White Coat, Black Art

Health Professionals *open* up about their profession Will someone please invent an app for that?

Disruptive innovation in Healthcare

> SEAMO Dr. Brian Goldman June 6, 2018

Objectives

- Define disruptive innovation with examples in health care & especially in urology
- DI trends to keep an eye on because they affect you
- Some lessons on how to cope
- Disclosure: no financial conflicts
- No recommendations for off-label prescribing
- Twitter: @NightshiftMD

Disruptive innovation

- "Innovation that creates a new market/value network & eventually disrupts existing market...displacing established market leaders & alliances."
- Often by introducing simplicity, convenience, accessibility & affordability where complication and high cost are the status quo."





How they do it

- The innovator has a product that is outside the existing market
 - Why outside? Because they lack the means or knowledge to access & use incumbent solutions
- They offer a version of the leading product that performs worse compared to the leader on measures most valued in the incumbent market
- Who cares? They end up capturing the market because their product is simpler, more convenient and cheaper

Uber and the taxicab business

- UberCab launches in 2009
 - May 2011: launches in NYC
 - July 2012: launches in London, UK
 - July 2014: launches in Beijing



- 2015-16: UberEats, UberPool, UberX
- December 2015: valuation of \$62.5 billion
- 2016: Yellow Cab in SF files for bankruptcy protection
- 2016: medallion (necessary to operate taxi in NYC) drops to \$650,000 from \$1.32 million in 2013
 Medallion price drops in Boston & Chicago

The Uber disruption

- Inferior product. Rejects expert taxi drivers in favour of cheaper & more convenient Uber drivers
 - Heavily-regulated industries (taxis) tend to have less innovation.
- Attracts non-taxi customers
 - Innovations often occur in adjacent unregulated areas because smart innovators target neglected customers
- Enabler: ? 1. Near ubiquity of smartphones & GPS
 GPS nullifies the taxi driver's advantage
- Special knowledge is the taxi driver's sole advantage for now
- This happens frequently in healthcare

Disruption preparedness

- Awareness & understanding potential for technology to drive disruption
- Culture: extent to which firm promotes & encourages innovative practices
- Organizational agility to redirect systems, assets & people to address threats & opps
- Effective resources to enable change
- Results: 64% either struggling to prepare or largely unprepared

* Deloitte: Age of Disruption – are Canadian Firms Prepared?

Medical culture's hangups about change • Risk averse

- Defensive & ultra-sensitive to criticism & threats
- Think we're supposed to know everything
 Sound familiar?

Example 1: laparoscopic surgery

- 19th century: anesthesia & antisepsis
- Much of 20th century: better yet similar instruments

 Technology: CT/MRI, labs, ICU
- 1950s: 1st diagnostic laparoscopy; 1981: 1st lap surgery
- 1980s: first GB surgeries.
- Surgical practice changed almost overnight despite lack scientific evidence and despite calls for caution due to bile duct and other injuries
- Why? Dramatically reduced LOS & recovery time meant much faster turnover of patients & reduced wait lists

Example 2: cataract surgery

- 1966: first phacoemulsification cataract surgery by Charles Kelman.
 - Took 4 h & caused endophthalmitis
- 1984: 90% extracapsular cataract extraction (ECCE)
- 1989: foldable IOL means smaller incisions & makes phace a viable option
- 1995: ECCE nearly obsolete
- 2017: refinements in microsurgery, instruments, fluidics & chamber stability
- 4 hour O.R. now takes seconds
- A headache for provincial medical associations





The next DI: non-surgical cataract treatment?

- Cataracts caused by damaged crystallin proteins in the lens.
 - start off soluble & transparent but become misfolded opaque clumps
- Lanosterol: a small molecule that binds to-& re-solubilize misfolded proteins
 - Partial reversal of blindness in mice
 - 2015: improved vision of dogs with cataracts
- Imagine what impact this would have on the practice of ophthalmology
- How much will the province pay for cataracts that can be treated by a nurse?



BPH

- BPH: one of the top ten prominent and costly diseases in men over 50 years of age in the US
 50% of men age 50–60 years of age & 90% in men over 80
- Impact expected to grow as population ages

The other little blue pill as disruptive innovation

- 1992: finasteride approved as first drug for BPH with potential to delay and even avert TURP
- Urologists raised objections
- Drug marketed at family doctors instead
- U.S. payers were skeptical so company offered to pay for TURP if surgery not averted
- 1997: U.S. Medicare data showed 50% decrease in TURPs for white men and 40% for black men





Disruptive Innovation in Healthcare

- Rule: MDs do everything
- DI: transfer of skills from highly trained but \$\$ personnel to more affordable providers (often using technology)
- Shift from hospitals to clinics, offices and patient homes

"Clayter Chersterson has done in again, Galley per analyse hash had of valuable insights . . . The tensoritor's Avecaniptics might and mark the beginning of a class cas in installing or . —HIGHAEL BLOOMSERS, Mayor, New York City

Innovator's Prescription

A Disruptive Solution for Health Care



Clayton M. Christensen BESTSELLING AUTHOR OF THE INNOVATOR'S DILEMMA Jerome H. Grossman, M.D. & Jason Hwang, M.D.

Do we need a doctor all the time?

- P: 800,000 Ontarians can't find FD
 - NP-led clinics
- P: surgeons can't do enough hip & knee replacements
 - PA's at Concordia & improve efficiency
 - APTs for better triage of patients
- P: paramedics take too many LTC patients to hospital
 - NS: paramedics treat patients on the spot instead of taking them to hospital
 - Rural NS: NP+ paramedic clinics reduced Txs to ED by 40%

Answer: NO!



Community Paramedic Clinics

- 911 calls going up 8% per year
- Typical high rise: 1x911 call per week
- Hotspots: up to 4x911 calls per week
- Install CP clinics at hot spots
 - BS, BP + referrals to smoke cessation, MH
- 911 calls dropped by 22% (3.99/100 units/month to 3.1/100 units per month)





Virtual Doctor Visits

- Rule: MDs can't properly assess patients unless in person
- Equinoxe Virtual Clinic in BC
- BC first province to pay for virtual visits
- Shouldn't every province fund this?
- How about virtual CBT?



Kimberly Strain - Abbotsford



Dr. Vim Hofmeyr – Horseshoe Bay



Dr. David Gratzer

Just around the corner

- 2010: WHO estimates 285 visually impaired people
- Not enough ophthalmologists
- Geographic limits
- Financial limits



Iris scanner

A 'Peek' at the future

- Peek is a mobile phone app with clip-on hardware
- Checks acuity
- Can diagnose glaucoma, cataracts, macular degeneration, and diabetic retinopathy
- Tested on > 5,000 patients in Kenya
- Cost: £300 vs £96,000 on stateof-the-art eye clinic equipment





Clinical Validation of Smartphone Based Adaptor: Peek Retina for Optic Disc Imaging in Kenya

- Study comparing grading of optic nerves from smartphone vs digital fundus camera

 1490 adults
- Independently graded at Moorfields Eye Hospital Reading Centre
- Non-clinical photographers were able to acquire images at standard that enabled independent remote grading of the images using desktop retinal camera
- "The potential for task-shifting and detection of avoidable causes of blindness in at-risk communities makes this an attractive public health intervention."

Validation of Smartphone Based Retinal Photography for Diabetic Retinopathy Screening

- 301 patients with DM2 had seven field digital fundus photography
 - Carl Zeiss fundus camera vs fundus on phone camera (FOP)
 - Sight-threatening DR (STDR): proliferative DR or diabetic macular edema
 - Conclusion: retinal photography using FOP camera is effective for screening & diagnosis of DR and STDR

PLOS One 2015;10:1371

Application to affluent countries

- Patients living longer
- Need to closely monitor eye health in patients with DM₂ & HTN
- Not enough ophthalmologists to go around!
- Shift in eye screening from ophthalmologists to GPs to nurses, pharmacists, patients & family members

AI can diagnose and treat retinal diseases

- Optical coherence tomography: non-invasive scan bounces light off retina
- Researchers analyzed 200,000 optical coherence tomography eye scans
- AMD & diabetic macular edema
- Accuracy similar to well-trained ophthalmologist
- Could make referral recommendation within 30 seconds with 95% accuracy



Paging Dr. Watson

- Deep learning is pushing the accuracy of machine-read DI to 95%
- AI will be used initially to scan prior CTs to ID patients to search for cancer & other diseases

 Genomic testing to ID patients at risk
- Primary clinical interpretation will require regulatory approval
- In 5 years, expect 50% drop in # radiologists needed

Al and prostate cancer

- March, 2018: Chinese researchers tested deep learning system
 - 918 prostate whole mount path samples
 - Human pathologist 'gold' standard
 - 99.38% accurate

Al and prostate cancer

- Prostate cancer Dx using deep learning with 3D multiparametric MRI
 - Non-deep learning sensitivity 66-81%; specificity
 82-92%
- Convolutional neural network based deep learning
- Statistically significant increases in sensitivity & specificity

10 professions under threat from Big Data*

- Healthcare
- Insurance
- Architects
- Journalists
- Financial industry
- Teachers
- HR
- Marketing & Advertising
- Lawyers/paralegals
- Law Enforcement



*Bernard Marr: Forbes, April 25, 2016

There's more

• Robots are coming!

Each of us is replaceable. The trick is to see it coming & adapt.

Japan's care deficit

- 27% age 65 and older
- Small, nuclear families
 - Falling birth rate + fewer stay at home adults
- Tomio Hasegawa
 - One of 25,000 retired day labourers in Osaka
- 2025: will be 1 million personal care aids short
- Unprepared for senior tsunami



Michihiko Tokoro

Carebots





Shigeki Sugano, Waseda University

Telenoid

- At a LTC facility in Sendai
- Agitated seniors with dementia
 - Unengaged, apathetic
 - Sun-setting
 - Then, a strange robot named
 Telenoid arrived
 - A torso with a pre-schooler's head & rudimentary arms
 - It hugs
 - Tele-operated: it speaks thanks to a nearby caregiver



Telenoid



The system will look after me

RODGERS LIMPING OFF FIELD What, Me Worry?

YAH I'M NOT WORRIED



NotWorried.com

I'M NOT WORRIED ABOUT THAT RIGHT NOW.

Barry Bonds

QUOTEHD.COM

I'M NOT WORRIED ABOUT ME OR WHAT'S GOING TO HAPPEN TO ME

NOT SURE IF I'M NERVOUS

OR POOP TIME

ELIZABETH EDWARDS

PICTURE QUOTES . com

PICTUREQUVTES

Will the system take care of physicians?

- CAIR Survey:
 - 1 in 4 residents not
 confident about job
 prospects
 - 4 in 10 aren't
 satisfied with career
 counseling advice



Advice: take care to take care of these patients

- Seniors with multiple complex co-morbidities
- Patients with mental health illnesses
- Patients with substance dependence
- Patients with disabilities
- Fragile children with complex disease and healthcare needs
- Homeless patients

Duties that could easily be taken from MDs

- Arbiter of medical marijuana
- Judge and practitioner of MAID. Could be given to death doulas
- Smoke cessation and E-cigarettes

Emerging Healthcare Jobs

- Hospitalist
- Care coordinator: RN or APN who manage patient transitions
- Navigator: licensed clinical prof who facilitates patient patient/family treatment pathways
- Scribe: takes notes so you can concentrate on patient care.
- Population health officer: hospital leader who develops & implements population or employee health strategy
- Tobacco treatment specialist: NRT expert

The bottom line

- Don't get too comfy
- Aim for the top not the bottom – of your scope of practice
- Be nimble. Be innovative
- Find a way to get paid to think, not do
- Pack a parachute

