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# The Physician in the 21<sup>st</sup> Century

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# For thousands of years...

## The practice of medicine has been a “traditional profession”

# UNTIL NOW

- A physician's knowledge and skills are the foundation of the care of patients
- The doctor-patient relationship was paramount
- The foundational idea of this personal, caring relationship has stood the test of time

# Fundamental change is on the way

- 21<sup>st</sup> century trends are transforming some of the most basic and timeless qualities of medicine
  - The nature of the “guild” and the locus of knowledge
  - The sacrosanct doctor-patient relationship
  - The ability to solve patient problems single-handedly
  - A medical marketplace driven by technology, artificial intelligence, and consumer empowerment
  - Practices focused on precision medicine

# Some drivers of 21<sup>st</sup> century medicine

[alphabetically]

- 1. Changing market forces**
  - Politics and policies
- 2. Consumer empowerment**
  - Population demographics
  - Disease patterns
  - Globalization
  - Pace of change
- 3. Science**
  - Societal needs and values
- 4. Technology**

# 1. Changing market forces

- Trillion-plus dollar spend on healthcare offers enormous opportunities for companies and entrepreneurs
- Wave of consolidation in healthcare
- Restraints on practice are weakening
  - Information and services delivered directly to patients, bypassing the profession

# Some obvious examples

- Ambulatory Care<sup>1</sup>
  - Retail Clinics – now over 1900 and growing. CVS, Walgreens, Kroger, and Target have clinics in only 8% of their 20,000 stores
  - Urgent Care Centers – about 6400 with annual growth rate of 300-600 per year
- Direct to consumer marketing and advertising
  - Drugs
  - Diagnostics
  - Wearables

1. Convenient Ambulatory Care – Promise, Pitfalls, and Policy. Chang JE, Brundage SM, Chokshi DA, *N Engl J Med* 2015;373:382-388/July 23, 2015.

## 2. Consumer Empowerment

- Through:
  - Knowledge
  - Technology
  - Social Media
  - Loosening of restrictions (e.g., direct to consumer advertising)

# Where does this leave the health professional?

“...self-testing and self-interpretation could cause even more problems than they aim to solve...it is not clear that healthy people or patients can be trained to use diagnostics more wisely.”<sup>2</sup>

2. Ioannidis JPA, Stealth research and Theranos. *JAMA* 2016;316:389-390.



## 3. Science

- We are entering a new era in medical discovery that will focus on precision medicine

medical care designed to optimize efficiency or therapeutic benefit for particular groups of patients, especially by using genetic or molecular profiling

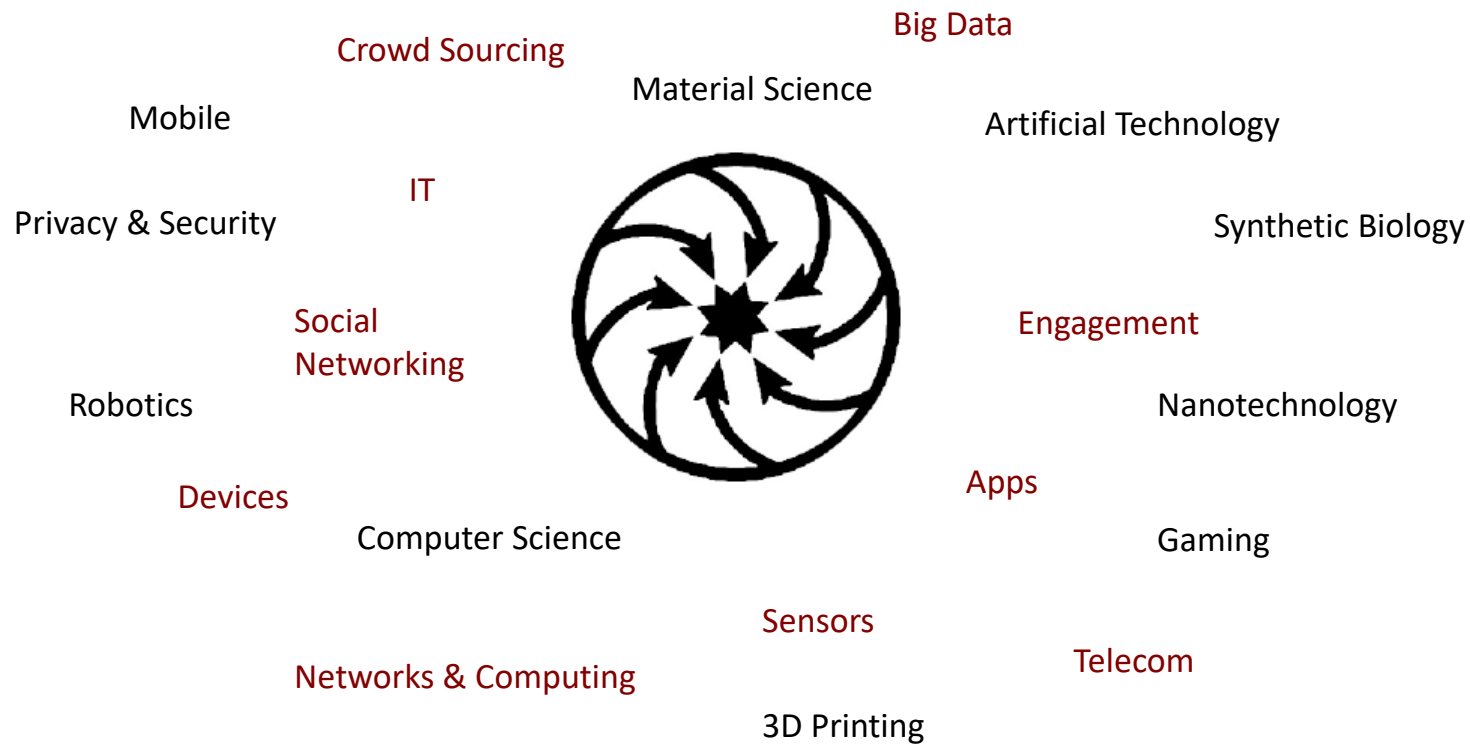
- This changes the paradigm for care delivery, drug discovery, and virtually everything else

## 4. Technology

- We are moving from a print-based industrial society to a technology-based Internet society<sup>3</sup>
- We are in the midst of a “technologic convergence”

3. Susskind R and Susskind D. *The Future of the Professions*. 2015: Oxford University Press.

# THE TECHNOLOGIC CONVERGENCE



- Slide attributed to Daniel Kraft, Singularity University -

# A few game-changing technologies<sup>4</sup>

- Portable Diagnostics
- AI in decision-making
- The end of human experiments
- Augmented reality
- Social media
- DIY biotechnology
- Direct-to-consumer genomics
- Surgical and other robots
- Augmenting human features
- Nanorobots in our bloodstream

4. The Medical Futurist, 4/12/16.

# What about machines?

- “Human professionals will have to come to terms with the need to defer to the superior capabilities of machines.”<sup>5</sup>
- “You’ll be paid in the future based on how well you work with robots”<sup>6</sup>

5. Susskind and Susskind, op.cit

6. Kevin Kelly, quoted in Brynjolfsson, Eric and McAfee, Andrew. *The Second Machine Age*. New York: Norton: 2014.

# What about machines?

- **These views present a compelling platform for the transformation of medical practice**

5. Susskind and Susskind, *op.cit.*

6. Kevin Kelly, quoted in Brynjolfsson, Eric and McAfee, Andrew. *The Second Machine Age*. New York: Norton: 2014.

# But let's not forget the other drivers

- Disease patterns
- Globalization
- Pace of change
- Politics and policies
- Population demographics
- Societal needs and values

**What's really changing in 21<sup>st</sup> century  
healthcare is:**

**THE FUNDAMENTAL NATURE OF  
MEDICAL PRACTICE**



# Summary: Four key trends

## *1. Care anywhere*

- Technology is moving with and inside the patient's body, wherever the patient may be
- Large, fixed infrastructures are necessary, but will be configured differently
- Consumers want convenience and one-stop shopping

# Summary: Four key trends

## 2. Care in teams

- The one-to-one doctor patient relationship is being augmented by relationships with multiple health professionals
- Figuring out how to gain the most value from team care is key
- Reimbursement must be supportive
- Scope of practice needs careful re-design

# Summary: Four key trends

## *3. Care by large data sets*

- Collections of huge meta-data sets are becoming standard for patients, eventually leading to continuous monitoring
- A new interpretive and functional infrastructure is required to manage this data
- Locus of decision-making is shifting to the cloud

# Summary: Four key trends

## 4. *Care by machines*

- Machines can out-perform humans in many tasks (surgery, data storage and recall)
  - They don't get tired
  - Their abilities don't decline with age
  - They can be updated
  - They are “HR friendly”
- They don't have to be perfect - just make less mistakes than humans

# Robots trending today in healthcare

## - Examples -

- Data management: Watson-like models
- Dispensing meds: robot pharmacists
- Diagnosing diseases: pap smear screening
- Caring for the elderly: 24 hour live-in robots
- Surgical robots: now a billion dollar industry in a growing range of medical specialties

# Robots trending today in healthcare - Examples -

- **HOW ARE THE**
- **MACHINES TO**
- **BE MANAGED?**

# Some things for physicians to be concerned about

- Knowledge acquisition
- New kinds of expertise
- Effective teamwork
- Technology management
- Globalization of the health economy and medical services

# To practice effectively in the 21<sup>st</sup> century, physicians need to become expert at these five additional skills

1. Mathematical (i.e., statistical) and communications skills necessary to understand and communicate the *meaning of probabilities* (using big data and predictive analytics)



## Do the math...

“The new tools for tailoring treatment will demand a greater tolerance of uncertainty and greater facility for calculating and interpreting probabilities than we have been used to as physicians and patients ...

## Do the math...

...Assessing and acting on these probabilities will require approaches to data presentation, risk quantification, and communication of uncertainty for which we are largely ill equipped and that we already struggle with.”<sup>7</sup>

7. Hunter DJ. Uncertainty in the era of Precision Medicine. *New Eng J Med* 2016;375:711-713.

# Probability and uncertainty...

- The greatest clinicians...have a sixth sense for biases...The discipline of medicine concerns the manipulation of knowledge under uncertainty<sup>8</sup>

8. Siddhartha Mukherjee, *The Laws of Medicine*, TED Books, 2015.

# To practice effectively in the 21<sup>st</sup> century, physicians need to become expert at these five additional skills

## 2. Knowing how to *work with the machines*

“...machines and systems will work alongside tomorrow’s professionals as partners. The challenge here is to allocate tasks, as between human beings and machines, according to their relative strengths...”<sup>9</sup>

9. Susskind and Susskind, op. cit.

# JAMA Viewpoint 2-9-16

“The profession of medicine has a tremendous opportunity and an obligation to oversee the application of this technology to patient care.”<sup>10</sup>

10. Darcy AM, Louie AK, Roberts LW, *JAMA* 2016; 315: 551-2.

# To practice effectively in the 21<sup>st</sup> century, physicians need to become expert at these five additional skills

3. Management and oversight of *delegated responsibilities* within multiprofessional care teams
4. Adapting clinical practice to *performance measurement and value-based payment*
5. Proactively promoting *population health* in addition to treating individual patients

## But wait...there's more!

- “There are some things people come to know only as a consequence of having been treated as human beings by other human beings.”<sup>11</sup>
- “Healing, whether physical or emotional, is an experience of life, one that technology can never replace.”<sup>12</sup>

11. Joseph Weizenbaum, *Computer Power and Human Reason*. W.H. Freeman and Company, 1976, p209

12. Polacco MA. The \$6 million physician. *The Pharos* 2015; 78(2): 11-15.

# Physicians need to become even better at two traditional skills

- Respecting the right of patients to make choices according to their values and understanding how these values impact care decisions
- Having real and tested abilities to provide the *uniquely human services* that patients and communities need, including empathy and compassion



# Some views of these traditional skills...

- “Suffering with the patient” is Joseph Campbell’s definition of compassion in medicine<sup>13</sup>
- “...the physician’s duty is not to stave off death or return patients to their old lives, but to take into our arms a patient and family whose lives have disintegrated and work until they can stand back up and face, and make sense of, their own existence.”<sup>14</sup>
- Not every patient can be saved, but illness may be eased by the way doctors respond<sup>15</sup>

13. From *The Power of Myth* with Bill Moyers. Anchor Books, 1991

14. Paul Kalanithi, *When Breath Becomes Air*. 2016: Random House.

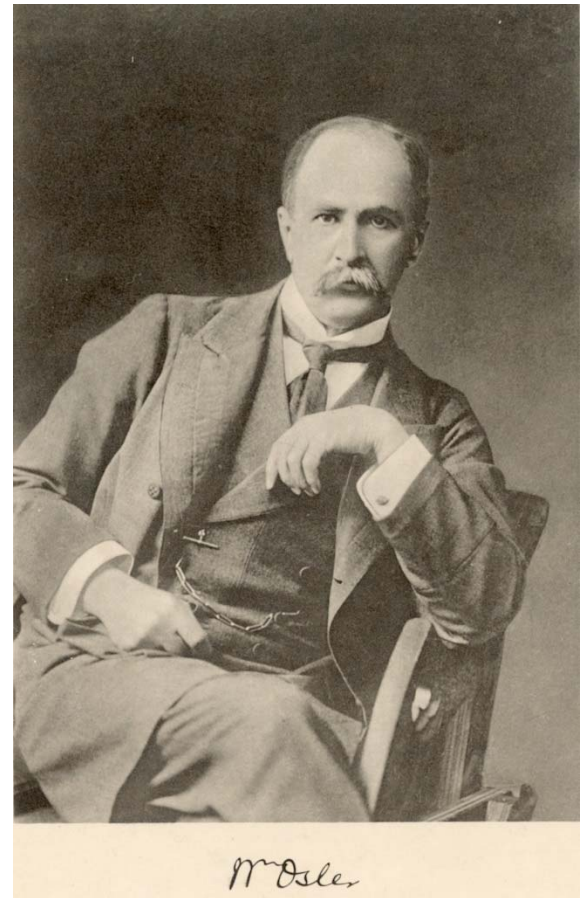
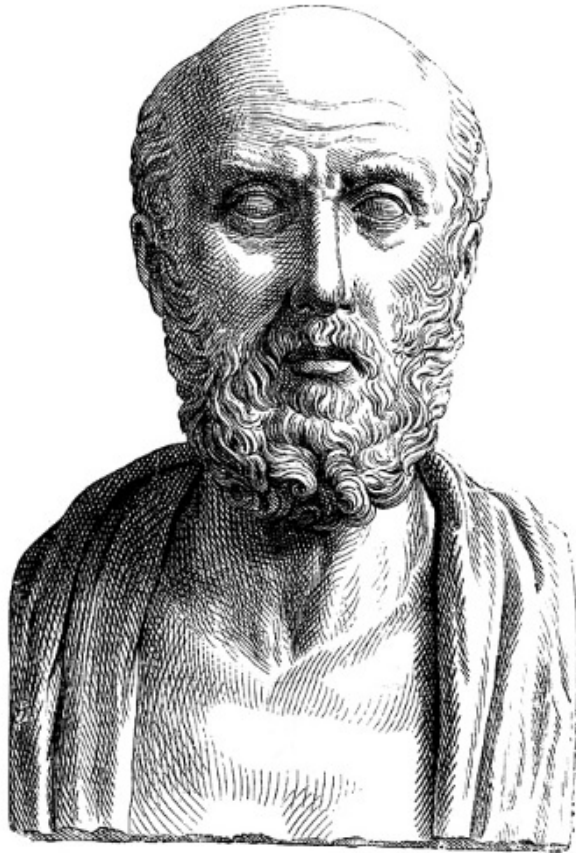
15. Adapted from *Intoxicated By My Illness*. Anatole Broyard, 1992: Ballentine Books.

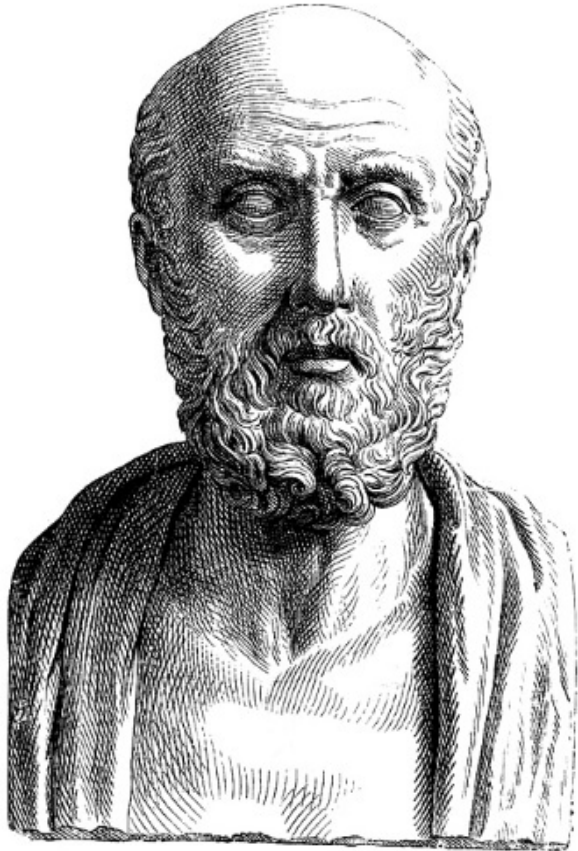
# But the profession must overcome a classic problem...

“all professions seem to share the bias of finding difficulty in imagining any thoroughgoing re-engineering of their own discipline.”<sup>15</sup>

15. Susskind and Susskind, op.cit.

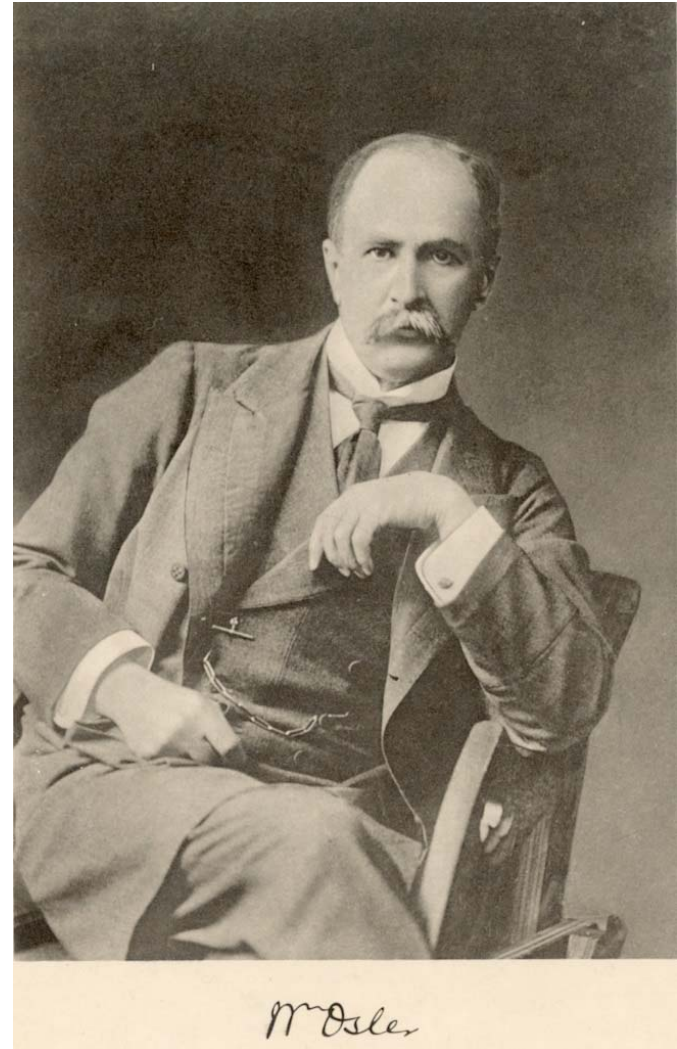
# For thousands of years...





- **It is more important to know what sort of person has a disease than to know what sort of disease a person has**

**Medicine is a  
science of  
uncertainty and  
an art of  
probability**



**For thousands of years...**

**It has never been more  
important for physicians  
to return to their roots!**

# Thank you



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