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IMAGING

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Innovation Training Program Supports Radiologists and Other Clinicians Seeking to Develop New Devices and Software

- Clinicians often have ideas for improving the quality of patient care, but they typically do not have the training to develop these ideas.
- Massachusetts General Hospital offers an innovation incubator, with a shared prototyping space and an integrated core curriculum, for clinicians seeking to develop new devices or software.
- Innovation training and support through the incubator has guided the commercialization process for products such as a percutaneous probe stabilization device for use in lung cancer treatment.

Innovation plays a crucial role in health care, with advances in medical devices or software offering improved means to address disease and other health care concerns. Because imaging is integral to a broad range of diagnostic and therapeutic applications, radiologists have insights into many aspects of patient care and thus are well positioned to identify needs for new devices and software. However, few have the training or experience in innovation needed to develop the ideas or bring products to market.

Recognizing this untapped need for training in areas including idea generation and validation, device and software prototyping, intellectual property, corporate structuring, artificial intelligence and informatics, and entrepreneurship, the Department of Radiology at Massachusetts General Hospital introduced a first-of-its-kind innovation incubator: Medically Engineered Solutions in Healthcare (MESH). MESH offers a shared prototyping space and formal integrated core curriculum to help develop and prototype new devices and software.

Obstacles to Innovation in Radiology Practice

Innovation has played an increasingly prominent role in academic research since the United States Congress passed the Bayh-Dole Act in 1980. Designed as a shot in the arm for the flagging economy of the late 1970s, the act opened the door to researchers claiming ownership of—and ultimately commercializing—inventions for which they were responsible. In the years since, two primary pathways to commercialization have emerged: licensing the inventions to outside companies through institutions' technology transfer offices (TTOs) and launching a startup, a spinoff company in which the original researchers are major stakeholders. The latter is an increasingly popular option for academic researchers interested in innovation, in part because the overhead costs associated with TTOs—and the limited resources they often have as a result of these costs—can inhibit both the number and scope of inventions that ultimately see commercialization. According to a recent study, the number of startups established by universities each year has almost doubled over the past decade.

The entrepreneurship model can work well for radiologists and other clinicians. But for many the entrepreneurship process has proved a formidable one. Not least because they often lack the training and experience, and do not have access to the institutional infrastructure, that are typically needed for successful commercialization of a new product.

MESH and the CRDC Course at Mass General

The MESH Incubator, launched in July 2016 was conceived by Marc Succi, MD, a clinical fellow in radiology at Mass General. Succi had previous experience in device invention, entrepreneurship, and patents/licensing and found that, many of his colleagues were coming to him with questions about ideas they had for new devices or software. He quickly realized the need for a resource to help health professionals develop such ideas for eventual clinical use.

Designed as a shared lab space for radiologists and other clinicians to translate their ideas into licensable intellectual property, MESH has added resources to help clinicians pursue innovation, including 3-D printers, circuitry and microprocessors. These high-tech tools are available to help clinicians produce prototypes of devices or software, which they can then leverage into a patent, a product, or a grant application. The incubator provided resources and assistance to a number of clinicians who otherwise may not have known how best to develop their ideas.

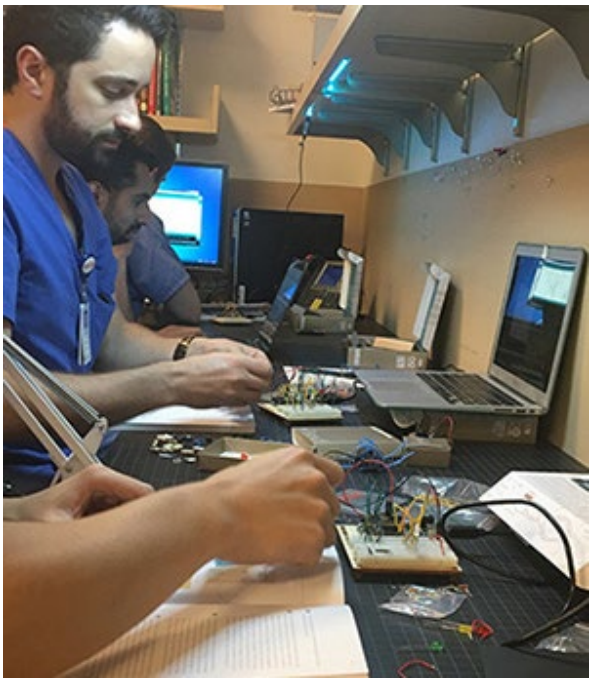

Figure 1. The MESH Incubator offers both resources and training to help radiologists and other clinicians seeking to develop new devices or software.

Early last year, MESH supported the Core Residency Design Curriculum (CRDC), a one-week intensive boot camp. Over the course of three weeks in 2018, 12 residents rotated through the pilot program, attending courses and hands-on training sessions taught by experts in areas such as 3D printing, entrepreneurship, data science, intellectual property and programming.

Integration of the CRDC into department offerings has contributed in important ways to the innovation effort at Mass General. Most clinicians and other health professionals "don't know what they don't know" with respect to prototyping, programming and entrepreneurship. By introducing training in these areas, the department helps them understand how they can begin to develop their ideas for practical application in the clinic.

Anonymous surveys of course participants have reinforced the benefits of the innovation training. One of the radiology residents who enrolled in the pilot course described how the MESH CRDC "will be fundamental in my future medical practice." Another noted that the course "re-establishes a mindset of creativity and divergent thinking, which are key components of any doctor."

MESH and the CIDC at Mass General

In addition to providing a lab space and an integrated core curriculum, the MESH program works with health professionals on individual projects. When a clinician asks for help with a preliminary idea, MESH will enroll him or her in the Core Invention Design Curriculum (CIDC), an initial six-month cycle of brainstorming, data collection, qualitative feedback and idea validation combined with a second six-month period of prototype development, testing, iteration and, eventually, an end product such as a physical device, smartphone app, intellectual property disclosure or license. This process is represented in the figure below.

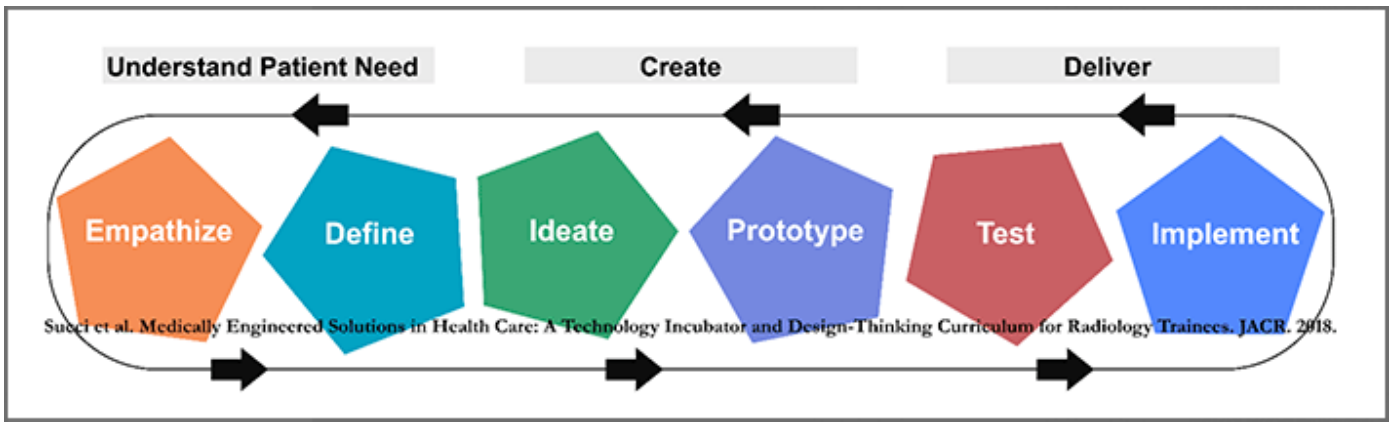

Figure 2.

An example of these individual projects is a percutaneous probe stabilization device that emerged from a collaboration with an attending physician in the Division of Thoracic Imaging in the Mass General Department of Radiology who was seeking a means to improve current methods to stabilize ablation probes for lung cancer treatment. Currently, to keep these probes stable, clinicians rely on an *ad hoc* stack of towels to prop up both the probe outside the patient and the tip of the probe inside the patient's tumor. This relatively insecure arrangement is prone to disturbance by any sudden movement.

The first step in the project was for the MESH team to validate the problem by participating in the procedure in question and collecting data. Next, they brainstormed with the attending physician who had approached them with the idea and then designed and 3D-printed a prototype of a new device. After several iterations, they filed a patent disclosure for the finished device with plans for future testing.

The attending came to the incubator with no experience in device creation or design and now has a patentable device, experience in the process and a new means of addressing a long-standing problem in lung cancer treatment.

Further Information

For further information about the MESH innovation program, please contact Marc Succi, MD, Founder and Director, MESH, Massachusetts General Hospital. We would like to thank Dr. Succi for his advice and assistance in preparing this article. See also the MESH Incubator webpage.

References

Itri JN, Ballard DH, Kantartzis S, et al. (2015). *Entrepreneurship in the academic radiology environment.* Acad Radiol 22(1): 14-24.

McCarthy DP. (2017). *Fostering a culture of innovation in academic surgery.* Surgery. 161(4): 892-896.

Succi MD, Uppot RN, Gee MS, et al. (2018). *Medically Engineered Solutions in Health Care: A Technology Incubator and Design-Thinking Curriculum for Radiology Trainees*. J Am Coll Radiol 15(6): 892-896.

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