

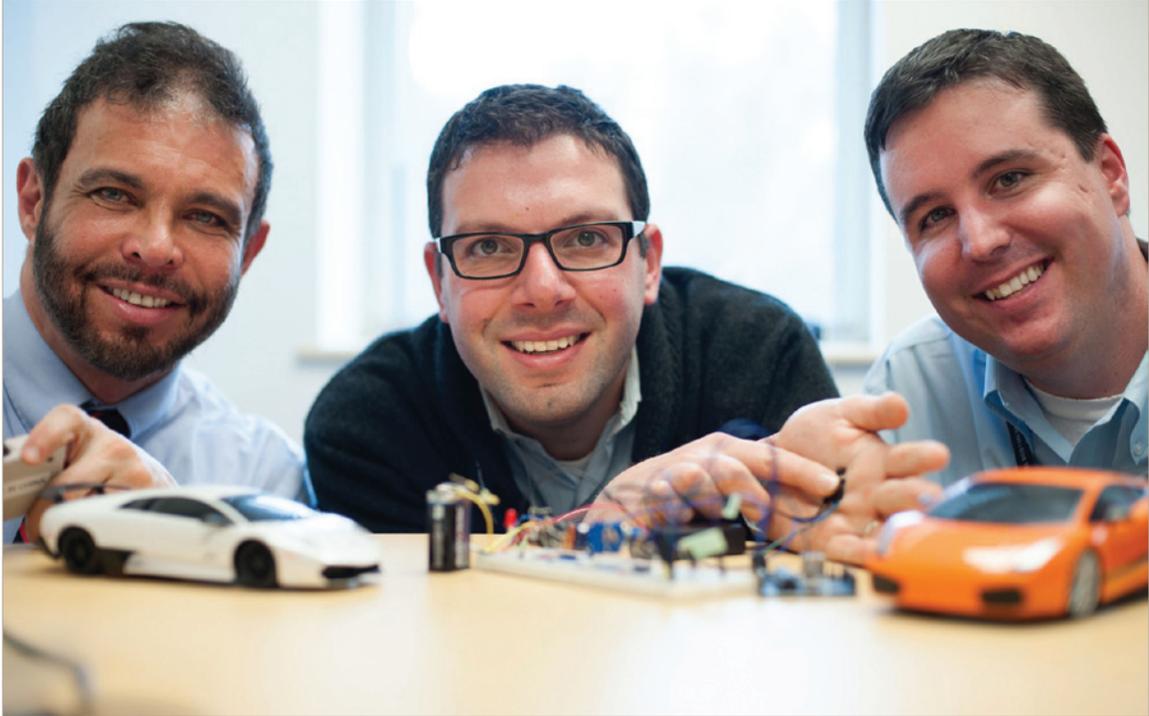
The Innovation Acceleration Program

Unlocking Innovation, Propelling Promise

PROGRESS REPORT APRIL 2013



Boston Children's Hospital
Innovation Acceleration
Program



From left: Joseph Gonzalez-Heydrich, MD, Jason Kahn, PhD, and Peter Ducharme, MSW II, developed technology-enhanced toys for toddlers with severe emotional regulation disorders with support from an Innovation Acceleration Program's Innovestment Grant. Children learn emotional self-control through the use of these toys while they wear a wireless heart rate monitor that collects physiological proxy measures for automatic response, stress and anxiety.

Cover photograph: Cardiac patient Hayes Hall wears a thermal head wrap that can be used in the rewarming process for patients cooled during cardiopulmonary bypass surgery developed by Karen Sakakeeny, RN, BSN. This innovation was developed with support from the Innovation Acceleration Program's Innovestment Grant program.

The Innovation Acceleration Program

Unlocking Innovation, Propelling Promise Progress Report April 2013

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**Boston
Children's
Hospital**

Until every child is well™

Innovation Acceleration
Program

Letter from the Chief Innovation Officer, Naomi Fried

Dear colleagues:

When I arrived at Boston Children's Hospital in the summer of 2010, I was given the opportunity to begin to develop a program that would enhance the hospital's innovation culture and support the innovation process. Since its launch, the Innovation Acceleration Program (IAP) has built an infrastructure for innovation and established robust resources that have helped innovators take risks and develop new solutions. I am thrilled to report that the IAP team has seen success on many fronts and at many levels of the organization, and I am proud to share this first progress report.

Innovation is in the DNA of Boston Children's. I have had the privilege of working with some of the most productive and inspiring innovators in our hospital. Our innovators demonstrate curiosity, creativity and determination as they move ideas from concept to development. By supporting innovators and connecting them with one another, the IAP has built innovation communities where experiences are shared and solutions enhanced. The fear of failure is being replaced by the excitement of the pursuit and realization of the possible. The IAP provides a framework for facilitating, accelerating and nurturing innovation through a variety of venues and media.

I am so proud of our team's accomplishments and am grateful for their dedication as well as the collaboration and support of Pedro del Nido, MD. I believe there are many more innovations brewing at the hospital, and I am excited about the potential those ideas hold.

The more innovation we unleash, the more Boston Children's will stand out as an innovative leader locally, nationally and internationally.

A handwritten signature in black ink that reads "Naomi Fried". The signature is written in a cursive, flowing style.

Chief Innovation Officer
April 2013

Executive Summary

Innovation is at the core of Boston Children’s Hospital. Embedded in the culture and the mission is the drive to do things more efficiently, more effectively, do it better. Innovation is how we get there. By trying out new ideas, testing new systems and extending curiosity to the furthest limits, our exceptional employees and staff embrace innovation and find solutions. There is no guarantee of success when innovating—in fact, risk and uncertainty are inherent. However, by committing to continuously innovate, we increase our chance of succeeding and reaching our institutional potential.

Since its inception in the summer of 2010, Boston Children’s Innovation Acceleration Program (IAP) has been a mentor and guide for the hospital’s best and brightest innovators. Formed upon the recommendations of the Task Force for Clinical Innovation (a 14-member cross section of hospital leadership) and with the support of executive leadership, the IAP has defined the path for innovation at all levels of the institution.

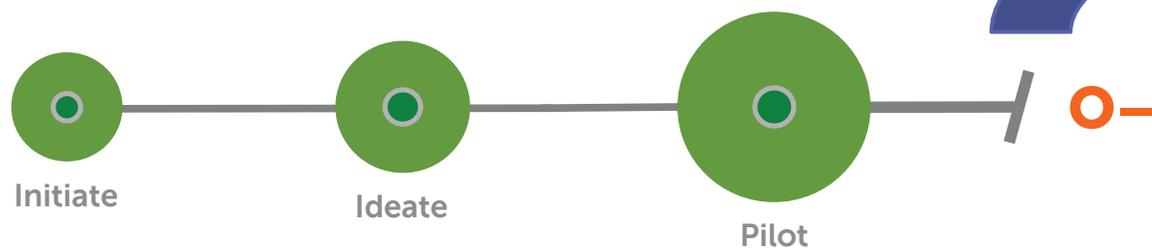
Led by Chief Innovation Officer Naomi Fried, PhD, the IAP embraces a three-pronged mission to enhance the innovation culture:

- identify, catalyze and support new opportunities for innovation
- promote and facilitate grassroots innovation
- collaborate on and support strategic initiatives at the institutional level

The IAP has set new standards for innovation at Boston Children’s, and the results have been impressive. Over the past two years, the IAP has removed many previous barriers to innovation, educated hospital staff and employees about the innovation process, and nurtured a culture that encourages and supports ideas from throughout Boston Children’s. Ideas that historically have emanated from—and remained at—the department level are now being discussed, enhanced, and tested across departmental lines and implemented institution-wide.

Innovation Life Cycle

The **Innovation Lifecycle** is a six-step process and a gap (the “o-gap”) that describes how innovation happens in a health care organization. The lifecycle is a useful organizing paradigm that both helps innovators understand the process and helps organizations think about how to resource and support innovation.



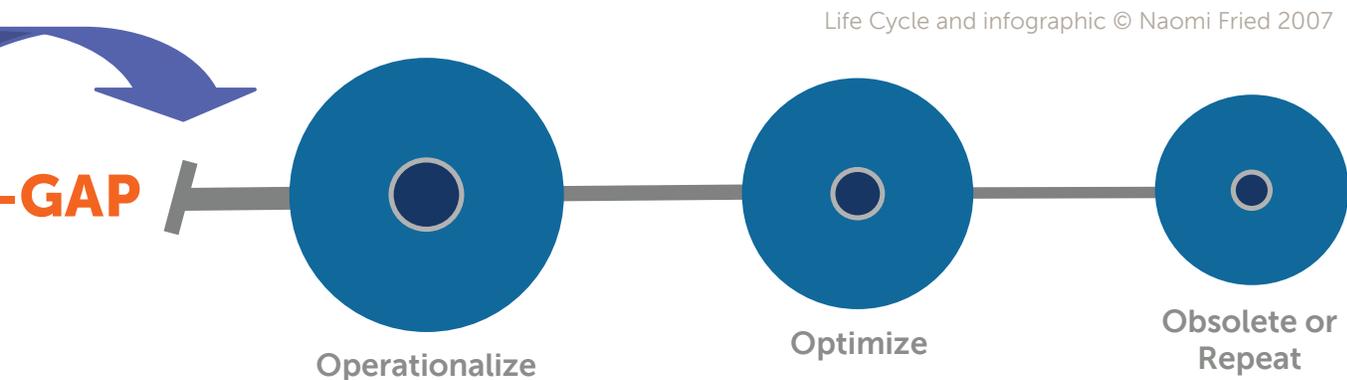


Michael Agus, MD, demonstrates the use of novel elastic multi-electrode ECG strips designed for easy placement on the neonatal chest. The Innovestment Grant provided funding for the initial prototype design and helped connect him with a prototype manufacturer.

Achievements include:

- Twenty-six projects launched through a new seed fund for innovation
- Nine successfully completed innovation projects, including development of a medical device to re-warm babies after cardiac surgery and technology-enhanced toys to help children learn how to regulate their emotions
- One patent pending and seven products under patent review
- Seven awards to build new software solutions that enhance care delivery and improve efficiencies
- Six telehealth pilot programs, with eight more being readied
- Creation of a robust innovation community through a new communication platform (Social Platform for Accelerating Resources and Connections), the Innovators' Forum, and Innovation Day

The IAP has built momentum. The hospital's innovation pipeline is filling with promising ideas and discoveries. Many of the new projects have significant potential to enhance the patients' experience while improving the cost of health care delivery. With continued institutional investment and commitment to a robust IAP, Boston Children's will distinguish itself even further as a leader in innovation and quality health care for children.



Innovation Grant



Using an Innovation Grant, **Niles Mehta, MD, (left)** and **Craig Smallwood, RRT,** have developed a prototype for metabolic monitoring during noninvasive ventilation.

This novel mask will bring gas exchange monitoring ability to patients at home, chronic care facilities and hospitals. An abstract of their work was published in the *Journal of Parenteral and Enteral Nutrition*.

A seed needs nutrients to grow. An idea needs funds to bring it to life. The Innovation Grant Program infuses necessary resources to move innovations through the innovation life cycle. From rapid assessments and feasibility studies to prototypes and commercial development, Innovation Grants help innovators construct models, collect data and test solutions. In addition to funds,

the IAP provides strategic guidance to help innovators navigate obstacles, connect with prototype developers and potential collaborators, and pursue patenting and licensing opportunities with the Technology Innovation Development Office.

As of fall 2012, the Innovation Grant Board had concluded four rounds of funding, reviewing 88 grant applications from 32 divisions, and granting more than \$300,000 to 26 winners from nine divisions.

Impact

All 26 projects* were selected because of their potential to improve clinical care in the near term. Several Innovation projects have potential cost-savings implications, while others may increase hospital revenue through licensing agreements. Many are cross-departmental with the potential to impact care delivery in multiple areas of the hospital.

Unique intellectual property created through these grants has the potential to generate future licensing and royalty revenue for Boston Children's. As of fall 2012, the Innovation Grant Program had yielded one pending patent and seven projects under patent review. In addition to supporting and stimulating early prototypes and pilot development, the IAP also helps transition successful pilot projects to the next phase of development. Currently, Boston Children's is seeking commercial partnerships for four medical device prototypes for further development.

Among many Innovation Grant successes that are changing clinical care delivery at Boston Children's:

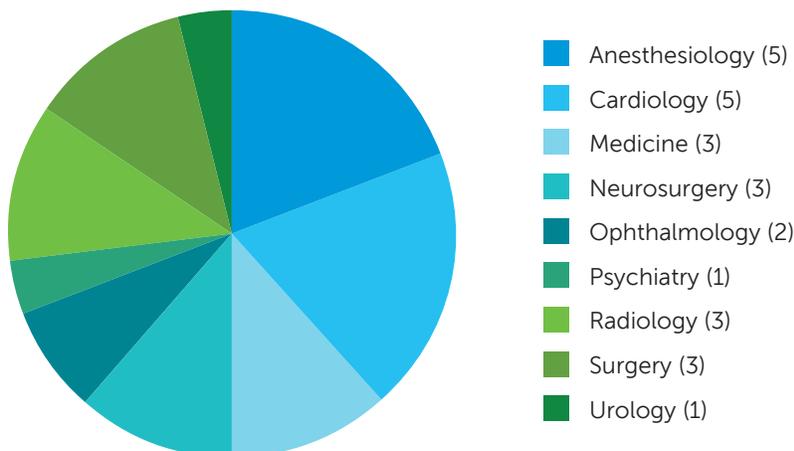
* See number of grants by department chart, page 9. A complete list of the 26 grants can be found in the Appendix, which begins on page 18.

- **Karen Sakakeeny, BSN, RN, CNOR, CPN**, staff nurse III, Perioperative Program, received funds to design and develop an innovative “turban-style hat” to re-warm babies who have been cooled for heart surgery. Ms. Sakakeeny’s patent application is pending, and results from the pilot study indicated that the hat is safe and easy to use.
- **Joseph Madsen, MD**, associate in Neurosurgery, designed and piloted a telehealth program using home-based digital photography to diagnose babies with plagiocephaly (flat-head syndrome). The pilot proved effective in streamlining triage and choice of therapy for patients. The project is being transitioned to a community physician office setting.
- **Jason Kahn, PhD**, postdoctoral fellow, Psychiatry, is developing technology-enhanced toys that help patients improve emotional regulation skills using a biofeedback mechanism to measure how children respond to stress and anxiety.
- **Gena Heidary, MD, PhD**, primary clinician for the Neuro-ophthalmology service, is testing a noninvasive method of measuring intracranial pressure using sounds from the inner ear. If successful, this new method will provide a quick, inexpensive approach to diagnosis, potentially replacing the traditional lumbar puncture procedure.

“The IAP’s Innovestment Grant program fills a real gap at Boston Children’s, encouraging and supporting creative people to take a step forward, which is not easy to do. The progress that’s been made on many fronts, including telehealth, has been invaluable and there is so much further to go. The continuation of the IAP’s efforts, which emphasizes innovation at the organizational level, is critical to the future of Boston Children’s and underscores its leadership position in the health care landscape.”

– Scott Pomeroy, MD,
Chief of Neurology

Number of Grants by Department



FastTrack Innovation in Technology (FIT) Award



Debra Weiner, MD, uses the BEAPPER mobile app to consult with Joel Hudgins, MD, in the Emergency Department. BEAPPER was developed and piloted with the support of a FIT Award.

The FastTrack Innovation in Technology (FIT) Award provides innovators who submit clinical software ideas with dedicated, skilled software development support, business analysis and deployment expertise. Through the FIT Award, Boston Children's accelerates the development and deployment of innovative clinical software solutions beyond the traditional Information Services Department's (ISD) project framework. This unique award, not typically found at other provider organizations, creates customized software that integrates with Boston Children's clinical systems to support clinicians and patients.

Since the inception of the FIT Award, three award cycles have been conducted, resulting in 79 applicants across 19 divisions. The FIT board granted seven awards* in the first two cycles.

Impact

The successful FIT Award pilot projects are the result of agile and low cost development, testing, deployment and evaluation services provided by the FIT team. Examples of FIT Award projects that have improved clinician communication, operational efficiency and/or enhanced patient experience include:

ALICE

Aggregated Local Information Collected Electronically, a clinical smart board that replaces the manually updated grease board, offers a real-time aggregated display of patient location, assignments, bed activity and clinical information in a single comprehensive view. Following a rapid three-month development process, ALICE has now been rolled out across 16 inpatient units and integrated with the electronic medical record. The FIT team successfully created a customized solution for Boston Children's complex clinical system environment after other unsuccessful attempts. Time savings resulting from decreasing futile travel to empty patient rooms and readily available CHEWS scores (a safety indicator) has the potential to translate into earlier patient discharges.

*A complete list of all FIT awards can be found in the Appendix, which begins on page 18.

BEAPPER

Bi-directional Electronic Alert Patient-centered Provider Encounter Record is an Emergency Department (ED) mobile application that alerts the clinical team when labs are ordered and results received. In addition, BEAPPER facilitates quick, mobile communication among members of the care team. The BEAPPER pilot demonstrated a 28 percent decrease in the time it took to get lab results to ED clinicians. When fully operational, estimated time savings from BEAPPER translate into the potential to see more than 1,300 additional patients in the ED per year without additional resources.

GPUTT

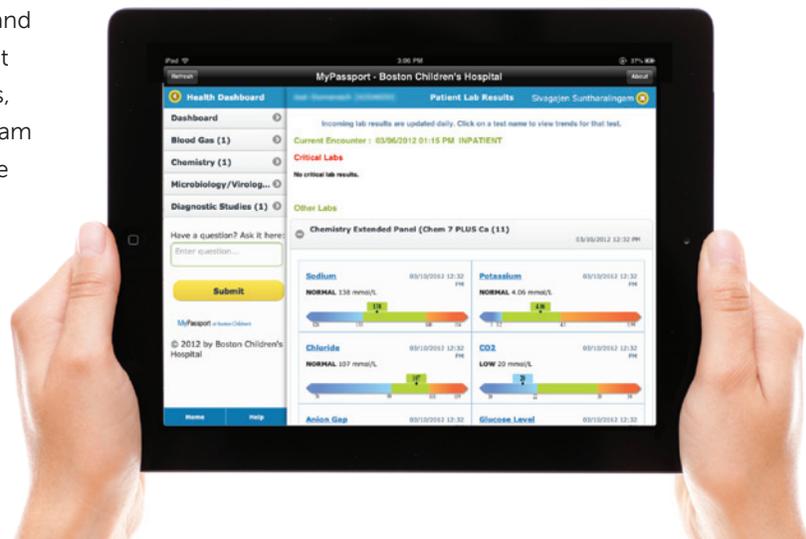
Gastroenterology Procedure Unit Time Tracker is an innovative bar coding and web application that replaces existing paper time studies in the GPU, standardizes data collection, eliminates manual paper tracking and enhances compliance. Integrated with Boston Children's clinical systems, GPUTT captures real-time metrics from physician staff, allowing nursing staff to easily enter important process data points, procedure delay information and quality metrics. Pilot results involving 1,000 patients show marked improvements in operational efficiency, including a 35 percent increase in captured metrics.

MyPassport

MyPassport offers admitted patients and their families a mobile application that provides access to test and lab results, displays names and photos of care team members, provides details on the care plan, and provides an easy way for patients and their families to direct questions to their clinician. Early pilot results show patients and families are enthusiastic about this communication tool, feeling empowered through a better understanding of their environment and the care they are receiving.

"The FIT Award was catalytic in my ability to build MyPassport, a new mobile app for admitted patients. Access to a dedicated team of developers as well as expert IAP program leadership helped me navigate the innovation process and turn research on patient satisfaction into a valuable tool that has the potential to enhance and change the patients' care experience."

— Hiep Nguyen, MD,
Co-Director, Center for Robotic Surgery,
Director, Robotic Surgery Research and Training



Telehealth Programs



Laura Johnson, MD, takes a digital photo of a patient's skin condition as part of the Tele-Dermatology Program. The patient's history and the image are sent digitally to a Boston Children's dermatologist for review and evaluation within 48 hours.

Telehealth uses communication technologies to facilitate virtual physician consultation, patient care and patient education, extending the reach of our clinicians beyond traditional clinic and hospital walls. The IAP's Telehealth Program has developed projects that align with Boston Children's mission of extending high quality care while reducing overall delivery costs, as well as enhancing clinical relationships with network hospitals and physicians. In addition, Boston Children's is forging new strategic relationships locally, regionally, nationally and internationally as a result of the Telehealth Program initiatives currently under way.

As of fall 2012, the Telehealth Program had launched six pilot projects and was preparing an additional eight for pilot. Since its introduction in 2011, the Telehealth Program has collaborated with more than 24 clinical divisions and administrative departments across Boston Children's to support telehealth interests and projects.

Impact

Several telehealth projects have succeeded in reducing overall health care costs by delivering care in lower-cost environments—in the home and inpatient settings. In-home programs include post-surgical home visits using a mobile video robot to facilitate virtual follow-up visits, and post-concussion virtual follow-up visits done via video in the home. Both programs combine in-person diagnosis and care with virtual follow-up, improving efficiency of care and reducing the need for office visits, ER visits and re-hospitalizations.

In the inpatient setting, the Genetics TeleConsult Project at Beverly Hospital uses real-time video to remotely perform genetic consultations and recommend care plans. This model provides specialized care in the community and closes the gap of distance and time when clinicians and families need immediate answers.

Other telehealth projects reduce costs by keeping care local in a lower-cost setting, eliminating costs associated with potentially avoidable medical transportation. TeleConnect at South Shore Hospital uses real-time video to enable Boston Children's-based intensivists to remotely evaluate acutely ill patients in the South Shore Emergency



As part of the TeleRop Program, **Carolyn Wu, MD**, Ophthalmology, remotely interprets digital retinal images sent from South Shore Hospital's Newborn Intensive Care Unit for the diagnosis of retinopathy of prematurity.

Department and, if necessary, recommend proper transportation modes. Working with Boston Children's clinical champions, the IAP secured a grant from the Provider-Payor Quality Initiative to expand both the TeleConnect and TeleConsult programs to other hospitals and specialties.

Strengthening relationships with community physicians and hospitals has been another natural benefit of several telehealth projects. The Tele-ROP (Retinopathy of Prematurity) project at South Shore Hospital involves Boston Children's clinicians who remotely interpret stored digital images sent to them from this distant location, facilitating communication, diagnosis and care plans for the eye health of premature babies. Tele-Dermatology at Martha Eliot Health Center (MEHC) uses technology to connect primary care doctors at MEHC with Boston Children's dermatologists, eliminating the need for patient travel and appointments and increasing overall patient satisfaction. Additionally, telehealth offers the potential to expand clinical services beyond our immediate geography, to service patients regionally, nationally and internationally.

In addition to directly supporting the development of these and other telehealth projects, the IAP team is fostering telehealth innovation throughout the institution by serving as a knowledge repository, demonstrating the impact and importance of telehealth, advising on the development of a technology infrastructure, establishing workflow and payment models and advising on payer and regulatory issues.

"The establishment by the IAP of the Telehealth Program—an idea that's been discussed and contemplated at Boston Children's for many years—has made innovation top of mind for clinicians and staff. With resources and experts readily available, ideas and solutions can be accelerated through the development phase and introduced to a broader user base."

— Gary Fleisher, MD,
Chief of Medicine

Social Platform for Accelerating Resources and Connections (SPARC)

Leveraging the power of social media, SPARC is a secure online social community for employees of Boston Children’s Hospital. The goal of SPARC is to enhance communication and collaboration to support continued innovation. Launched in early 2011, SPARC supports blogs, videos and virtual conversations to help innovators find each other and stay connected. SPARC enables Boston Children’s innovators to form and join groups, search for experts and resources, broadcast announcements and hold conversations with this user-friendly mobile website. Employees can self-identify complementary projects and align efforts to reduce duplication and uncover new collaborators and potential stakeholders. SPARC offers all Boston Children’s employees multiple virtual venues and methods to nurture community involvement, discover unmet clinical needs and distribute ideas and solutions to a network of people.

Impact

Since its inception, SPARC has been widely embraced across the institution, with an average 20 percent growth in membership per month, passing 1,500 members by the end of 2012. Forty-five online groups have been established, generating robust content on more than 1,500 wiki pages (web pages that can be created and edited through a user-friendly text editor). Promoted through a viral word-of-mouth marketing campaign, SPARC has resonated with employees as a relevant and useful social media tool that enhances workflow and leverages crowdsourcing (the ability to distribute and collect information from a large group).



SPARC has been successfully used in clinical settings, laboratories and administrative offices across Boston Children's, enabling users to post and access content that is shared by multiple users, and improve efficiencies in their daily work. Examples of the more than 45 groups that are using SPARC include:

- The Boston Combined Residency Program (BCRP) has used SPARC to share important information including curricula, schedules, policies, forms, medical literature and guides to each academic rotation. One hundred and fifty BCRP users access more than 150 wiki pages rather than carrying information on paper to the various institutions they rotate through. As of last summer, the group's wiki pages had more than 7,000 views.
- For the Robotic Research Group, SPARC allows the robotic surgery team, spread between offices in Boston and Brazil, to add content, including photos and videos, to 70-plus wiki pages on topics ranging from molecular imaging to telerobotics.

"As former chief medical resident, I was thrilled to use SPARC to share important and voluminous information with the Boston Combined Residency Program. SPARC enables residents to access curricula, ED schedules, nightfloat information, and much more, from any device. SPARC is easy to use, convenient, and has undoubtedly enhanced the workflow for residents."

— Israel Green-Hopkins, MD,
fellow, Division of Emergency Medicine

Representing a cultural shift in information sharing, blogging on SPARC has been successfully and widely used to share knowledge, experiences, stories and thoughts within the Boston Children's community. Blogging provides a means for users to add their voices to a discussion and reach a large audience with minimal effort. SPARC currently has multiple active bloggers.

The IAP continues to encourage new users of SPARC in an effort to further nurture grassroots innovation throughout Boston Children's. In May 2012, the IAP challenged the Boston Children's community to participate in an "Idea Tournament" to encourage employees to voice ideas—big or small, clinical or non-clinical, simple or complex. Over the course of five days, more than 30 tournament ideas were submitted and commented on, and more than 3,000 votes were cast. ISD leadership implemented the winning idea based on the interest of the innovation community. SPARC membership grew by 90 percent during the tournament.

Innovators' Forum, Boot Camps and Other Activities

Navigating unfamiliar territory can be difficult without directions. For an innovator, armed with intellectual curiosity and creative ideas, the path can be especially daunting without appropriate resources, support or a community of peers. An important ingredient for creating and sustaining an innovation culture is building communities in which innovators can converse, explore, share and learn in an environment that is supportive and accepting. The IAP has built a variety of communities through the creation of forums, educational workshops and personalized consulting meetings to help innovators connect with others and with resources, and to move ideas forward.

“Since its inception, the IAP has nurtured a thriving, robust innovative culture and community at Boston Children’s Hospital. With opportunities such as the Innovators Forum, innovators can meet, exchange ideas, learn about available resources and move ideas from concept to implementation—learning from each other along the way. The IAP is unlocking the potential for innovation at every level of Boston Children’s.”

— Pedro del Nido, MD,
Chief of Cardiac Surgery

Innovators' Forum

Innovators' Forums are monthly meetings aimed at building and educating a community of innovators at Boston Children’s. In addition to innovator presentations, forums have also included guest experts who educate participants on aspects of the innovation process, such as intellectual property protection and working with the Internal Review Board. By the end of 2012, 21 forums have been held, featuring 34 speakers, with an average attendance of 45. Twelve guest experts made presentations. Surveys to forum participants resulted in high ratings (4.5 out of 5) for the quality and usefulness of the presentations.

Innovators' Forums have been successful in facilitating the exchange of ideas and connecting innovators with each other. Many innovators who presented at a forum reported that receiving feedback from colleagues in that setting was helpful in advancing their work. In addition, audience members valued hearing innovators recount personal experiences from their innovation journey.

Innovation Boot Camp

Innovation Boot Camp is an educational workshop designed to teach clinical and non-clinical participants about the innovation process, introduce resources available, and lower the barriers to developing a new idea. Innovation Boot Camp also includes a panel discussion with experienced innovators who share the trials and tribulations of innovating at Boston Children’s.



Naomi Fried, Chief Innovation Officer, introduces an innovator at Boston Children's monthly Innovators' Forum.

Since 2011, four Innovation Boot Camps had been held with an average attendance of 25 participants from more than 20 clinical and non-clinical divisions. Eighty-five percent of participants said they felt more empowered and encouraged to innovate after attending a boot camp.

Innovation Clinics

While the Innovators' Forums and Innovation Boot Camps are important for building community and jumpstarting the innovation process, Innovation Clinics provide personalized consulting advice to individual innovators or teams on specific projects. The IAP team has conducted more than 250 individual consultations with Boston Children's innovators from all disciplines, providing advice, guidance and navigation through the complex innovation process.

Innovation Day

An important aspect of innovation is the celebration and recognition of innovators' hard work and relentless pursuit of new ideas. Innovation Day 2012 was a half-day conference featuring more than a dozen novel clinical products, processes and technologies that are making health care safer, better and less expensive. Innovation Day aimed to spotlight promising ideas, inspire collaboration and recognize the exciting work coming from BCH. Nearly 180 people attended presentations, demonstrations and poster exhibits.

"The IAP has helped elevate and recognize the efforts of individuals who have embarked on an innovation journey. Employees throughout the hospital now know there are resources and experts available to move ideas forward and help them achieve success, for themselves and for Boston Children's."

— David Hunter, MD, PhD,
Chief of Ophthalmology

Mobile Applications Working Group

The Mobile Applications Working Group was formed to support a growing hospital community interested in mHealth and mobile application development. The group provides a forum for members to discuss topics such as device security, technical development challenges, and tips on user interface development. The creation of the Mobile Apps group has supported individuals in their work on mobile apps and also helped advance the development of hospital-wide mobile app policies and procedures, including compliance policies and user interface standards for mobile devices.

Appendix

Innovestment Grant Program

Complete list of awarded projects

2010 Innovestment Grant Winners

- 1. Michael Agus, MD,**
"Elastic Multi-Electrode ECG Strip"
The prototype design and development of a fixed set of six ECG leads, pre-arranged with a combination of plastic and flexible material, into an array for quick and accurate placement on the neonatal chest. The prototype was developed in collaboration with a bio-medical firm, Thera-Nova LLC, and a provisional patent was filed.
- 2. Henry Cheng, MD, Sitaram Emani, MD,**
"Cardioscopy for Identification and Closure of Complex Ventricular Septal Defects (VSD) in Children"
The development and testing of novel cardioscopic techniques that could improve identification, characterization and visualization of apical and anterior muscular VSDs, thereby improving the rate of surgical closure.
- 3. Anne Hansen, MD, MPH, Dario Fauza, MD, PhD, Rusty Jennings, MD,**
"Minimally Invasive Approaches for Esophageal Atresia"
The design and testing of a non-suture-based tissue fixation device to be used for stretch induction of the distal and esophageal pouch. This device could avoid the complications of surgical procedures currently used to treat esophageal atresia, such as sutures pulling out of the tissue, creating esophageal leaks and thoracic infections.
- 4. David Harrild, MD, PhD, Ed Marcus, MSc,**
"A Speckle Tracking-based Tool for 3D Visualization of Ventricular Contraction Using Cardiac Magnetic Resonance Images"
New software that applies an emerging technology (speckle tracking) in a novel fashion to cardiac MRI images. The software constructs patient-specific three-dimensional animations of contraction and mechanical indices such as velocity, strain and strain rate.
- 5. Heung Bae Kim, MD,**
"Is Ductus Venosus (DV) Closure the Triggering Event for Necrotizing Enterocolitis (NEC)?"
The investigation of whether DV closure in pre-term infants leads to portal venous congestion and intestinal ischemia leading to NEC. If so, NEC, the most common neonatal surgical emergency, could be prevented. This is an ongoing pilot project with Brigham & Women's Hospital and Beth Israel Deaconess Medical Center.
- 6. Joseph Madsen, MD,**
"Digital Photographs in Web-Based Triage for Plagiocephaly"
A telehealth program to diagnose plagiocephaly in an effort to streamline triage and therapy of patients. Piloted with over 30 patients, families uploaded photos of patients for evaluation by the neurosurgery team. Initial results indicate that home-based digital photography can help triage plagiocephaly. Team is exploring a pilot for a physician-physician program.
- 7. Hiep Nguyen, MD, FAAP,**
"Diagnosis of Pyelonephritis Using Fluorescence Imaging"
Near infrared fluorescent imaging (NIRS) with a specific tracer to sensitively identify areas of inflammation in renal parenchyma. Initial results of this quick, radiation-free diagnostic tool for acute infection of the kidney were positive. Results were presented at the American Urological Association Conference in May 2011.
- 8. Karen Sakakeeny, RN, BSN, CNOR, CPN,**
"Hypothermic Control Device for Infants"
A thermoregulation head wrap for re-warming infants cooled during cardio-pulmonary bypass surgery. The prototype was successfully tested with 10 patients, and the safety and feasibility of the device was successfully demonstrated. The team is currently exploring industry partnerships for licensing.

2011 Innovestment Grant Winners

9. David Casavant, MD,
"Tele-CAPE: Remote Monitoring Program for Kids on Home Ventilators"
Leveraging home-based biomedical equipment and video conferencing to care for patients with complex conditions at home. Expected outcomes are reduced cost, work flow efficiency and better patient care.
10. Gulraiz Chaudry, MD, ChB, MRCP, FRCR,
"Novel Expansive Biodegradable Sclerosant for Vascular Anomalies"
New therapies that could potentially overcome current treatment limitations for vascular anomalies and reduce the number of procedures required. The ideal compound would result in permanent damage to the cells lining the malformation and degrade over time, resulting in reduction in size of the anomaly. Novel sclerosants are being tested in animals.
11. Jason Kahn, PhD, Peter Ducharme, MSW, LICSW, Joseph Gonzalez, MD,
"Development of Technology-Enhanced Toys for Severe Emotional Regulation Disorders"
Emotional manipulatives to help children manipulate, develop and explore emotion regulation skills. Children will learn emotional self-control through the use of technology-enhanced toys while they wear a wireless heart rate monitor that collects physiological proxy measures for automatic response, stress and anxiety.
12. Kai Matthes, MD, PhD,
"Novel Coupling Mechanism to Combine Two Endoscopes for Endotracheal Intubation"
A dual endoscope prototype that enhances safety while visualizing both the vocal chords and the trachea continuously during the intubation process. Simulation tests conducted led to improved prototype design. Team is currently seeking industry partnerships.
13. Nilesh Mehta, MD, Craig Smallwood, RRT,
"Prototype Development for Metabolic Monitoring During Noninvasive Ventilation"
Accurate and complete collection of expired gas through a novel mask prototype that can accurately measure VO₂ and VCO₂, assess work of breathing, oxygen cost of breathing and resting energy expenditure. The prototype will bring gas exchange monitoring ability to patients at home, chronic care facilities and hospitals. Team is currently seeking additional funding for a clinical grade prototype and submitted a manuscript to the *Journal of Parenteral and Enteral Nutrition*.
14. Stephen Sanders, MD, Sanjay Prabhu, MBBS, DCH, MRCPCH, FRCR,
"Cardiovascular Imaging to Advance Autopsy Practices"
A noninvasive autopsy through imaging to detect treatment complications for pediatric cardiology patients. Initial data collected was promising. Post mortem imaging in pediatric cardiology won the best presentation award at the Indian Society of Pediatric Radiology in September 2012.
15. Fred Wu, MD,
"A Noninvasive Technique to Monitor the Hemodynamic and Liver Status of Fontan Patients"
Noninvasive monitoring of Fontan patients through transient elastography, an investigational technology that is not commercially available, which utilizes ultrasound to estimate the stiffness of the liver. Early data collected from 59 patients was promising and a presentation was submitted to the American College of Cardiology.

Appendix

Innovation Grant Program (continued)

2012 Innovation Grant Winners

16. Patrick Codd, MD,
"Concentric Tube Robotics for Neurosurgery"
A first phase concentric tube robot prototype for minimally invasive intra-ventricular neurosurgery. This device more gently, accurately and safely addresses intracranial pathology. Currently in testing on a simulation model to further develop the prototype.
17. Camille Gomez-Laberge, PhD, Gerhard Wolf, MD,
"Helping Sick Kids Breathe Easy: EIT-Guided NAVA"
Improving patient-ventilator synchrony by providing a supported breathing mode guided by neuromuscular diaphragm activity and dynamic imaging of the lung. The timing of the diaphragm activity is tracked relative to regional lung filling and emptying to lead to better synchrony than current standard of care.
18. Michael Manfredi, MD,
"TGVR for Weight Loss in Adolescents"
Testing efficacy of transoral gastric volume reduction (TGVR) in children, using endoscopic suturing device to reduce stomach volume. Solution is expected to result in weight loss, with minimal complications and shorter hospital stays. First surgery resulted in a 35-pound weight loss in three months. The team will continue to monitor first patient and conduct two additional surgeries.
19. David Mooney, MD,
"Repair of the Esophageal Atresia without Thoracotomy"
Using force-controlled magnets placed into upper and lower ends of interrupted esophagus to bring the two ends together and then to anastomose them together. The esophageal ends will be stretched and then anastomosed without needing thoracotomy. Team is developing a simulation model to test new approach.
20. Tomer Anor, PhD, Sanjay Prabhu, MBBS, DCH, MRCPCH, FRCR,
"Know the Flow: A New Approach to Diagnosing Shunt Problems"
A previously developed MRI compatible Flow Enhancer and a new MRI method, when used together, dramatically enhance the cerebrospinal fluid flow signal. This signal should result in a noninvasive, reliable diagnostic to manage hydrocephalus.
21. Moti Freiman, PhD,
"Image-ine: Non-invasive Assessment of Bone Tumor Necrosis with IM-MRI"
IM-MRI is a new technique developed at Boston Children's that will more accurately assess bone malignancies necrosis, providing oncologists the ability to personalize surgical plans and chemotherapy regimens and improve overall survival rate in pediatric bone tumors.
22. Anne Fulton, MD,
"Perfect View: Resolving Peripheral Vision and Misalignment of Eyes"
Using prism glasses after surgery to correct strabismus to help maintain peripheral vision. Study addresses the conflict of treating either the loss of peripheral vision in children who have had surgery to straighten misaligned eyes or strabismus by using prism glasses.
23. Craig Smallwood, RRT,
"Dynamic Lung Function and Gas Exchange Measurement During High-Frequency Ventilation"
Development of the High-Frequency Amplitude Attenuation Device (HAAD) to prove that continuous, noninvasive gas monitoring is feasible during high-frequency ventilation. By adapting gas flow to technology, prototype will reduce the flow of exhaled breaths, therefore reducing the variability of the exhaled gas flow that enables flow, CO₂, VO₂ and VCO₂ monitoring.

24. **Gena Heidary, MD, PhD,**
“Non-invasive Monitoring of Intracranial Pressure Using Sounds from the Inner Ear”
 Investigation of whether distortion product otoacoustic emission (DPOAE) may be a new, noninvasive method of monitoring intracranial pressure (ICP). ICP can lead to bilateral swelling and irreversible damage to the optic nerves causing profound vision loss. Early treatment of elevated ICP can help prevent visual impairment from developing.
25. **Sanjay Prabhu, MBBS, DCH, MRCPCH, FRCR, Nilesh Mehta, MD,**
“ULIVE: Ultrasonographic Localization of In Vivo Endotracheal Tube”
 An endotracheal tube prototype with unique reflectors strategically placed inside the tube. Reflectors will help determine position and exact location of tube tip through a routine ultrasound exam at bedside while reducing exposure to radiation.
26. **Fred Wu, MD, Jonathan Rhodes, MD, Bartolome Celli, MD,**
“Exercise for the Heart: Inspiratory Muscle Training in Fontan Patients”
 Intervention on the thoracic pump as a means to improve functional capacity in Fontan patients. Inspiratory muscle training can improve both inspiratory muscle strength and stamina with little expense and time commitment. Continued inspiratory muscle training could lead to improved quality of life, and slow down the rate of progression to Fontan failure and transplant.

FastTrack Innovation in Technology Award

2010 FastTrack Innovation in Technology (FIT) Awards

1. **Courtney Cannon, MBA,**
Aggregated Local Information Collected Electronically (ALICE)
 Replaced existing, static, dry-erase boards on inpatient units with electronic smart boards integrated with Boston Children’s clinical systems to intelligently organize and provide up-to-date information (e.g., patient’s condition status, bed management, caregiver assignments) to improve service efficiency and the coordination of care. Prototype was built and tested. Based on pilot success, enterprise deployment for ALICE was launched and completed.
2. **Kate Donovan, PhDc, BS, AGST, Dennis Gotto, BFAVC,**
Gastrointestinal Procedure Unit (GPU) Time Tracker
 GPU tracker is an electronic replacement for the current paper-based processes for measuring and tracking efficiency in the unit. The software integrates with the electronic medical record to access relevant information and simplify the data collection process throughout the patient procedure to improve efficiency by decreasing delays and shortening wait times for patients and their families. The pilot has been completed. Plans are to phase out paper-based processes entirely.
3. **Debra Weiner, MD, PhD,**
Bidirectional Electronic Alert Patient-centered Provider Encounter Record (BEAPPER)
 Inspired by Twitter, BEAPPER is a mobile solution to help improve multidisciplinary teams’ communication challenges in a busy emergency department. This mobile app organizes patient demographics, collects clinical information from the clinical systems, and displays pictures and details of the clinical team to improve the timeliness of information flow and enhance communication through real-time texts messages or “BEAPPs.” Prototype was built and piloted in the emergency department. Clinicians received reports 28 percent faster when using BEAPPER.

Appendix

FastTrack Innovation in Technology Award

2010 FastTrack Innovation in Technology (FIT) Awards (continued)

4. **Hiep Nguyen, MD, FAAP,**
Boston Children's Hospital MyPassport
MyPassport is intended to improve the inpatient experience for patients and their families by providing organized, personalized access to their medical information, their care delivery team and their care plan during their stay at Boston Children's Hospital. After a successful paper-based pilot demonstrating significantly improved patient satisfaction, MyPassport was re-designed and enhanced by the FIT team as a mobile app. The pilot is close to completion and evaluation will be completed in summer 2013.

2011 FastTrack Innovation in Technology (FIT) Awards

5. **Vincent Chiang, MD,**
Care Transition: Patient Follow-up After Discharge
After discharge, patients and their families often experience challenges during the transition of care processes after a hospitalization. This digital solution will send the patient or guardian a post-discharge follow-up message with a pre-defined set of questions to determine whether they need any follow-up assistance from Boston Children's Hospital with post-discharge coordination of care. Patients will choose whether to receive a text message or email. Pilot launching in spring of 2013.
6. **Timmy Ho, MD,**
Real-Time Collaborative Task List for Residents
A secure, mobile solution is being built to replace the current paper processes for clinical team members' managing task lists related to each patient's care plan. The paper versions can be cumbersome to manage, to keep up to date and to share across the team. This mobile software solution will integrate data from the electronic medical record to enhance how task lists are managed, improve cross team coordination and improve security and access to real-time information. This pilot will launch in early fall of 2013.
7. **James Smith,**
Catalyst Consulting Award: Wayfinding App for Mobile Devices
Simplifying the experience for patients and their families to navigate within the walls of Boston Children's, a wayfinding mobile app was built to help visitors find their way to clinic or other areas within the hospital. The FIT team consulted on the technology specifications and design of this solution. Consulting is complete and the wayfinding app was built and successfully deployed by Marketing and Communications.



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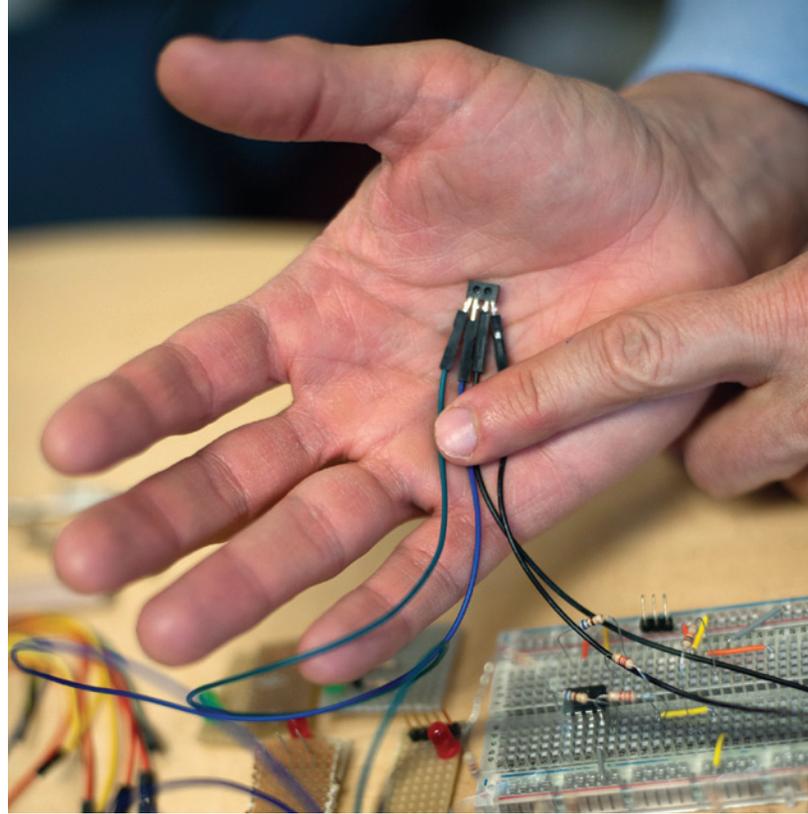
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