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The Leading Edge

Accelerating change: Fostering innovation in healthcare delivery at academic medical centers

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ABSTRACT

Academic medical centers (AMCs) have the potential to be leaders in the era of healthcare delivery reform, but most have yet to display a commitment to delivery innovation on par with their commitment to basic research. Several institutional factors impede delivery innovation including the paucity of adequate training in design and implementation of new delivery models and the lack of established pathways for academic career advancement outside of research. This paper proposes two initiatives to jumpstart disruptive innovation at AMCs: an institutional "innovation incubator" program and a clinician–innovator career track coupled with innovation training programs.

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1. Background

We are at the beginning of an unprecedented era for innovation in healthcare delivery in the US due to the convergence of payment reform and the proliferation of technology. Policy advances at the federal and state level are catalyzing the shift from volume to value-based reimbursement and creating the best opportunity in recent history for quality-driven innovations such as patient-centered medical homes to have successful business models.^{1,2} At the same time, ubiquitous access to the Internet and advances in analytic software give us new mobile tools to transform patient engagement and gain unique insights into population health. These reimbursement and technology trends offer an opportunity to overcome some of the deep-seated problems facing healthcare, while creating commercially sustainable business models.

Underlying these trends is a growing recognition that rising costs and poor quality of care threaten the US economy and our nation's health. These problems are complex and challenging, and they merit significant investment in developing innovative

solutions in healthcare delivery. Given their status as leaders in American biomedicine, many look toward academic medical centers (AMCs) to help guide the healthcare system out of our current quagmire. AMCs have the potential to be strong leaders in this era of delivery reform, but most have yet to display a commitment to delivery innovation on par with their commitment to basic research. This difference is not due to lack of talent or innovative spirit in AMCs, but rather because of institutional factors that impede the process of experimentation and innovation in delivery models.

We define "delivery innovation" as any new product, service or redesign of care that moves health systems towards the "triple aim" of improved patient experience, improved healthcare quality and decreased costs.³ We conceptualize delivery innovation not just as practice improvement projects, but as entrepreneurial, potentially high-risk, and highly scalable new products or processes driven by consumer adoption. An example is the success of QPID (Queriable Patient Information Dossier) at Massachusetts General Hospital. Initially developed to help radiologists to extract key data from voluminous electronic patient records, QPID proved to add value beyond its home institution and is now being commercialized nationally. What began as an improvement project, is now a venture-backed company with potential to be self-sustaining through revenue generation while promoting the triple aim.⁴ This project initially emerged out of an AMC with no formal pathway or administrative support to grow an improvement process into a business. With more formal institutional support, there may be

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an opportunity to accelerate the transformation of similarly innovative ideas among other clinicians into scalable products.

Several obstacles slow delivery innovation at AMCs including the lack of entrepreneurial culture, the paucity of training in design of new delivery models, and the scarcity of established pathways for academic career advancement outside of research.⁵ To become leaders in high quality, patient-centered care delivery in the next decade, AMCs must commit to break down these barriers.⁶ There are many paths to cultivating innovation in healthcare, but we believe that entrepreneurship is a neglected driver of innovation at AMCs today. The development of a culture of entrepreneurship has had a significant impact in larger university settings^{7,8} which could be recreated in AMCs. We propose two interlocking initiatives for AMCs to adopt in order to grow their own culture of entrepreneurial innovation: an institutional “innovation incubator” program coupled with a clinician–innovator (CI) career track providing a training pipeline for the “innovation incubator”.

2. Incubator programs at academic medical centers in the US

An innovation incubator at an AMC is a program that cultivates the rapid transformation of ideas into value-generating products or services that benefit patients, providers, and/or payers. Incubators at AMCs have their roots in the original business incubators dating back to the 1950s.⁹ Since then, business incubation has grown substantially to include over 1100 incubators in the US and approximately 7000 incubators around the world.¹⁰ With the recent proliferation of software development and mobile technology and the plummeting cost of starting a new company, there has been a rise in incubators dedicated to incubating smaller, less expensive startups. More recently, several startup incubators, such as Rock Health and Startup Health, have arisen with an exclusive focus on digital health.¹¹

Incubators are a natural fit for the culture of creative professionals who work at AMCs. AMCs attract thousands of the most talented people into diverse health professional fields who are often driven to make an impact in healthcare. The anachronistic culture of AMCs’ funnels most of the nascent creativity into grant-funded laboratory science, which takes as its mission to publish and get more grants. However, incubators could offer another outlet for creativity at AMCs that help clinicians and researchers turn their ideas not into publications, but into scalable products and services. Channeling these ideas through an incubator is a triple win for AMCs because (1) the AMC can derive financial benefit through licensing fees, royalties, or equity ownership of technology; (2) the CIs can develop and scale their new ideas more rapidly; and (3) patients can get faster access to innovations that can improve their lives.

In addition to these three core benefits, the incubator approach can also benefit two other key missions of AMCs: research and education. Incubators can offer a rich source of academic research opportunities to evaluate various innovation approaches and allow AMCs to differentiate themselves as centers of thought leadership on innovation. Likewise, an incubator program can create many additional avenues for education to let faculty and trainees become involved in entrepreneurship, program evaluation and project management.

To examine the clinical innovation incubator phenomenon at AMCs, we performed a systematic web-based review of the “Honor Roll” and most highly ranked pediatric hospitals according to the 2013 US News and World Report.^h We found that only 6 of

the top 18 adult hospitals and 2 of the top 10 pediatric hospitals had dedicated innovation incubator programs¹² (Table 1). This review is clearly limited by the narrow focus on “top” hospitals defined by US News and World Report but suggests that even among the most well regarded AMCs in the US, entrepreneurship as a model for delivery innovation is not yet widely accepted. Although some early-adopting AMCs are participating in or creating their own incubators to spur local healthcare innovation, there are no best practices to guide successful implementation of innovation incubators at AMCs.

3. Creating and running a new incubator at an academic medical center

The key resources for incubators at AMCs are the frontline insights of their clinicians,¹³ combined with the wealth of available clinical data to add granularity to the problems clinicians observe. However, most AMCs lack training programs in innovation methodology, so the clinicians are unprepared to take advantage of their insights and fail to efficiently produce solutions to these problems. We propose the following adaptation of prior best practice guidelines for incubation programs as a starting point for AMCs to begin growing a community of CIs.¹⁰

An AMC incubator should be composed of the following services and resources: experienced entrepreneurship advisors, software developers, legal guidance, fundraising support, and networking with other innovators (Fig. 1). Entrepreneurship advisors provide ongoing, high-touch mentorship and instill innovation skills that remain with the CI even after the incubation process is complete. Immediate access to software developers is essential for rapid development of functional prototypes and can serve as a potential source of technical co-founders for startups that may evolve from the incubator. Legal advisors help to navigate incorporation, licensing, financing, and conflict of interest considerations. Fundraising channels help secure internal and external investment to help the startups emerging from AMC incubators to grow their impact rapidly. Lastly, networking activities facilitate collaboration between CIs and potential partners, customers, co-founders, and investors.

The process of starting an incubator begins with selection of CIs who participate in an innovation boot-camp to teach them the basic principles of innovation. With the help of their entrepreneurship advisor, the clinicians then go through a series of exercises to identify the vision and goals they are trying to achieve through innovation, their approach to achieve that vision, and the specific products or services they will create through that approach.

After visioning and setting goals for innovation, the entrepreneurship advisor helps the CI to create a draft business plan to guide their innovation. The business plan outlines a series of hypotheses made by the CI about the end-user’s problem, the unique way in which the proposed solution solves that problem, and the approach to scaling the solution. The business plan continuously evolves as new results arise from testing the plan’s hypotheses.¹⁴ The proximity of AMC incubators to healthcare delivery provides access to a sandbox for CIs to inexpensively and rapidly validate novel delivery concepts.

Incubation at AMCs is ideally suited for software development, but it can also be applied effectively to delivery redesign,

(footnote continued)

the combined search within each institution’s website and examined all publicly available websites for evidence of ongoing incubator programs. Criteria for inclusion as an “incubator” in our review included a website clearly documenting the existence of a separate organizational entity to promote the development of healthcare concepts into businesses. For example, many institutions have an “innovation center” which can mean many things, such as promotion of translational research, but this does not meet our inclusion criteria.

^h To perform the systematic review, we searched the web domains of the websites for each of the 18 “Honor Roll” hospitals as chosen by US News and World Report using the Google.com search engine for the following key words/phrases: “innovation incubator”, “innovation center”, “entrepreneurship incubator”, “entrepreneurship center”, and “startup incubator”. We looked at the top 50 results for

Table 1
Academic medical center incubators.

MEDICAL CENTERS	INCUBATOR	WEBSITES
MASSACHUSETTS GENERAL HOSPITAL/ HARVARD MEDICAL SCHOOL	CENTER FOR PRIMARY CARE INNOVATION CENTER	HTTP://BIT.LY/HMSINNOVATION
BRIGHAM AND WOMEN'S HOSPITAL/ HARVARD MEDICAL SCHOOL	RAPID HEALTH INNOVATION (RHINNO)	HTTP://RHINNO.PARTNERS.ORG/
MAYO CLINIC	MAYO CLINIC CENTER FOR INNOVATION	HTTP://BIT.LY/MAYOINNOVATION
CLEVELAND CLINIC	GLOBAL CARDIOVASCULAR INNOVATION CENTER	HTTP://GCICINCUBATOR.ORG/
UNIVERSITY OF CALIFORNIA SAN FRANCISCO	THE ENTREPRENEURSHIP CENTER AT UCSF	HTTP://BIT.LY/UCSFINNOVATION
UNIVERSITY OF PENNSYLVANIA	PENN MEDICINE CENTER FOR HEALTH CARE INNOVATION	HTTP://BIT.LY/PENNINNOVATION
BOSTON CHILDREN'S HOSPITAL	INNOVATION ACCELERATOR PROGRAM	HTTP://BIT.LY/WLIOEF

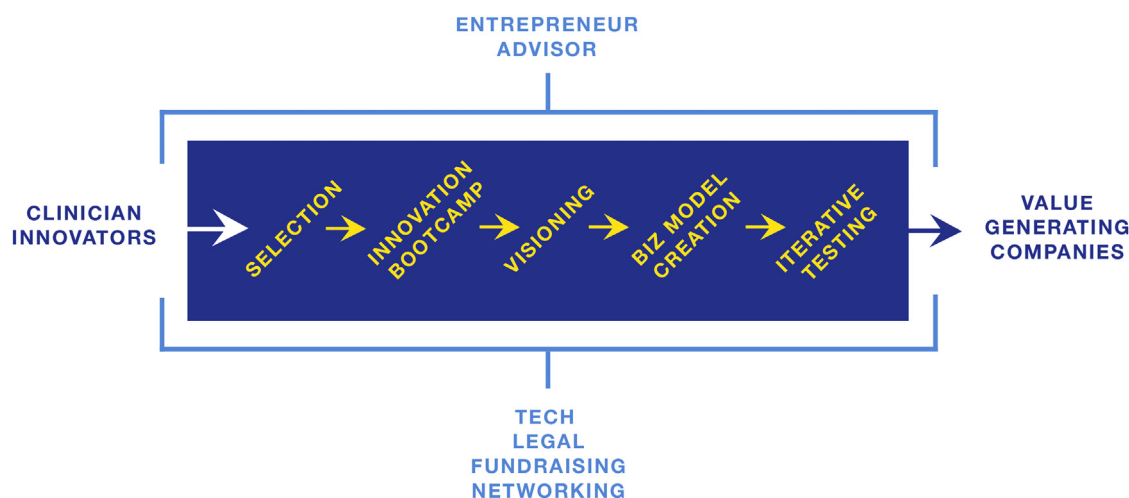


Fig. 1. Structure of an innovation incubator.

reimbursement innovation, and even traditional device development.¹⁵ If the endpoint of the incubation process is a commercial product or service, a logical next step in the growth of the startup company is to transition the innovation activity from the AMC incubator to one of the many growing independent digital health incubator programs (Fig. 2).

4. A clinician–innovator career track

Essential to the success of an incubator program are the clinicians to fuel innovation. However, AMCs have a poor track record of helping clinicians advance their academic careers outside of grant-funded research, so it would be difficult to convince clinicians to devote extra energy to an incubator project unless it could also promote their career. To recognize the contribution of successful innovation to the healthcare system, AMCs should create a CI career track. The measure of success within this track should be based on contributions toward successful projects – which could be measured in a variety of ways, including return on investment (ROI), savings generated or venture capital raised – rather than on volume of publications. The incentives for non-traditional career paths should exist at every level of training starting at the undergraduate level all the way through the faculty level.

From an administrative standpoint, the CI track is not necessarily more complex than the traditional clinician–researcher track.

Clinicians interested in the track can have a certain percentage of their time allocated towards innovation projects which would initially need to be supported by their clinical department, much like junior researchers. As an alternative to departmental funding, support from investors, donors or foundations focused on social impact, such as the Robert Wood Johnson Foundation, could subsidize innovation projects.¹⁶ These funding sources do not necessarily provide the lucrative “indirect” institutional funding that comes with many government grants, but they can be financially sustainable for departments through other mechanisms. Unlike traditional clinical-research programs, the time in the CI track would be used to transform ideas into interventions such as QPID with a potential for positive ROI for the AMC and sponsoring department. With more experience and a track record, faculty with successful projects should eventually be able to support their own time through affiliated commercial ventures or grant mechanisms such as the federal Small Business Innovation Research grants.

5. Clinical innovation training

The maturation of CIs within the incubator system would be bolstered by rigorous innovation skills training that complements traditional medical and specialty training. Training in innovation requires exposure to entrepreneurial practices that are currently

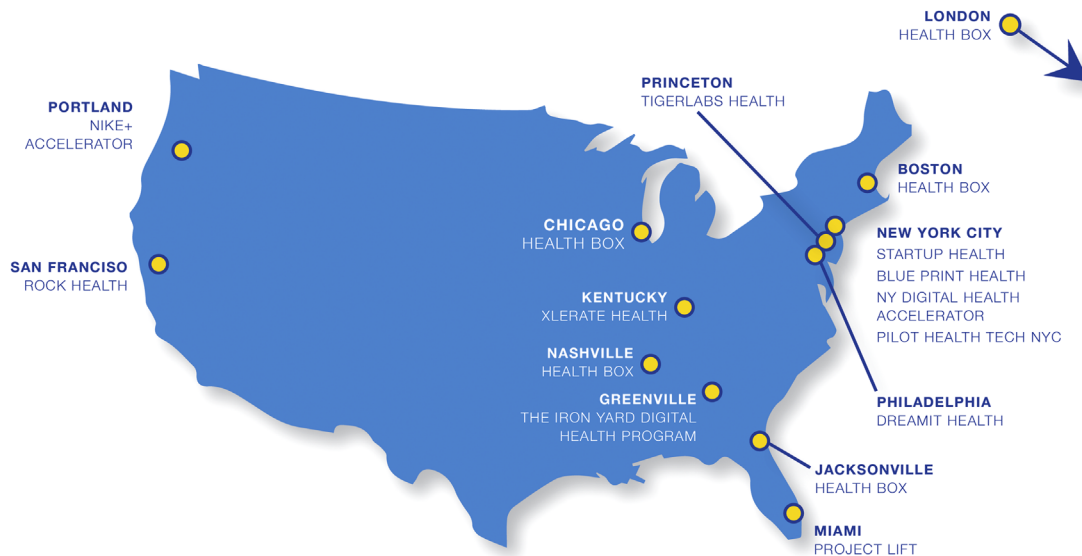
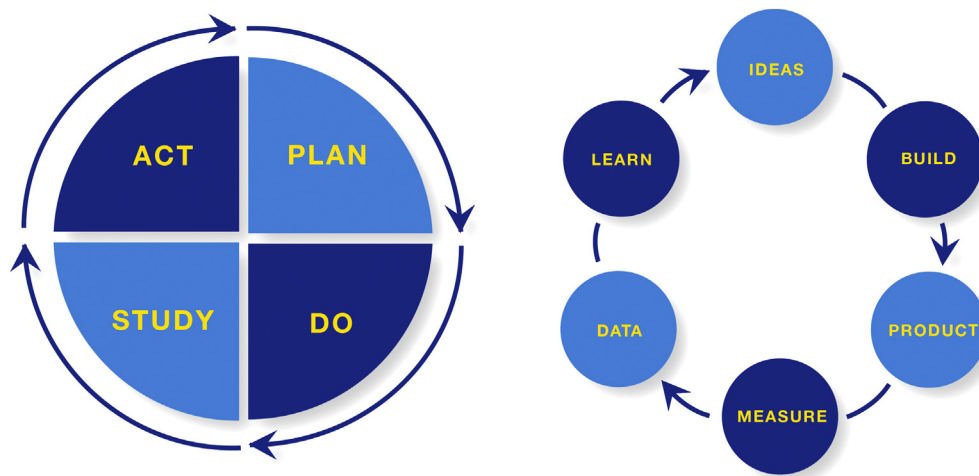


Fig. 2. US digital health startup incubators.



Adapted from Langley et al. *The Improvement Guide*. 2009 and Reis. *The Lean Startup*. 2012.

Fig. 3. PDSA cycles in quality improvement vs BML cycles in lean startup thinking.

foreign to academic medicine. One of the foundational innovation practices is Lean Startup Thinking (LST). Lean Startup Thinking is a management process that aims to create a minimal viable product (MVP), which is an intervention with the fewest features needed to get an end-user to pay with a scarce resource such as money, time, or attention.¹⁷ Similar to the Plan-Do-Study-Act (PDSA) cycle of Quality Improvement,¹⁸ the Build-Measure-Learn (BML) cycle of LST is a continuous process of building a prototype, testing and measuring the impact of the intervention, and learning from the results of testing to inform the refinement of the prototype (Fig. 3). This cycle is rapidly repeated until there is sufficient validation of an MVP or until there is sufficient invalidation to change course or pivot toward another MVP.

Although traditional implementation science at AMCs and LST share similar origins, the outcome being tested in LST is not a statistically significant difference between two interventions or a special cause of clinical improvement on a run chart. Rather, LST focuses on the confirmation that a patient, provider, or payer is willing to pay for a new product or service.¹⁷ The benefit of using LST as the core methodology for incubation at AMCs is its emphasis on end-user

validation, which creates consumer-driven rather than clinically driven incentives to prioritize patient-centeredness, minimize costs, and optimize clinical outcomes. The alignment of these incentives and the inherent for-profit orientation of LST works towards generating sustainability through generating revenue. In contrast, traditional implementation science approaches may produce or discover interventions that lead to improved clinical outcomes, but if end-users do not perceive value in those outcomes, then the interventions risk never being utilized or the cost of those interventions may go unchecked. The end goal of LST is the creation of a product or service that builds on the three pillars of quality improvement³ to achieve the “quadruple” aim: improve patient satisfaction, decrease costs, improve care quality, and be commercially self-sustainable.

6. Future challenges and conclusion

There are important challenges to be overcome for an AMC to build successful incubators and innovation training programs. The most pressing issues include development of a consistent but

flexible protocol for mitigating conflicts of interest, safeguarding against projects that marginalize patients with lower socioeconomic status, and creating a culture that accepts delivery system innovation as an equally laudable pursuit as clinical research.

These challenges bring up questions about how promoting “for-profit” enterprise within an AMC can still fit within the non-profit mission of AMCs. We believe there is less dissonance in this contrast than may appear superficially. Despite the fact that most AMCs are non-profits, they still have to generate revenue to remain operational. A non-profit designation is a legal status that benefits from certain tax breaks whereas a for-profit status enables more flexibility with receiving investments. Although the former is required to be mission driven, the latter can be equally mission driven and has more financial incentive to scale. Separating entrepreneurial innovation from the business-driven world of healthcare delivery is artificial. Our proposal for incubators invites clinicians to harness their creativity to help their institution’s delivery of healthcare and scale it beyond their system’s walls through consumer driven growth. Naturally, this may be a marked culture shift for many AMCs to undertake and missteps are likely to occur in the beginnings of implementing the pathways we outline. Nevertheless, we believe that promotion of entrepreneurial innovation by AMCs will enable them to take advantage of rather than be burdened by the changing reimbursement environment.

In conclusion, payment reform and technology proliferation are creating an unprecedented swell of innovation potential. To realize this potential, AMCs must take the lead and embrace risk-taking that is difficult in our traditionally conservative culture of medicine. If the entrepreneurial spirit of “failing fast, failing cheap, and failing often” can be effectively and responsibly fused with patient-centeredness, then the swell may build into a perfect storm of innovation that can move our healthcare system towards achieving the quadruple aim.

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