OPPORTUNITIES AT THE INTERSECTION OF INNOVATION, ENTREPRENEURSHIP, AND PATIENT CARE

Disclosure

- I have commercial interests with the following:
  - Compensated lecturer, American Medical Informatics Association
  - Co-founder, Haystack Informatics, Inc.

- I do not intend to discuss an unapproved/investigative use of a commercial product/device in my presentation.

About Informatics@CHOP

- 2015 Computerworld “Best 100 Places to Work”
- 2015 Healthcare’s “Most Wired Hospitals”
- HIMSS EMRAM Stage 6
- Clinical Informatics Program
  - 24 embedded provider informaticists
  - Six Board-Certified Clinical Informaticists
- Department of Biomedical & Health Informatics
Who has the right to see your medical records?

Data, data everywhere...
Good luck with that.

Haystack Informatics
- Graduate of CHOP & DreamIt 2014
  "Open Canvas" program
- CHOP innovators partnered with entrepreneurs
- Four-month accelerator program
- Patient privacy monitoring software
- Social network analysis and machine learning to identify EHR "snooping" events
Innovation must address a problem
“Chant no more your old rhymes about bold Robin Hood,
His feats I but little admire,
I will sing the Achievements of General Ludd
Now the Hero of Nottinghamshire”
There's a difference between ideas, inventions, and innovation.

- "Idea" is a novel thought or insight, but without form.
- "Invention" is the creation of something new, but without application.
- "Innovation" is a product or process applied to solve a problem.

Innovation must address a problem

Innovation in medicine is the same, but different
Why can’t we innovate in medicine?

- We can, it’s called **Research**
  - Human subjects, requires IRB
  - Contribute to generalizable knowledge
  - May result in licensable IP
  - Systematic testing of a hypothesis
  - Typically an external funding source, such as a grant from public or private agency with no fiduciary expectation

Why can’t we innovate in medicine?

- We can, it’s called **Quality Improvement**
  - Desire to improve a process, protocol, or program
  - Uses a standard QI methodology, such as Plan-Do-Check-Act
  - Aimed at producing change in a process
  - Typically internal operational funding source

Why can’t we innovate in medicine?

- We can, it’s called **Entrepreneurship**
  - Shared goals of improving health but also demonstrating return on investment
  - For your investors, the latter is most important
  - Subject to same restrictions as rest of healthcare
  - Some very important differences, latitudes, affordances
Risks of innovation in medicine

- Mission
  - If you're a not-for-profit hospital, is this really aligned with your mission?

- Financial
  - Who's paying for this and what (if anything) do they expect in return?

- Clinical
  - Be sure the risk to patients is minimal, or else this is "research"
  - There is reason why the FDA must approve medical devices

- Professional
  - Credibility
  - Conflict of interest

THERAC-25: a cautionary tale

- Radiation therapy machine
- Responsible for 6 accidents, 3 deaths due to massive radiation overdose from 1985-1987
- Attributed to failure to detect a "race condition" in software
- Poor design of error messages
  - "MALFUNCTION" followed by a number (from 1 to 64)
- Personnel didn't believe patient's complaints

What else is different?

- Healthcare is heavily regulated
  - IRB / Human Subjects
  - FDA
  - HIPAA
  - Institutional COI policies
  - Institutional consulting policies

- HIPAA
  - All vendors who use PHI must have a Business Associates Agreement (BAA) in place
  - Often require their own data-loss liability insurance
Haystack experience

- Client 1: Behind the Firewall
  - Haystack employees had to undergo CHOP background checks, as do all "contractors"
  - Assigned a named user account
  - Created a secure FTP port

- Client 2: Outside the Firewall
  - Amazon AWS HIPAA-compliant private cloud server
  - Amazon will execute a BAA with clients (available whitepaper)

Google’s nine pillars of innovation

- Innovation should come from everywhere
- Focus on the user
- Aim to be 10-times better
- Bet on unique insights
- Launch and iterate
- Give your employees 20% time to create
- Default to open (platform, not solution)
- Fail well
- Have a mission that matters

Innovation in healthcare is necessarily different

- Must balance innovation with risk to patients.
- Medical devices requires a different level of testing rigor.
- People tolerate buggy software, but not in healthcare. So “launch and iterate” doesn’t translate the same way.
- “Failing well” means different things to Google and to a hospital.
- I don’t know about you, but nobody is giving me 20% time to tinker!
“Derisking” is Not a Made Up Word

Derisk

verb [j or T] (also de-risk) /ˌdiːˈrɪsk/

to make something safer by reducing the possibility that something bad will happen and that money will be lost.

Challenge Implicit/Explicit Assumptions
- Positioning / differentiation
- Demand
- Market size
- Feature set
- Competition
- Pricing / business model
- Sales / adoption cycle

Credit: Steve Barsh, SmartVestors
Every doctor will want one!

Goals of Derisking

- Convert assumptions into knowledge
  - At low cost
  - As quickly as possible
- Decrease assumptions to increase value
- Consume intellectual capital before outside capital
- Know when to proceed and when to pivot

Credit: Steve Barsh, DreamIt Ventures

Validate assumptions, iterate frequently

- Customers
  - Who are they?
  - What do they think?
  - What do they like/dislike?
- Investors
  - Who will fund this and why?
- Talent
  - Who do you need to bring this to market?
- Time
  - How can we shorten the time to market and how do we get there?

Credit: Patrick Yonge-Moore, CHOP OIE & The Lean Startup by Eric Ries
Examples of Derisking

- **Target market**: you see rare diseases a lot, but does your target market?
- **Dollars**: is the group that would benefit the group that would pay for it?
- **Sales cycle**: hospital enterprise software sales cycle is 1-2 years!
- **What does it solve**: do others agree this is a big enough problem to warrant a special solution?

Market Validation

Pivot when necessary
3. Derisk early: challenge every assumption

- Nine out of ten startups fail (worse than restaurant industry)
- Be aware of your own confirmation bias: of course you think it's a great idea, it was your idea!
- Choosing to change early is easier than being forced to change late.

Build a strong team and seek out expertise

Raise your hand if you can answer yes...

- Your hospital has a device fabrication / prototyping facility?
- Your hospital has a mobile apps development shop?
- Your hospital understands modern web technology?
- Your hospital has a formal structure to support innovation?
- Your hospital can introduce you to innovators, investors, and entrepreneurs?
- You have personal experience with starting a company?
Some hospital examples

Healthcare accelerators / incubators

What to look for

- Do they prefer early or late stage companies?
- What do they offer?
  - Space
  - Resources
  - Mentorship
  - Speakers / Tutorials
  - Connections / Introductions
- Track record? Alumni network?
Experience with Haystack

- DreamIt identified a startup veteran, Adrian Talapan, as CEO
- We were the marketing, branding, product development, technical, sales, and HR team all rolled into one. Startups are impressively nimble.
- We hired our first 2 developers via Craigslist!
- Web stack is entirely open source
- Took a “mini-sabbatical” for 40% effort x 4 months
- Built the minimum viable product “MVP”

Build a strong team and seek out expertise

- Defer to expertise where you can find it.
- Accelerators/incubators offer a specific value – see if it’s right for you.
- When given an opportunity to network, pay it forward.

Innovation comes in all shapes and sizes
**CHOP Electronic Antibiogram**

- Research suggests stratified antibiograms are most appropriate when choosing empiric therapy.
- Epic/meditech lab data allows us to automatically generate these and apply IDSA filtering rules.
- Traditional antibiograms are time-intensive to generate manually.
- Drs. Jeff Gerber and Bea Larru worked with Enterprise analytics team.
- Clinical go-live this month!
- Built on Qlikview analysis platform.
High-Risk Influenza Dashboard

- AAP recommends influenza vaccination for all children, especially those with certain chronic diseases.
- Department of Pediatrics undertook a project to improve vaccination for high-risk specialty-care patients.
- Epic alerting & workflow was supplemented with an analytics tool to understand end-user behavior.
- Also allowed us to provide QI-style metrics.
- Between FY13 and FY14, saw 20% improvement.
- Between FY14 and FY15, saw another 50% improvement.

Care Assistant & Epic Integration

- EHR built to document digital health data can mean digital intervention.
- R&D Technologists + Clinical Informaticians + HCI Analysts: Software framework and portfolio of decision support apps.
- Improved outcomes e.g., immunization rates, patient care coordination, asthma management.
- Vision: real-time predictive decision support.

Credit: Jeff Pennington, CHOP DBHI
Funded by various grants & CHOP support.
ProBand: Digital Pedigree & Algorithmic Risk Prediction

- Digital family history
- More difficult to decipher genetic and other genetic conditions
- State of the art is still hand drawing on paper; scanned into EHR
- Jeff Miller + Genetic Counselors = Multi-touch iOS app & enterprise server
- 1000s of families in Center for Fetal Diagnosis and Treatment, Genetics
- Over 1K downloads from App Store
- Piloting at Johns Hopkins University

Funded by NHGRI Clinical Sequencing Exploratory Research program.
PediCrisis

Available for iOS and Windows 8

5 Innovation comes in all shapes and sizes

- From “Big I” innovation all the way to “little i” process innovation.
- There is value in developing a culture and process for innovation.
- Identify the correct patron up front and make sure incentives are aligned: what’s in it for A to pay you to build B?
- Learn to “pitch” your ideas – big or small – for traction.

Most of all, have fun!
Most of all, have fun!

- Some of the most creative and exciting work I've done in years.
- Startups are very different from hospitals, and the differences are enlightening.
- Valuable and portable skillset.
- Incredibly rewarding experience, enduring relationships.
Office of Innovation & Entrepreneurship

- Educate, Elevate, & Expand
- SPRINT Program
- Provide entrepreneurial support at any stage of development
- Penn Hackathon, Philly Codefest

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