THE FUTURE HEALTH CARE SYSTEMS
The case of Cardiovascular Medicine

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Disclosures

“Nothing to declare related to this presentation, apart my love to innovation.”
HEALTH CARE SYSTEMS. DRIVERS OF THE FUTURE

- Ageing of population
- Affordability/Sustainability issues
- Private insurance companies domination
- Quality of care based medicine
- Marginalization of physicians
HEALTH CARE SYSTEMS. DRIVERS OF THE FUTURE

- Digitization/Digitalization of medicine
- Big data and analytics
- Artificial intelligence (AI)
- Well educated and connected patients
POPULATION AGEING
The change in the Population Structure

Graph 12 - Population pyramids (in thousands), EU27/EA, in 2008 and 2060
Figure 5: Older people consume more healthcare than younger people do

Aging and expenditure

Note: Ratio of average spending on individuals in each age group in each country relative to an individual aged 50-64 in the same country. Numbers rounded
Regardless of Reforms Expenditure Will Increase

Figure 1.10. Increase in public health and long-term care spending by country
2005-50\(^1\), in percentage points of GDP

1. The vertical bars correspond to the range of the alternative scenarios, including sensitivity analysis. Countries are ranked by the increase of expenditure between 2005 and 2050 in the cost-containment scenario. Turkey was not included because data limitations made it impossible to calculate one of the scenarios.

2. OECD average excluding Turkey.

CVD epidemiology - morbidity

Estimated DALYs per 1000 individuals for all cardiovascular diseases, including heart disease and stroke.
European Region 2016.
Organization, Health Statistics and Information.

Cardiovascular disease in Europe: epidemiological update 2016.
CVD epidemiology - mortality

Proportion of all deaths due to major causes in Europe, latest available year, among men (A) and women (B). (Source: WHO mortality database)

Cardiovascular disease in Europe: epidemiological update 2016, N. Townsend et al

www.escardio.org
VALUE BASED
MEDICINE
VALUE BASED MEDICINE

• The term “value-based” was first introduced by a team of researcher led by Dr. Brown (2013), at Pennsylvania State University.

• The team defined VBM as “the practice of medicine incorporating the highest level of evidence-based data with the patient-perceived value conferred by healthcare interventions for resources expended.
<table>
<thead>
<tr>
<th>Variation</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>2x Variation in 30-day mortality rate from heart attack in US hospitals</td>
<td>USA</td>
</tr>
<tr>
<td>4x Variation in bypass surgery mortality in the UK hospitals</td>
<td>UK</td>
</tr>
<tr>
<td>5x Variation of major obstetrical complications among US hospitals</td>
<td>USA</td>
</tr>
<tr>
<td>9x Variation in Dutch hospitals’ complication rates from radical prostatectomies in the Dutch hospitals</td>
<td>Netherlands</td>
</tr>
<tr>
<td>18x Variation in reoperation rates after hip surgery in German hospitals</td>
<td>Germany</td>
</tr>
<tr>
<td>20x Variation in mortality after colon cancer surgery in Swedish hospitals</td>
<td>Sweden</td>
</tr>
</tbody>
</table>

Variation is pervasive across conditions and all types of outcomes wherever systematic data is available.
The Quality Measurement Landscape

Patient Experience, Engagement, and Adherence

Patient Initial Conditions, Risk Factors

Processes

Protocols/Guidelines

Indicators

E.g. PSA, Gleason score, surgical margin

Structure

E.g., Staff certification, facilities standards

Outcomes
SENTIMENT ABOUT CURRENT QUALITY OF HEALTHCARE IN THE UNITED STATES

EXCELLENT OR VERY GOOD

GOOD

ONLY FAIR OR POOR

CURRENT QUALITY

QUALITY TRAJECTORY

SENTIMENT ABOUT FUTURE COST AND QUALITY OF HEALTHCARE IN THE UNITED STATES

14%  Strongly Positive
66%  Moderate
20%  Strongly Negative
SENTIMENT ABOUT FUTURE COST AND QUALITY OF HEALTHCARE IN THE UNITED STATES

DECREASING

SAME

INCREASING

FALLING BEHIND

KEEPING PACE

PULLING AHEAD

1% Strongly Positive
77% Moderate
22% Strongly Negative

QUALITY TRAJECTORY

NOTE: Each square represents 1% of survey respondents.
MARGINALISATION OF PHYSICIANS
PHYSICIANS WILL NOT BE LONGER THE STARS OF HEALTHCARE

• The progressive marginalization of physicians can no longer be denied.

• Over the years, our profession has been increasingly pushed to the sidelines by other players in the healthcare game.

• Now days, in many cases physicians are called, generally, “providers” or “health care Professionals”.
PHYSICIANS WILL NOT BE LONGER THE STARS OF HEALTHCARE

• It’s not longer, “we’ve got the best urologist”, but “we’ve got the best surgical robotics”.

• Whatever happens, take good care of your coworkers, and most of all, take good care of your patients.
DIGITIZATION
OF MEDICINE
DIGITIZATION OF MEDICINE AND HEALTH CARE

“The digital world has been in a separate orbit from our medical cocoon, and it’s time the boundaries be taken down”

Eric Topol MD
Digital Practice

Medicine has come a long way from the early 19th century, when the stethoscope was the most technologically advanced tool in a doctor’s bag. Advances in health-care technology have increased longevity, made once impossible surgeries possible, eradicated some diseases, changed the way doctors monitor and treat patients, and helped reduce the mountains of paperwork that burden the profession. “Medicine has always been information driven,” says Ira Brodsky, author of The History and Future of Medical Technology. “You had to manually collect and analyze this stuff until the computer age.”
Early Digital Imaging

A precursor to modern digital imaging, the first equipment used by doctors produced images of blood vessels. The technique used to create those images—digital subtraction angiography—was developed by researchers at the University of Arizona, according to an article in Imaging Economics, a radiology journal.

Photograph by Siemens syngo iFlow
Computer-aided detection

A computer-aided detection device for displaying and interpreting mammograms was first approved by the FDA in 1998. The device converts film mammograms into digital files. Computer software then analyzes the file and marks suspect areas for radiologists to review, along with their own reading of the original film image, according to the National Cancer Institute.

*Photograph by Eric Van Den Brulle/The Image Bank*
Medical Apps

The FDA approved the first mobile medical app in 2009, according to Harry Wang, director of health and mobile product research at Parks Associates. AirStrip OB, a mobile application developed by AirStrip Technologies, allowed obstetricians to remotely access real-time and historical data for a mother and baby, including heart tracings and contraction patterns. Today the iTunes store contains about 4,780 medical apps, from pharmaceutical reference books to baby-care logs for parents. While developers are busy launching new apps, many are not considered medical devices. FDA spokesperson Erica Jefferson says the agency has only cleared “a handful of apps.”

*Photograph by Stefan Thomas Kroeger/Redux*
DIGITIZATION OF MEDICINE AND HEALTH CARE

• Disruptive technologies must transform the current healthcare systems, but to get there, we need to digitize the delivery of care.

• Healthcare will be transformed from paper based to digital and quantifiable.

• We will identify the very individual causes non-communicable diseases from large amounts of digitized quality information (Big Data and analytics).
Big data and predictive analytics

• Big data is a term for data sets that are so large or complex that traditional data processing application software is inadequate to deal with them.

• Predictive analytics encompasses a variety of statistical techniques from predictive modeling, machine learning and data mining that analyze current and older records to make predictions or correlations.
December 1, 2015
Thanksgiving is traditionally a time for family, food, and... Do...

3 BEST-KEPT SECRETS OF LOSING WEIGHT AND KEEPING IT OFF

November 19, 2015
At any given time, one in three adults of all American adults are trying to...

MONITORING YOUR BLOOD PRESSURE

November 25, 2014
DO I NEED A DOCTOR TO CHECK MY BLOOD PRESSURE? No - por...

TAGS

- favorite
- heart health
- healthy eating
- blood pressure
- diet
- hypertension
- low
- sleep
- stress
$ trillions are lost to non-communicable disease. But costs are expected to double in the next decade.

- **Cancer**: $290 billion in 2010, $458 billion in 2030 (+58%)
- **Diabetes**: $500 billion in 2010, $745 billion in 2030 (+49%)
- **Cardiovascular disease**: $863 billion in 2030 (+21%)
- **Chronic pulmonary diseases**: $4800 billion in 2030 (+120%)

Medical conditions linked to unhealthy lifestyle cause an economic burden.
AI IN MEDICINE:
RIZE OF THE MACHINES

• It’s hard to predict now what health care would be like in 20 to 30 years, as medical AIs become increasingly cheaper and more accurate.

• Also, it would have been hard to predict back in 1997 what life would be like now in 2017, in the era of smartphones, social media, online search (Forbes, 2017).
Projected Future of Imaging

Clinical Outcome

Thousands, Ten thousands, Hundreds of thousands of data sets

Supercomputer

Artificial Intelligence
Machine Learning
Deep Learning
“Big Data”

Prediction Diagnoses Treatment

1. Relationships and
2. Will improve diagnoses
3. Will improve prognosis
4. Will replace much currently done by radiologists

Predicting the Future — Big Data, Machine Learning, Clinical Medicine

Perspective

Algorithms rather than medical knowledge
AI IN MEDICINE: RIZE OF THE MACHINES

• New “deep learning” artificial Intelligence (AI) algorithms are showing promise in performing medical work which until recently was thought only capable of being done by human physicians.

• Deep learning algorithms have been able to diagnose the presence or absence of tuberculosis (TB) in chest x-ray images with astonishing accuracy (96% accuracy rate), better than many human radiologists.
Researchers at Google were able to train an AI to detect spread of breast cancer into lymph node tissue on microscopic specimen images with accuracy comparable to (or greater than) human pathologists.

Similarly, neural networks have shown to be (slightly) better than human physicians at detecting changes of diabetes in images of patient’s retina.
• It is even more important the possibility of AIs detecting new associations not yet detected by humans.

• For instance, UK researchers gave data on 295,000 patients to machine learning algorithms, to allow them to correlate medical history with rates of heart attacks. Then the algorithms were given records from another 82,000 patients and asked to predict which ones would have heart attacks.
THE MAIN DRIVERS OF FUTURE MEDICINE

- Ageing of population
- Insurance company domination
- Quality of care, based medicine
- Marginalization of physicians
THE MAIN DRIVERS OF FUTURE MEDICINE

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- Artificial Intelligence (AI). As a parter of antagonist
- Educated and Connected patients
- Feminization of medicine
Steve Jobs
1955-2011

“ The ones who are crazy enough to think that they can change the world, are the ones who do.”
"Imagination is more important than knowledge!"
— Albert Einstein