
Marc Noppen, MD, PhD
CEO, University Hospital UZ Brussel, Belgium
The Quest for the Holy Grail
The IHI Triple Aim

Population Health

Experience of Care  Per Capita Cost

No more Business as Usual in Healthcare

• Five disruptive forces:
  – The Greying patient (and Provider…)
  – The Lifestyle Epidemic
  – The Information Revolution
  – The Blessing and Curse of Technology
  – The New Health Care Consumer
The Greying Patient (and provider...)
The Greying Patient (and provider...)

<table>
<thead>
<tr>
<th>Totaal</th>
<th>Mannen</th>
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<th>Leeftijdspiramide</th>
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<td>N</td>
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<td>273</td>
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<td>69,6</td>
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<td>35 &lt; 40</td>
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2017 IHFTAIPEI 41st World Hospital Congress
The Lifestyle Epidemic

Projected Rise in Cases of Seven of the Most Common Chronic Diseases, 2003–2023

- Cancers: 62%
- Mental Disorders: 54%
- Diabetes: 53%
- Heart Disease: 41%
- Hypertension: 39%
- Pulmonary Conditions: 31%
- Stroke: 29%

Source: The Milken Institute
The Lifestyle Epidemic

Risks leading to death in perspective

- Smoking
- High blood pressure
- High cholesterol
- War
- Medical complications
- Pregnancy & birth
- Murder
- Illicit drug use
- Transport accidents
- Infections
- Non-transport accidents
- Alcohol
- Physical inactivity
- Low fruit and vegetables
- Obesity
Why an investor at Andreessen Horowitz thinks software is the future of healthcare

It's not exactly surprising that a partner of a venture capital firm with a tagline that "software is eating the world" thinks the same could be said for the drug industry.

Vijay Pande, a general partner at Andreessen Horowitz, runs the firm's bio fund. So far, the fund's made investments in companies including Freenome, which is developing a blood test that screens for the earliest signs of cancer, and Q, a startup that wants to quantify the human physiology.

Pande's argument, as he explained to Business Insider, is that as health-technology advances, we might be able to start replacing physical pills (the hardware) with software. At least the idea is that when medicines (think: antibiotics) can't get replaced, we might be able to get the treatment options to the right people.

Mining Internet searches yields clues to lung cancer diagnosis

Are people even more honest about their health concerns as they are when they type health questions into Internet search engines?

Two top Microsoft health researchers think it's a fair question, and set out to mine search logs to identify risk factors for the nearly 80 percent of cases of lung cancer found in non-smokers. Their work also could help diagnose lung cancer earlier, since 75 percent of patients are diagnosed at Stage III or IV of the disease, according to a study published online Thursday in JAMA Oncology.

This is a follow-up to a study that appeared in the August edition of the Journal of Oncology Practice. That study found that search engines — in this case, Microsoft's Bing — could yield clues to help diagnose pancreatic adenocarcinoma.
The Information Revolution
The Blessing and Curse of technology

TURNING SCIENCE FICTION INTO SCIENCE REALITY
The $10 million global competition to put healthcare in the palm of your hand.

QUALCOMM TRICORDER XPRIZE

LEARN MORE

- Multi-spectral imager: Measures patient's colour changes. Quicker but less detailed than hyper-spectral imager.
- High definition infra-red imager: Measures temperature changes, which can be a sign of problems.
- Mass spectrometer for breath analysis: Looks at body's metabolism and detects bacteria.
- Propaq monitor: Standard NHS machine that measures pulse, blood pressure and electrical activity of heart.
- Supra-thoracic ultrasound: Ultrasound, measuring heart function.
- Thoracic electrical impedance monitor: Shows how well heart and circulation is working.

LCD monitors: Show imaging data
Spirometer: Measures breath volume, depth and speed, and picks up gases linked to infection.
Gas sampling instrument and capnograph: Gauges oxygen and carbon dioxide in body.
The Blessing and Curse of Technology

US approves first cancer drug to use patient's own cells – with $475,000 price tag
The New Healthcare Consumer
( and Provider...)

THE EMPOWERED PATIENT

THE TRADITIONAL PATIENT
- Lets others control his health
- Is unaware that technology can put him in control
- Solely relies on caregivers for information concerning his personal health

THE EMPOWERED PATIENT
- Takes control of his own health
- Is used to control his life using new technologies, and expect to do the same with his health
- Is informed and uses different online channels and communities to stay informed about medical conditions, medicine and therapies
The New Healthcare Consumer
( and Provider...)

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>War</td>
<td>Wartime rationing</td>
<td>Cold War</td>
<td>Fall of Berlin Wall</td>
<td>9/11 terrorists attacks</td>
<td>Economic downturn</td>
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<tr>
<td>Rock’n’roll</td>
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<td>‘Swinging Sixties’</td>
<td>Reagan/Gorbachev/Thatcherism</td>
<td>Social media</td>
<td>Global warming</td>
</tr>
<tr>
<td>Nuclear families</td>
<td>Moon landings</td>
<td>Woodstock</td>
<td>Live Aid</td>
<td>Invasion of Iraq</td>
<td>Mobile devices</td>
</tr>
<tr>
<td>Defined gender</td>
<td>Youth culture</td>
<td>Family-orientated</td>
<td>Early mobile technology</td>
<td>Reality TV</td>
<td>Cloud computing</td>
</tr>
<tr>
<td>Jobs for life</td>
<td>Organisational - careers are defined by employees</td>
<td>“Portfolio” careers - loyal to profession, not to employer</td>
<td>Digital entrepreneurs - work “with” organisations</td>
<td>Multitaskers - will move seamlessly between organisations and “pop-up” businesses</td>
<td></td>
</tr>
<tr>
<td>Automobile</td>
<td>Television</td>
<td>Personal computer</td>
<td>Tablet/smartphone</td>
<td>Google glass, 3-D printing</td>
<td></td>
</tr>
<tr>
<td>Formal letter</td>
<td>Telephone</td>
<td>E-mail and text message</td>
<td>Text or social media</td>
<td>Hand-held communication devices</td>
<td></td>
</tr>
<tr>
<td>Face-to-face meetings</td>
<td>Face-to-face ideally but increasingly will go online</td>
<td>Online – would prefer face-to-face if time permitting</td>
<td>Face-to-face</td>
<td>Solutions will be digitally crowd-sourced</td>
<td></td>
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</table>
...in a world with limited budgets...

1. Total expenditure excluding capital expenditure.

Source: OECD Health Statistics 2014.
...where many needs have been met...
...and spending yet more money is insane...
…where 1 out three dollars/euro’s/…spent is pure waste…

Average U.S. Healthcare Spending per Person in 2014
$9,700

Total Wasted Spending per Person ........ $2,910
..where 50% of the total budget is spent on 5% of the population...

Note: Dollar amounts in parentheses are the annual expenses per person in each percentile. Population is the civilian noninstitutionalized population, including those without any health care spending. Health care spending is total payments from all sources (including direct payments from individuals and families, private insurance, Medicare, Medicaid, and miscellaneous other sources) to hospitals, physicians, other providers (including dental care), and pharmacies; health insurance premiums are not included.

...and where less than 5% is spent on prevention...?!
"It is not the strongest or the most intelligent who will survive but those who can best manage change."

—Charles Darwin
1. Organize into Integrated Practice Units (IPUs)

2. Measure outcomes and costs for every patient

3. Move to bundled payments for care cycles

4. Integrate care delivery across separate facilities

5. Expand excellent services across geography

6. Build an enabling information technology platform
How to maximize value for patients in the HC system

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<td>Value</td>
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<td>Information</td>
<td>Retrospective</td>
<td>Real-time &amp; predictive</td>
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<tr>
<td>Leadership style</td>
<td>Managerial divisional/departemental</td>
<td>Thinking across organisation</td>
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<td></td>
<td>thinking</td>
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**Leadership style**

- Managerial divisional/departemental thinking
- Thinking across organisation
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= networks
Current Fee-for-Service Payment System

The Problem
Care is fragmented instead of coordinated. Each provider is paid for doing work in isolation, and no one is responsible for coordinating care. Quality can suffer, costs rise and there is little accountability for either.

$  $  $  $
Hospital  Specialist  Primary Care  Home Health

Patient-Centered Global Payment System

The Solution
Global payments made to a group of providers for all care. Providers are not rewarded for delivering more care, but for delivering the right care to meet patient’s needs.

$  
Primary Care  Hospital  Specialist  Home Health

Source: Recommendations of the Special Commission on the Health Care Payment System, July 2009
Netwerking: the New Holy Grail..?
The Hospital of the Future is a Network

Published on February 17, 2017

Jeroen Tas
Chief Innovation & Strategy Officer at Philips

Connecting Care for Continuous Health
It should start within the organisation

Human development
Overview of the main (organizational) paradigms

Levels of Consciousness

TURQUOISE
TEAL
GREEN
ORANGE
AMBER
RED
MAGENTA
INFRARED

Effective matrix, predict & control, “the carrot”, shareholder perspective
relationships above outcomes, stakeholder perspective
self management for evolutionary purpose

formal hierarchies command & control “the stick”
powerful chiefdoms
authority by the Elders
foraging bands
MINDSET SHIFTS FOR Organization Transformation

From PROFIT to PURPOSE

From HIERARCHIES to NETWORKS

From CONTROLLING to EMPOWERING

From PLANNING to EXPERIMENTATION

From PRIVACY to TRANSPARENCY

Tanmay Vora @tnvora QAspire.com
Changing the Glue that holds people together in organisations
Governance → Strategy & Management → Real Life
Build it INTO the organisation

- Autonomy and motivation
- Purpose-driven
- Sense and adapt
- (Temporary) roles
Holacracy takes powers traditionally reserved for executives and managers and spreads them across all employees.

In a traditional hierarchy, layers of management establish how products are approved and monitored.

- **Super-circle**: One that contains sub-circles. This could be Marketing.
- **Role**: A task related to a function. This could be Social Media Producer.
- **Sub-circle**: Each is dedicated to a function. This could be Digital Advertising.
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- **ROLE**: A task related to a function. This could be Social Media Producer.
- **SUB-CIRCLE**: Each is dedicated to a function. This could be Digital Advertising.
- **CEO**
- **UPPER MANAGEMENT**
- **MIDDLE MANAGEMENT**
- **SUPERVISOR**
- **STAFF**
Focus on CARE in horizontal networks

Focus on specialisation in clinical networks
Clinical Networks: Medical Offer

Subsidiarity Principle
Care- and task distribution in continuity
Can change over time
(Supra) regional networking
Architecture

- 25 locoregional “basic care” hospital networks in Belgium
- Each serving a 400-500,000 population
- Bottom up approach with (very) little government framework
- Complementary portfolio within a network
- Supra-network collaborations in referral care
- Programming (and financing) would follow...
- “Light” governance models
Hospital networks: quo vadis?
BUT...!

HEALTHCARE ORGANIZATIONS (HCO) are **Complex adaptive systems**

Characteristics of Complex Systems

- Across types of systems, across scales, and thus across disciplines
- Which exhibit common behaviors
- Giving rise to a number of hierarchical levels
- Dynamically interacting
- Many components

Complex Systems Involve

- Emergence
- Hierarchies
- Control Structures
- Self-Organization
- Decomposability into Subsystems

Kinds of (Sub)Systems

- A 'complex' system
- A 'simple' system
Model for Understanding Health Systems Changes as Complex Adaptive System

- **Perturbation (Program/Intervention)**
- **External Environment Changes**

**Complexity in Health System**
- Diversity
- Connectedness
- Interdependence
- Learning
- Types of actors in health system
- Closeness of actors
- How actors respond to each other
- Adaptation or new structures

**Outcomes**
- Intended Outcomes
- Unintended Consequences
- Health Services
- Health Status
- Distorted services
- Synergies
- Unsustainability

**Patterns of Change**
- Non-complex: Disorganization, Linear, Equilibrium, Periodic Orbits
- Complex: Cascading, Tipping Points, Phase Transitions, Path Dependence, Emergent Structures

**Time**
- Observation:
## Characteristics of Complex Adaptive Systems

<table>
<thead>
<tr>
<th>Complex Adaptive Systems</th>
<th>Traditional Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are living organisms</td>
<td>Are machines</td>
</tr>
<tr>
<td>Are unpredictable</td>
<td>Are controlling and predictable</td>
</tr>
<tr>
<td>Are adaptive, flexible, creative</td>
<td>Are rigid, self-preserving</td>
</tr>
<tr>
<td>Tap creativity</td>
<td>Control behavior</td>
</tr>
<tr>
<td>Embrace complexity</td>
<td>Find comfort in control</td>
</tr>
<tr>
<td>Evolve continuously</td>
<td>Recycle</td>
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Complex Systems

- Unpredictable
- Multiple and circular causality
- Self-organized, Cooperative, Synergistic
- Obey asymmetric statistics
- Modular
- Robust
- Open systems
- Non-linear
- Adaptative
Complex Systems

Emergence over scale

Self-Organization over time

Game Theory
- Prisoner's dilemma (PD)
- Rational decision making
- Iterative PD
- Bounded rationality
- Cooperation versus competition
- Evolutionary game theory

Collective Behavior
- Social dynamics
- Collective intelligence
- Herd mentality
- Self-organized criticality
- Agent-based modeling
- Synchronization
- Ant colony optimization
- Particle swarm optimization
- Swarm behavior

Nonlinear Dynamics
- Time series analysis
- Ordinary differential equations
- Iterative maps
- Phase space
- Attractors
- Stability analysis
- Population dynamics
- Multistability
- Bifurcation
- Coupled map lattices
- Chaos

Systems Theory
- Homeostasis
- Feedbacks
- Self-reference
- Goal-oriented/guided behavior
- Sense making
- Cybemetics
- Information theory
- Complexity measurement

Pattern Formation
- Spatial fractals
- Reaction-diffusion systems
- Partial differential equations
- Percolation
- Cellular automata
- Spatial ecology
- Self-replication
- Spatial evolutionary biology
- Geomorphology

Networks
- Social network analysis
- Community identification
- Centrality
- Robustness/Vulnerability
- Systems biology
- Dynamical networks
- Adaptive networks

Evolution & Adaptation
- Artificial neural networks
- Evolutionary computation
- Genetic algorithms/programming
- Artificial life
- Machine learning
- Evo-Devo
- Artificial intelligence
- Evolutionary robotics
- Evolvability
What is missing ...

- The acceptance of “Healthcare” as being a CAS (Complex Adaptive System) with its own governing laws
- Hence the role of Serendipity
- The importance of IKIGAI ("the purpose")
**ikigai**

*ikigai* is the Japanese concept of “a reason for being.” Everyone has an *ikigai*. To find it requires a journey of self discovery. But the search is worth it.

Your *ikigai* is the meaning to your life.
“Public Health Ikigai”

“Personal Ikigai”
...so we should *never, never* forget the Purpose, The Human Factor...
...’cause *this* is the true Holy Grail...