Disclouser

None for this topic apart from that

1) I am a computer virgin
2) I do not own a computer
3) I can just read emails in my phone

Cardiology: *a story of success!*

- **Life expectancy has recently increased by 10 years**
- **Cardiology has contributed to at least 7 years!**
- **Oncology only a couple of months, at the best (*3,1 months!*)**

Cardiology: *A success…….but!*

- In Europe, a heart attack every 26 seconds
- A CV death per minute
- 1,9 million deaths per year

But…*A partial success*

- We have not reduced CV death
- We have postponed it
- We have transformed an "*acute*" into a "*chronic*" pathology

In practice

- We have just contributed to population aging
- And to the increase of health care and research costs

The unsolved issue: public money spending

Health is priceless!

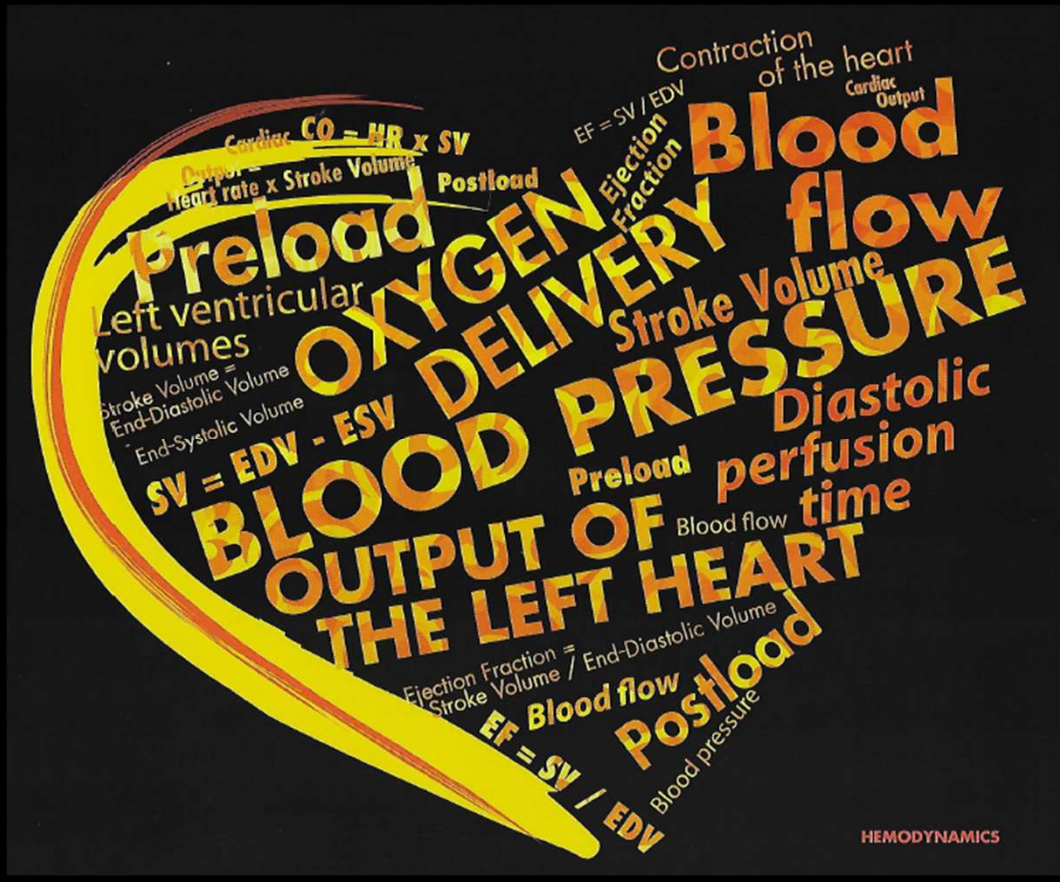
But

Health is costly!

- **Health is a right, therefore it's a political issue**
- **Health system is a political and technical issue based on evidence (*Research*)**

Cardiology has come a long way but now it stands among crossways

- Philosophic questions
- Economical issues
- Digital, big data, precision health
- Genetics, genomics, proteomics, Epigenetics, regeneration
- Patient-centred research



Physolophic questions:

- How long do we aim to improve (*CV*) life?
- Should we provide Anni Vita (*years of life*) or Vita agli Anni (*life to years!*)?
- We can beat pathology but not physiology!

Definition of the goal

- Actually there is no life without death
- Death (*apoptosis*) and regeneration is an integral part of Nature/Universe
- Life (*regeneration*) and death (*apoptosis*) cycle is neither good nor bad in Nature

It is essential!

Economic issues

- With aging CV trials have grown in size, complexity, and cost
- 95% of failure, 10-15 years from idea to approval, > 2 billion dollars per drug
- Health care costs will soon be unsustainable
- We need solutions

Which will be the solution?

- A change of healthcare landscape where digital technologies are increasingly integrated into everyday delivery of healthcare
- This seems to be the future highly wanted by politicians, patients, industries, nurses, but…not necessarily by doctors

An app a day keeps the doctor away!

- "*Alexa*" from Amazon is substituting GP in UK
- "*Babylon's GP at hand*" is used by 2 million citizens just in North London and features "*a triage*" as alternative to the NHS
- There are today more than 300 000 health-related apps!

Patients are being told to ask Amazon's virtual assistant, Alexa, to diagnose their symptoms rather than go to hospital or their GP, the Metro reports. The paper says the move is part of a tie-up between Amazon and the NHS.

But…what can be found in app stores?

- App developers have little or no medical training
- Often do not even involve physicians
- Not all apps with potential medical impact are undergoing regulatory process
- If you are not paying for the app, you are not the customer and **you and your data are the products to sell**

Even worse than that: "*Google has swallowed up DeepMind Health*" and abolished its independent Board

- Google has acquired "*DeepMind Health*", a software company founded in 2014
- DeepMind Health had a mobile app (*Streams*) for British NHS clinicians which promised the data would not be used by Google!

The real issue is: can any system contrast Google when is promising a "*quantum computing*"?

- Scientists have found a new milestone known as "*Quantum Supremacy*"
- Its processor is able to perform a calculation in less than 4 minutes that would take Summit, the most advanced classical computer, 10,000 years to do

Philips®' Blog – the future? Any company can become a healthcare provider

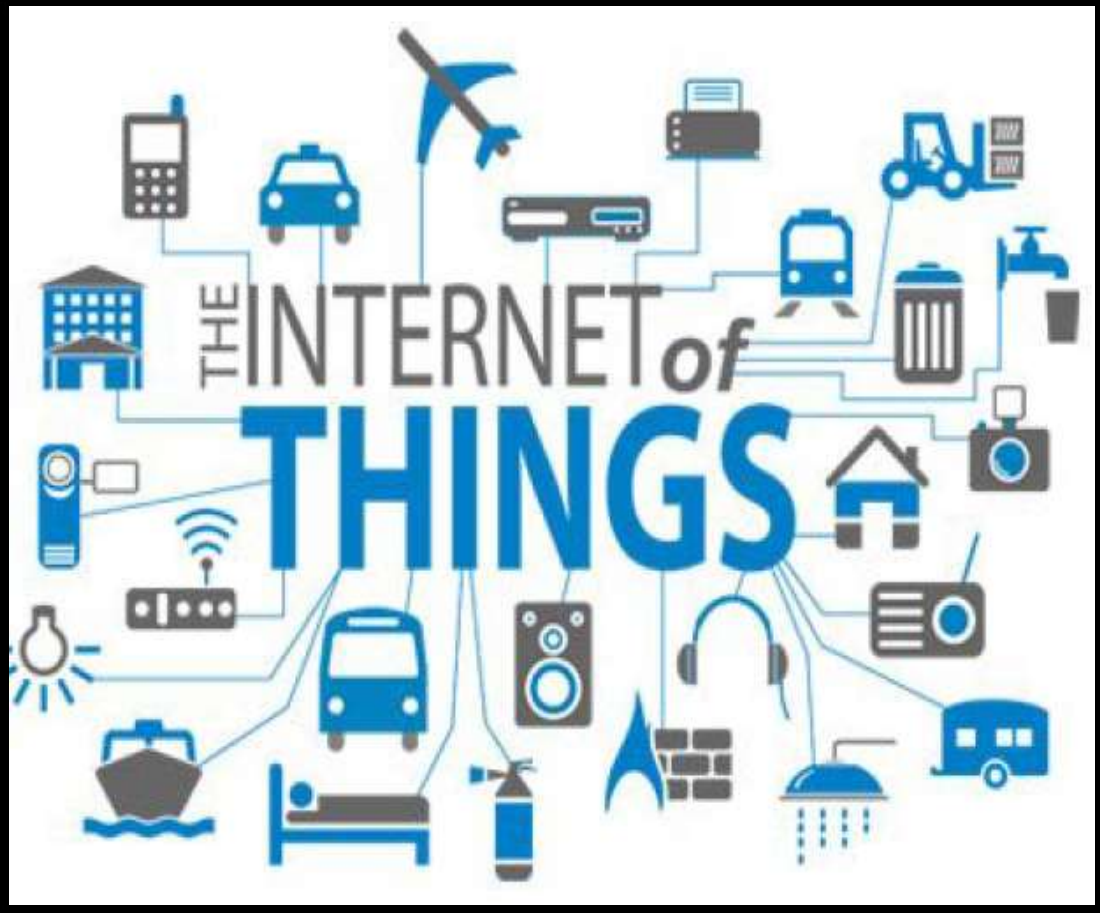
Jeroen Tas,
CEO, Informatics Solutions & Services
@jeroentas

- 'Consumerisation of the healthcare industry is developing very rapidly – a "recalibration"
- 'The Internet of Things empowers consumers to take control of their health
- 'Connected devices – tablets, wearables, hand-held devices – linked to EMRs will:
  - enhance decision making powers of professionals, and
  - enable patients to take a more active role in managing their health
- 'As the consumer takes more control..the business model of the healthcare industry will need to revolutionise

So a totally new wording for the future

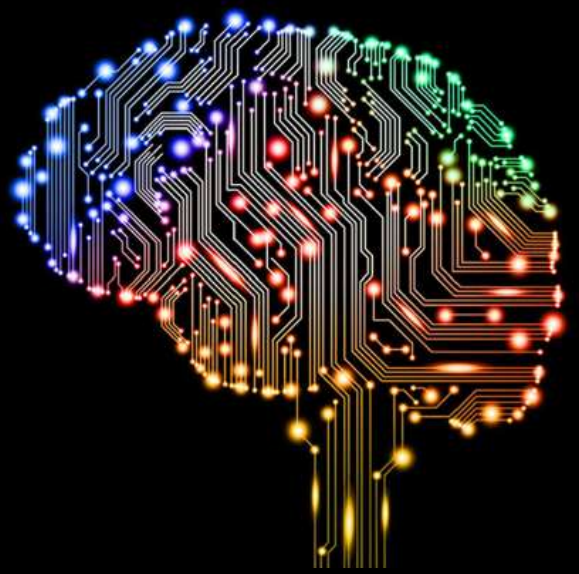
- **E-Health**: the use of information and communication technologies for health
- **Mobile Health**: the practice of Medicine and Public Health through the entire life supported by medical devices
- **Internet of things**: interrelated computing devices, machines, objects, animals or people able to transfer data to a network without requiring human to human or human to computer interaction

Digital and precision health, monitoring, big data: *will they be the solution?*



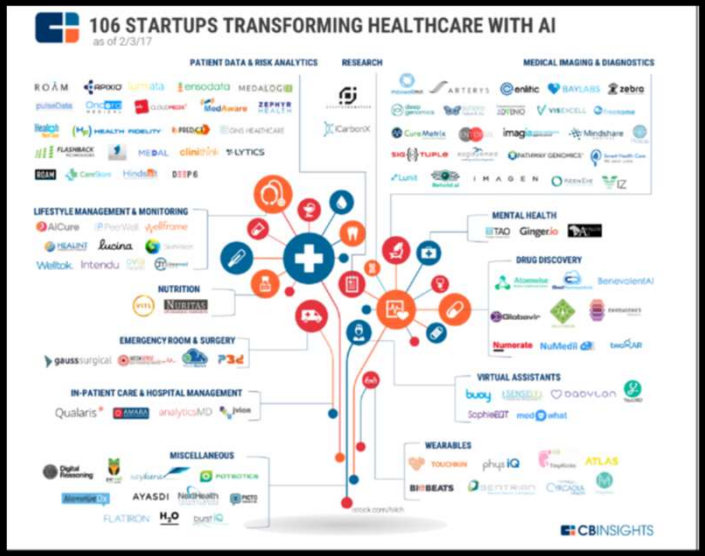
Digital and precision health, monitoring, big data: *will they be the solution?*

Artificial Intelligence



Drug delivery

Already started



World Diabetes Day: political advertising… bring changes

The Freestyle Libre flash glucose monitoring system, used by Prime Minister Theresa May, who has the autoimmune condition, was made available on the NHS last November.

But recent research suggested only 3-5% of type 1 patients in England had access to the monitors on the NHS, when 20-25% were eligible.

This was because some local clinical commissioning groups decided not to prioritise funding of the devices.

https://www.bbc.co.uk/news/health-46198366

NEWS

Health

Diabetes glucose monitors 'available to thousands more'

43 minutes ago

Wearable glucose monitors will be made available to tens of thousands more people with type 1 diabetes from April 2019, NHS England has announced.

Its decision comes after an investigation found patients in some areas of the country were being denied access to the device.

It reduces the need for finger-prick blood tests and helps people with diabetes to manage their condition.

Diabetes charities called the change of policy a huge step forward.

In England, around 300,000 people have type 1 diabetes.

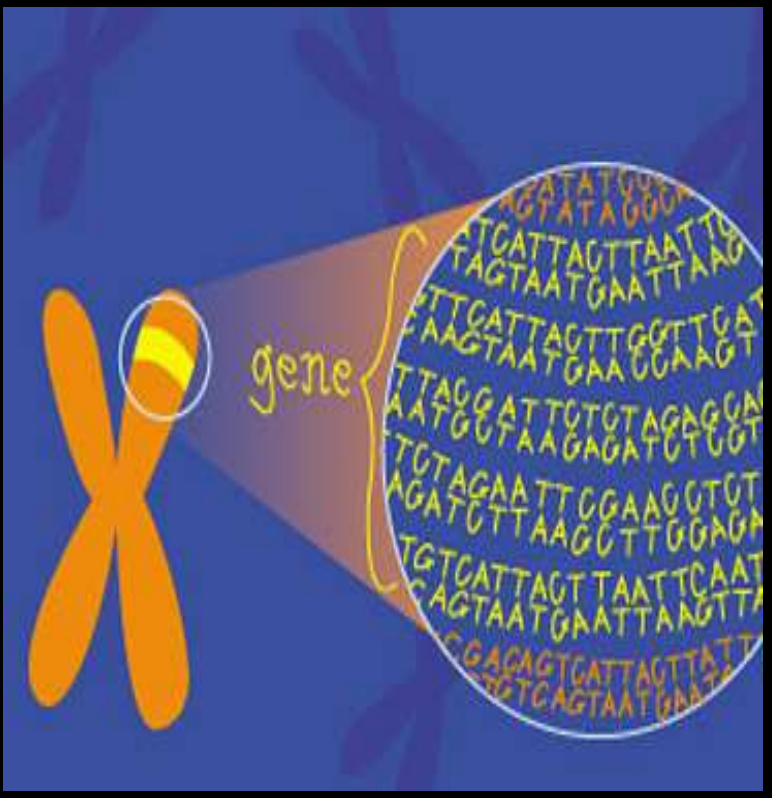
Will this be the solution? Somebody thinks so

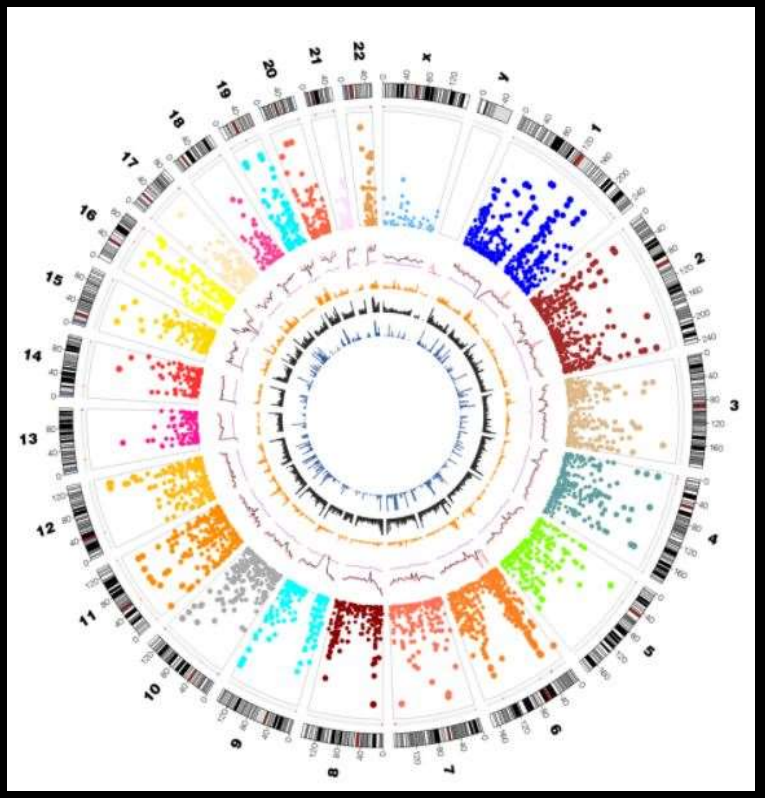
Politicians do see a grey world but believe in a tech "*Savvy*"

Ex-European Commission Vice-President

- e-Health will reduce costly visits to hospitals, help citizens take charge of their own health and wellbeing, and move towards prevention rather than cure
- It is also an opportunity for the booming app economy, for health, and for entrepreneurs

Will the rapid advances of genetics, proteomics, personalized health be the solution?





- **At present, Genotype-phenotype relationship is complex and environmental related, even for pathology with high genetic selection**
- **However, in 2017 the «*US Genetic Testing Registry*» has collected information on > 100,000 tests performed in 500 labs for 10,733 pathologies related to >26,000 genes!**
- **It follows that, evidence and Guidelines in Genetics are an *absolute priority***

New models of patient care and Research

- Computers recognise small variation better than humans
- Patients directly participate/run research as a civic duty
- In Sweden, 1/5 of the population is in contact with “my healthcare contact system”. 435,000 contacts per month
- Today, patients have a voice (*Twitter/Facebook*) and create networks of communication, generating solidarity, and hopes

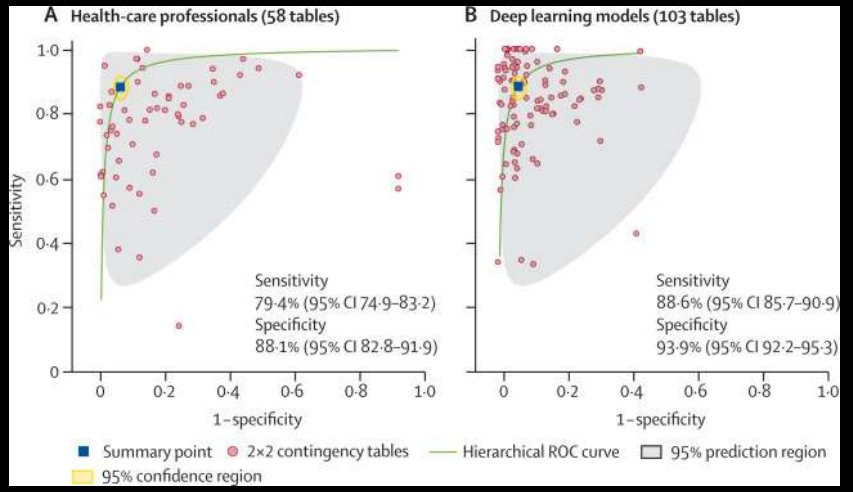
The Apple watch changes the paradigm: the patients inform the doctors, not viceversa!

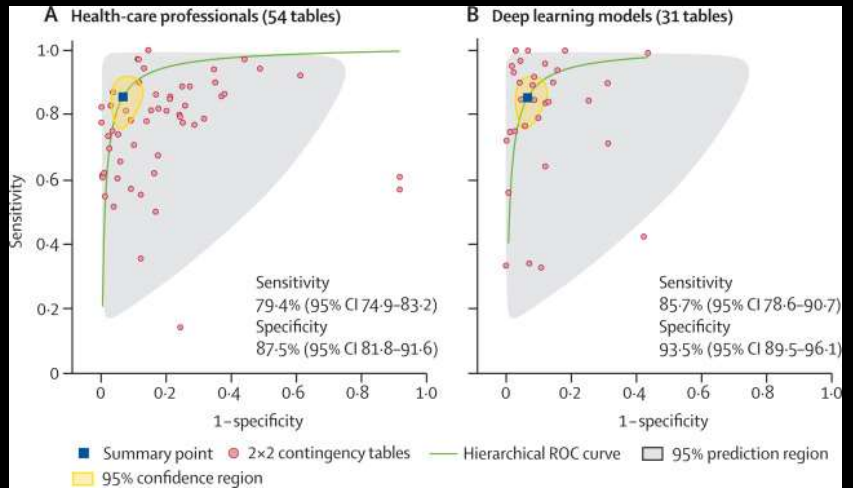
Somebody went to Argentina and called his doctor in Europe saying he was in AF

The globalised world is more and more connected: the Tallinn example

Deep learning imaging vs human diagnostic

- A metanalysis of 69 well conducted studies study provide 92% specificity for deep learning and 90% for healthcare professionals!
- Poor reporting is prevalent in deep learning studies and should be improved
- Thereafter… what remains for the doctors?

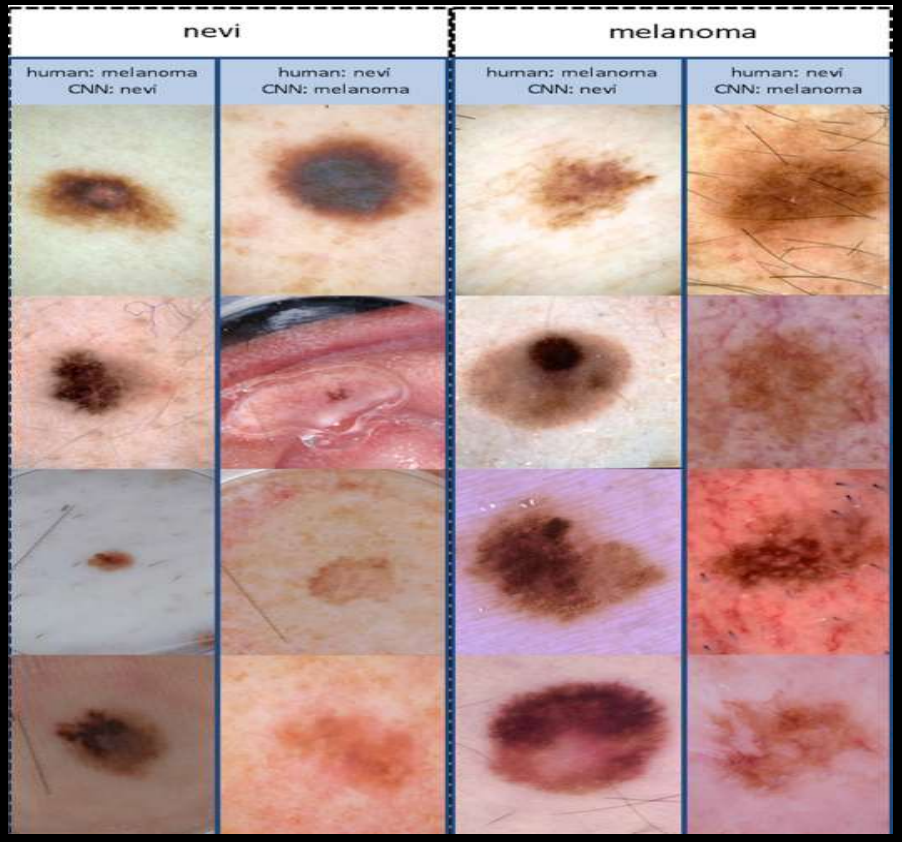




Lancet Digital Health, 2019

Deep neural networks are superior to dermatologists in melanoma image classification and for detection of diabetic retinopathy

- Automated dermoscopic melanoma image classification was shown to be significantly superior to both junior and board-certified dermatologists (*p<0,001*).



Eur J Cancer, 2019

Highly technical procedures more accessible

- If you are investing in echocardiography …think twice!
- A robot will do it for us!

Even GL will be engaged: NICE's future ambition for use of data and analytics

Develop and update guidance more rapidly than we can achieve currently

Provide answers to questions that we cannot answer using our traditional approaches

- Extrapolation beyond clinical trials – predictive effectiveness
- Validation of intermediate outcomes

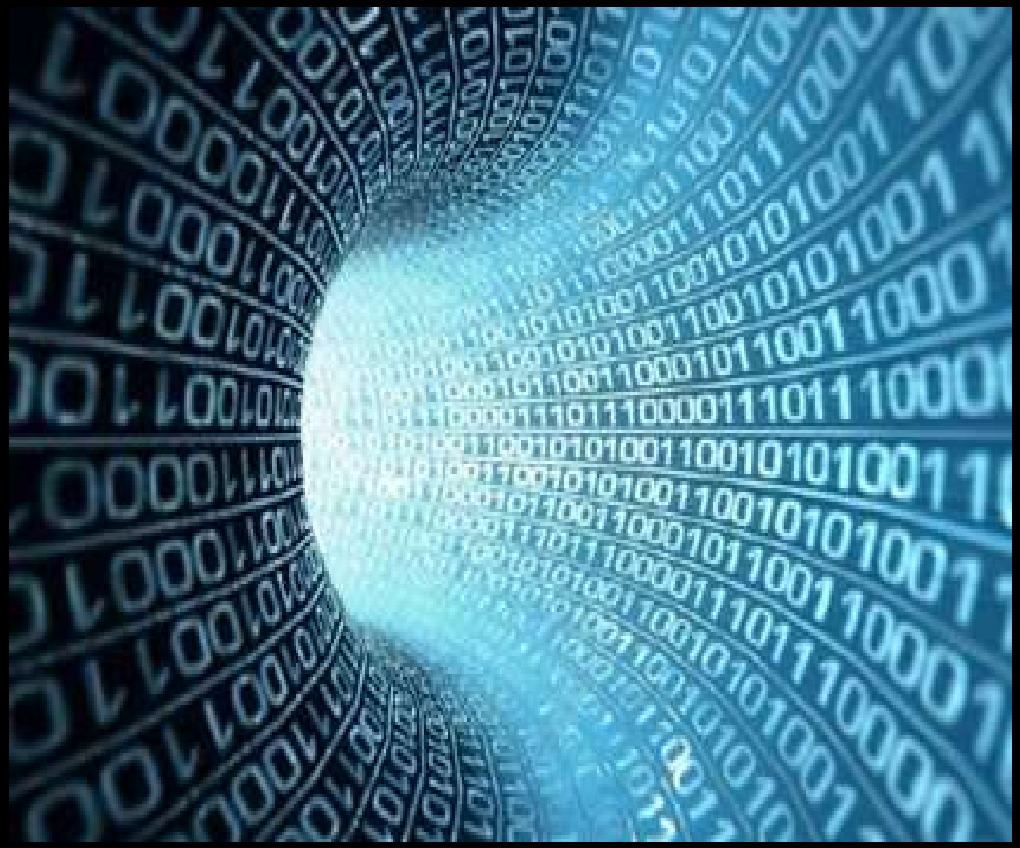
Measure the effectiveness of interventions in real-world settings;

Improve our tracking of guidance implementation, uptake and impact, and use of this information to inform the need to update.

NICE

Data, data, data everywhere and… Can we analyse them? And what are we analysing?

- How accurate?
- Is the coding correct?
- No adjudication
- Interpretation of evidence
- Effects on totally unselected population



Digital Medicine and Artificial Intelligence (*AI*): a very polarised opinion!

- The opportunity of AI in healthcare is unprecedented
- It is the worst that can ever happen to healthcare
- Today, Digital Medicine and AI are superior to human intelligence in diagnosis and prediction of several medical conditions

Digital Medicine and Artificial Intelligence (*AI*): a very polarised opinion!

- Digital Medicine and AI are far from demonstrating high and reproducible accuracy, they are highly dependant from reliability of data and coding
- AI is not as good as a full work up by a doctor but it's an interesting step forward in flagging up heart problems

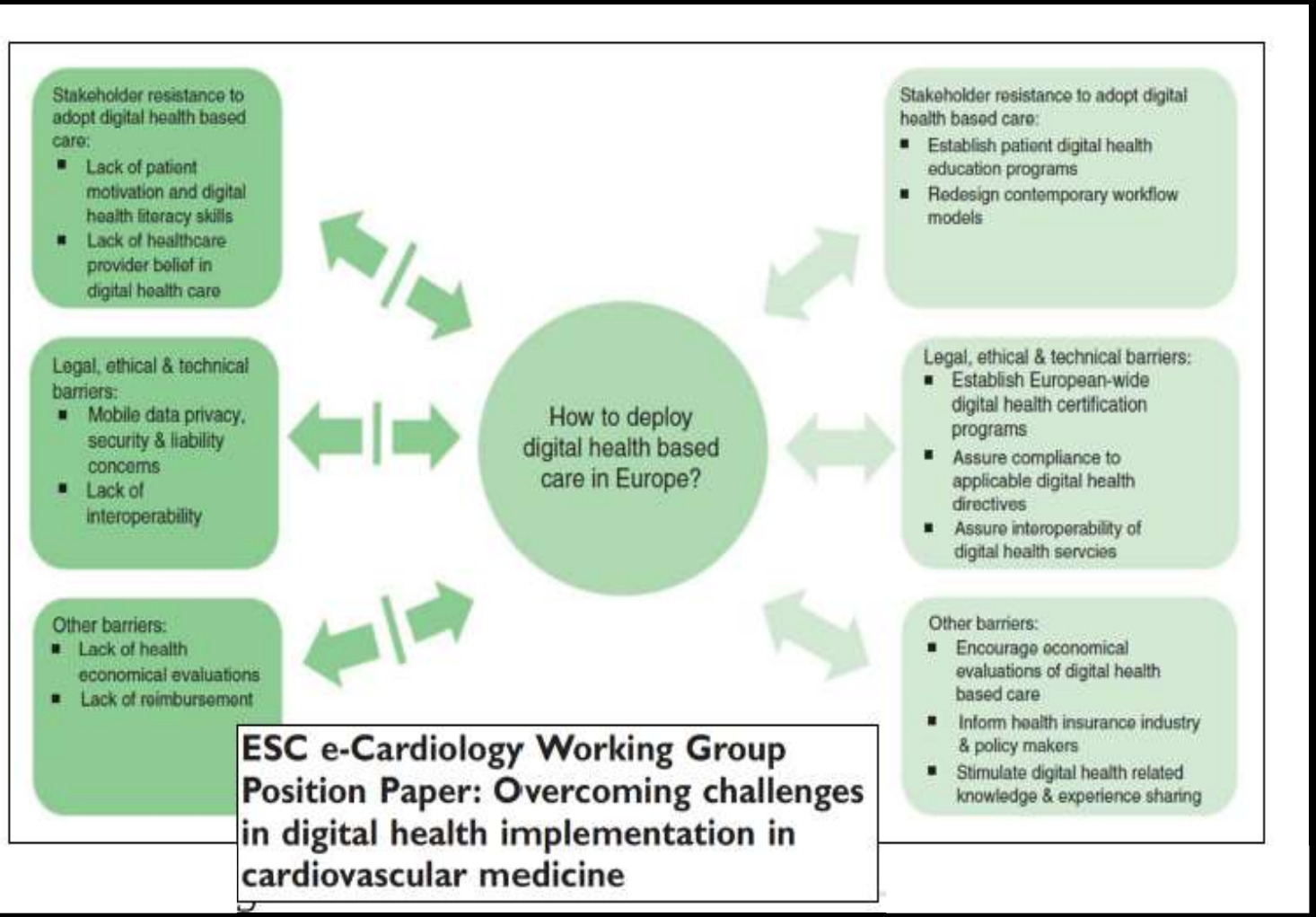
All good but…In Europe chaos reigns

73% of member states **do not** have an entity responsible for the **regulatory oversight** of the quality, safety, and reliability of e-Health

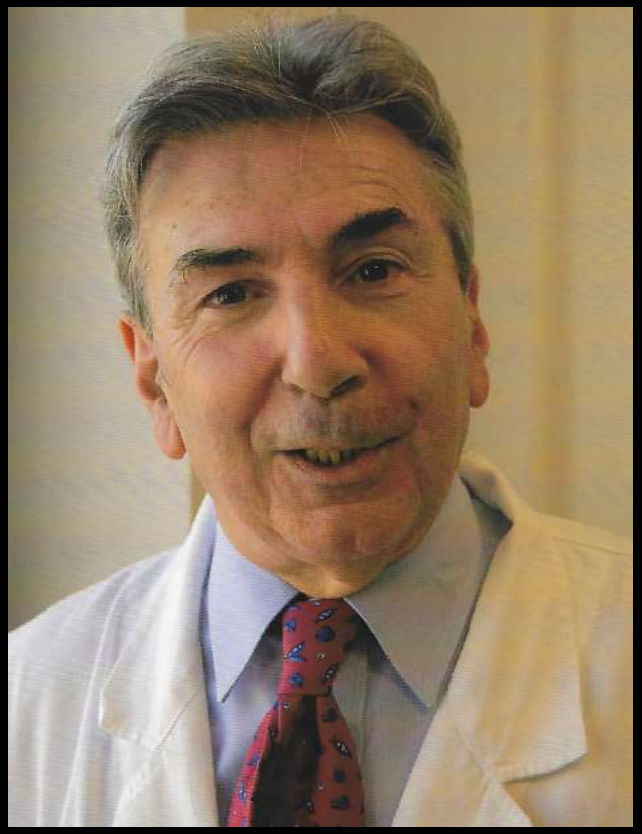
57% do not have policies or legislation that defines **medical jurisdiction, liability**

The "*doctors*" (*Medical Communities*) **are bypassed** and should "***wake up***"… "***quickly***"!

Barriers and solutions…

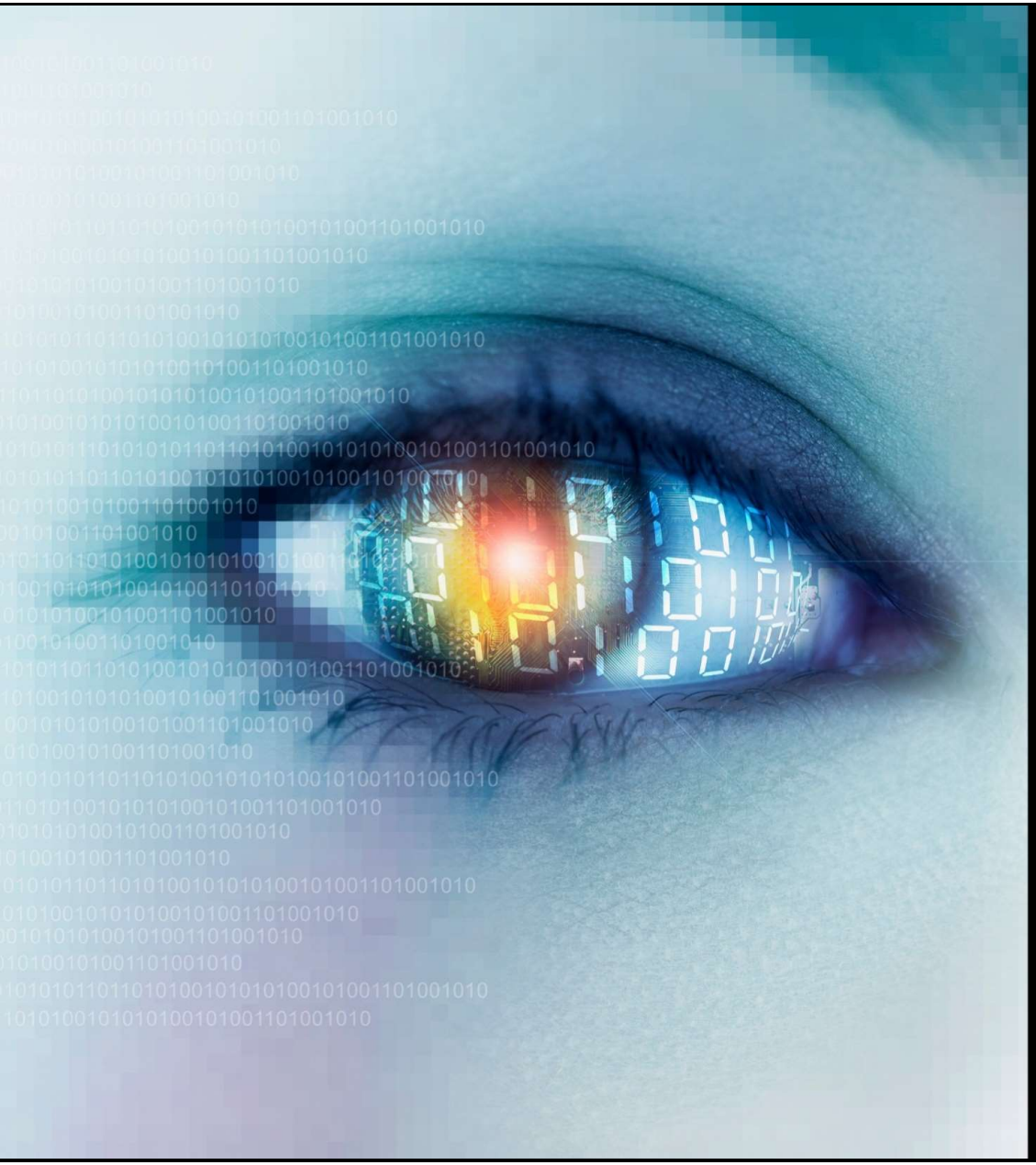


Will I be the same cardiologist in 2050…?



In any case…I will not reach 2050!

The rapid cardiologist evolution…



Transformation of Health Care and of the cardiologist profession

- Less classical (*diagnostic*) cardiologists → more epidemiologists, genetists, imaging doctors, etc
- Still several but different "*acting*" cardiologists

The "*acting*" cardiologists: a fusion between interventionists and surgeons

- The opportunity is to have a future generation of heart surgeons with skills in interventional cardiology (*and not only*) and vice versa
- To have a real (*and better*) heart team where, instead of competing each other to perform a procedure, physicians will do it together!
- Tertiary care will shift from achievement of individual experts toward cooperation among individuals and groups

Conclusions

- A new Medicine is just starting and Cardiology is part of it
- Health will integrate data analysis, artificial intelligence, sensor-based technologies, and big data
- This will transform:
  1. The medical profession (*medical art*)
  2. The Research (*culture*)
  3. Care delivery (*Health System*) and…
  4. The patient (*no longer passive*)

Conclusions

- The future looks great for patients (*first*) and for us (*cardiologists, interventionists, and surgeons*) if we – *and not others* – will lead the changes
- Imagine that we could:
  1. Capture the messages of the body
  2. Look into the body (*imaging*)
  3. Act inside the body in an integrated way

Conclusions

4. Repair broken parts of the body (*Regeneration*)

5. Re-programme the body (*Genetics*)

- This needs team building: group trust vs individual trust and … new teachers for new cardiologists
- Let's be part of it!

And shape the future together…

The current Digital Healthcare landscape

The ESC's journey