it (political decision)
Scientific Evidence

- Clinical studies
- Scientific debate
- Guidelines

Scientific Societies

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Why guidelines?

- Implementing clinical practice guidelines improves outcomes. This has been shown by several large scale registries; however, in spite of this, guidelines are poorly implemented in clinical practice for a wide variety of reasons

Bassand et al, EHJ 2005; 26: 1155-58
Reasons why guidelines may not be adopted

- Only a limited part of the target audience may be aware of the existence of the guidelines. 
  Hagemeister et al. J Hypertens 2001; 19: 2079-86

- Physicians may feel they are flooded by too much data and a plethora of guidelines.

- Physicians being nihilistic about the evidence or not believing in the guidelines.
  Ezekowitz et al. JACC 2004; 44: 1587-92

- In certain circumstances, despite the best evidence, physicians rely on their personal experience and on the impression that the therapeutic approach they are going to propose to their patient is the best.
Ressources to implement Guidelines

- Political decision
  - Recognition of the problem
    - Scientific societies
    - Patients organizations
    - Media
  - Allocation of a specific budget
    - Limited budget
    - Competing needs
Ressources to implement Guidelines

- Personnel prepared to do it
  - Dedicated people?
  - EP only?
  - Quality – quantity?
- EP labs available
  - Dedicated labs?
- Follow-up procedures
  - Dedicated personnel, allied professionals?
  - Remote monitoring role
European Diversity

Significant diversity exists among European countries in:

- Gross Domestic Product (GDP)
- The percentage of the GDP devoted to health expenditure
- Health systems
- Systems of medical education and training
## GDP Per Capita

<table>
<thead>
<tr>
<th>Country</th>
<th>GDP growth (%)</th>
<th>GDP/head ($)</th>
<th>PPP ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>2.2</td>
<td>45,290</td>
<td>37,800</td>
</tr>
<tr>
<td>Croatia</td>
<td>4.5</td>
<td>11,050</td>
<td>13,900</td>
</tr>
<tr>
<td>France</td>
<td>1.8</td>
<td>41,200</td>
<td>33,540</td>
</tr>
<tr>
<td>Germany</td>
<td>1.4</td>
<td>39,750</td>
<td>31,870</td>
</tr>
<tr>
<td>Greece</td>
<td>3.3</td>
<td>23,970</td>
<td>25,890</td>
</tr>
<tr>
<td>Norway</td>
<td>2.2</td>
<td>80,960</td>
<td>48,190</td>
</tr>
<tr>
<td>Russia</td>
<td>5.9</td>
<td>8,030</td>
<td>13,130</td>
</tr>
<tr>
<td>Spain</td>
<td>2.7</td>
<td>30,820</td>
<td>29,610</td>
</tr>
<tr>
<td>Turkey</td>
<td>4.5</td>
<td>5,130</td>
<td>9,240</td>
</tr>
</tbody>
</table>
ICD implants in relation to health care spending

Health Care Spending per inhabitant 2001 ($)

Implants/million 2003

USA

R=0.56 (EU)

EU mean = 49

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Correlation between per cent of GDP expended on health and ICD implanted per million inhabitants in year 2007. \( r = 0.595829 \) \( P = 0.0002 \)
Correlation between live expectancy and ICD implanted per million inhabitants in year 2007. \((r) = 0.617984, P < 0.0001\)
Significant diversity exists among European countries in:

- The age distribution of the population
- People’s awareness of health and educational issues
- The form of government, the orientation of independent institutions and the efficiency of the regulatory authorities
Demographics in Spain

Population: 40,397,842 (July 2006)  Growth rate: 0.13%

Age Structure

0-14 years  14.4% (male 3,000,686 / female 2,821,325)
15-64 years  67.8% (male 12,751,963 / female 13,653,426)
65 years +  17.7% (male 2,993,496 / female 4,176,946)

- The Spanish population is getting older. The demand for treatments for cardiovascular diseases will increase. Costs for health care are increasing.
ICD Market in Spain
Number of Implantations per Region

Number of implanted ICDs incl. CRT-D in 2005:
Total: 2,756

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Observations

- Any attempt to harmonize cardiology across Europe, particularly in our field, requires detailed knowledge of the prevailing conditions in each country.

- Apart from national economic factors the following must be taken into account
  - demographic information
  - market drivers/limiters
  - health care system details, etc.
### The Value of the White Book

- Whether the Guidelines for the therapy of bradyarrhythmias, tachyarrhythmias and heart failure are being properly implemented
- The diversities within individual countries, allowing clearer evaluation
- The level of expenditure required for CRM devices and ablation therapies per country
Table 2. The highest and the lowest CRT-D implantation rates per million inhabitants in the year 2007.

<table>
<thead>
<tr>
<th>The highest CRT-D implantation rate per million (upper quartile)</th>
<th>The lowest CRT-D implantation per million (lower quartile)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Italy</strong></td>
<td>93,47</td>
</tr>
<tr>
<td><strong>Netherlands</strong></td>
<td>85,63</td>
</tr>
<tr>
<td><strong>Germany</strong></td>
<td>84,13</td>
</tr>
<tr>
<td><strong>Israel</strong></td>
<td>68,33</td>
</tr>
<tr>
<td><strong>Czech Republic</strong></td>
<td>58,57</td>
</tr>
<tr>
<td><strong>Austria</strong></td>
<td>57,44</td>
</tr>
<tr>
<td><strong>Denmark</strong></td>
<td>50,11</td>
</tr>
<tr>
<td><strong>France</strong></td>
<td>46,34</td>
</tr>
<tr>
<td><strong>United Kingdom</strong></td>
<td>38,83</td>
</tr>
</tbody>
</table>
Implantations of CRT-D per million inhabitants in the year 2007
Ratio CRT-D to CRT-P implantations in years 2006 and 2007. Above horizontal line are countries in which predominate CRT-D, below horizontal line countries in which predominate CRT-P.
Annual ICD implants per million inhabitants

USA

MADIT & AVID

Europe

MUSTT

???

154

31

ICD market in Europe

Drivers:
- Rapidly aging population
- Increase in number of patients requiring devices
- Clinical efficacy increases acceptance of new implants
- Technological improvements

Stoppers:
- Limitation in referrals
- Few implanting electrophysiologists and cardiologists
- Budget restrictions
- High prices limits implant growing
Conclusions

There are great differences in the ICD-implanting rates between EHRA member countries.

The number of ICD implantations is increasing in almost all countries.

There are discrepancies in the number of implanting centers per million inhabitants between countries. The number of centers correlate with implantation rates.

The factors affecting the number of ICD implantations are national economic status and healthcare expenses.