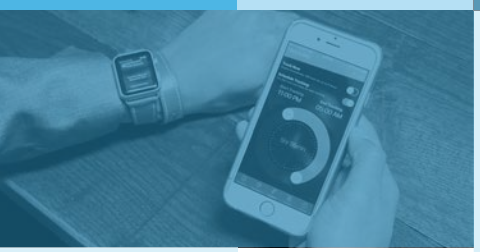
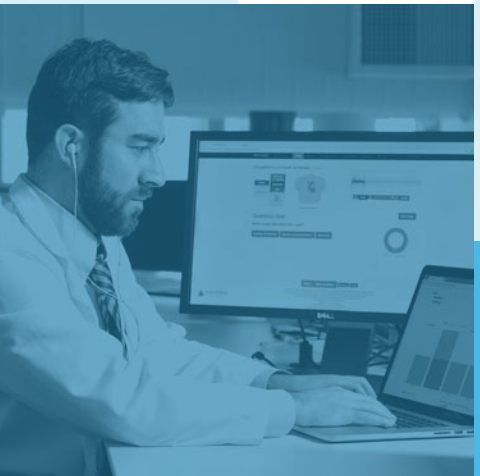
2016 ANNUAL REPORT



EMPOWERING AND CONNECTING **PATIENTS** AND CLINICIANS



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Our Call to *Action*

Our mission **in the Technology Innovation Center is to partner with researchers and healthcare providers to improve patient care. Look deeper into what we do, and you will find that we challenge the status-quo in healthcare. We believe that we can inspire and lead implementation of enormous benefits to patient care. In 2016 alone, TIC software was used by Johns Hopkins providers to improve patient care over 2,598,401 times.**

At its core, the Technology Innovation Center is about the people, culture, and opportunity driving change.

PEOPLE – a team sport

Johns Hopkins attracts the world leading experts in the study of disease. We cherish partnering with these remarkable clinical leaders by providing them with a professional team of talented designers, software engineers, and organizational-savvy leaders to translate insight and discovery into implementation and improved patient care. In 2016, we created 18 clinician-led teams around innovative products. The TIC works in close partnership with collaborators, using our networks to complete team rosters as ideas move from inspiration to implementation and then to commercialization.

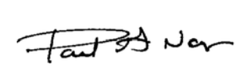
CULTURE – a product of environment

Evolving at a considerable pace, Johns Hopkins' culture embraces innovation. The TIC draws from the expertise of Johns Hopkins Technology Ventures and the Johns Hopkins Medicine (JHM) Business Development and Strategic Alliances to foster new ideas and develop industry partnerships. The TIC's signature leadership program, HEXCITE (Excited for Health), guides clinical inventors in building multidisciplinary teams, applying for funding, deploying solutions throughout JHM, and launching digital health startups in the East Baltimore FastForward incubator. This creates a competitive advantage for faculty working to change the course of patient care. In 2016, TIC-supported clinical faculty were awarded 6 commercialization grants for over half a million dollars at a success rate of 50 percent.

OPPORTUNITY – invention favors the bold

Leading change requires the convergence of three types of leadership. The first is clinical leadership by care providers striving to develop new relationships with their patients and re-engineer broken health care processes. The second: organizational leadership to create sustainable business models and work across specialties to create integrated healthcare delivery systems. The third is technical leadership to showcase the art of the possible and harness new technologies across industries. With our unique understanding of Johns Hopkins, the Technology Innovation Center has traversed barriers to empower a culture of innovation and engagement. In 2016, we standardized the first ResearchKit mobile app at Johns Hopkins (EpiWatch), integrated patient engagement tools into electronic medical records, and led a start-up (Artifact) that alleviates documentation burden for providers through deployment in a community hospital.

We are deeply connected throughout the Johns Hopkins Medicine community and there are over 100 people on page 37 that we want to thank for committing their time, energy, and goodwill to make 2016 a success for the TIC. We specifically wish to thank our 2016 Advisory Board including Peter Greene, Stephanie Reel, Christy Wyskiel, and Mark Shaver. The TIC would not be a success without the tremendous support from these four people. We would also like to acknowledge the support provided by clinical IT, notably, Alan Coltri. Lastly, we're thankful for the 592 folks from across Johns Hopkins spectrum that attended our events in 2016.



Paul Nagy, PhD, FSIIM
Deputy Director , Technology Innovation Center, Associate Professor of Radiology

Dwight Raum
Executive Director, Technology Innovation Center, Johns Hopkins Chief Technology Officer

Meet the *Team*

We are a professional design and software engineering team that builds and deploys innovative clinical information systems across Johns Hopkins Medicine. Our multidisciplinary staff acts as a hub for clinicians to create novel, technology-based solutions that span our medical specialties and practice settings. We are an access point for engineers and researchers at The Johns Hopkins University.

TECHNOLOGY INNOVATION CENTER TEAM

Marc Amick	Phil Gianuzzi	Patrick Ostendarp	Eric Schmitt
Julia Brown	Alex Hall	Katie Patras	John Scott
Rahiem Burgess	Kyle Hasty	Srilalitha Pusuluri	Gorkem Sevinc
Kelly Bystry	Amy Hushen	Ian Rashkin	Kirby Smith
Michael Cohen	Emily Marx	Dwight Raum	Josh Spangler
Joe Daniels	Jasmine McNeil	Ed Reyes	Jay Syed
Chris Doyle	Paul Nagy	Matt Nesbitt	Cao-ly Tran

Our team is passionate about tackling challenges facing patients, providers, and administrators creatively. Ready solve real clinical problems with us?

CONTACT US: Jhmtic.org
tic@jhmi.edu

OUR TEAM INCLUDES: designers, developers, project managers and business leaders who translate the conversation between healthcare and technology to produce results that impact patient care.

DESIGNERS

DEVELOPERS

PROJECT MANAGERS

BUSINESS LEADERS

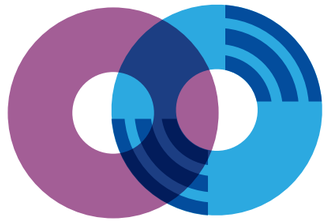
Core *Values*

Lead by serving:

be accessible, attentive, and accommodating to the team and customers.

Challenge what's usual:

take initiative, be relentless, and stay curious.



Take a team-based approach:

stay passionate about learning new technology and co-innovate.

FEATURED APPLICATIONS

CORUS: *Covering* **Communication Gaps with Group Chat**

CORUS, a group chat application built by the Technology Innovation Center to keep all providers in the loop while on the move and when caring for the patient, is promising to enhance and create communication channels for Johns Hopkins Hospital.

"I am a proponent of communication and communication devices making life simpler at the bedside," says Sherri Jones, Assistant Director of Nursing.

CORUS is the update to PING – the legacy system for clinical messaging at the hospital. The software will bring secure, group chat around specific patients to all of Johns Hopkins Hospital in 2017.

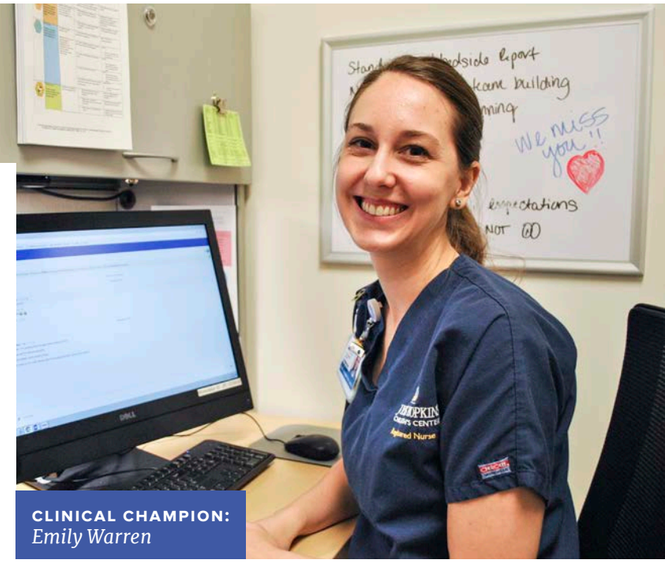
When the BETA version of CORUS came online in late 2016, Jones stepped up to help refine the application for for vital frontline care providers: bedside nurses.

"That nurse is a 24/7 caregiver and they must be able to communicate," says Jones. "This is huge, and I wanted nurses to be involved."

Secure image and document transfer

Quick user search to add providers to discussions

Integrated mobile-to-desktop experience that travels with clinicians as they navigate their day's care



CLINICAL CHAMPION: *Emily Warren*

Emily Warren is a Pediatric Intensive Care Unit nurse who says she predicts specific benefits in using CORUS. If the application traveled with the bedside nurse, that nurse could stay in the loop of physician communication on a multidisciplinary care team. Instead of filling dropped nursing shifts via phone tree, a single CORUS message could go out to all the nurses on that unit about the available shift. And the newly formed Wound Champion Group (nurses with expertise in caring for wounds) could provide wound care feedback through CORUS via secure image messaging.

"I think the patient is going to improve as the care team [communication] improves," says Warren. "They ultimately benefit from a well-organized and functioning team."

Warren says CORUS could also benefit staff satisfaction.

CLINICAL CHAMPION: *Sherri Jones*

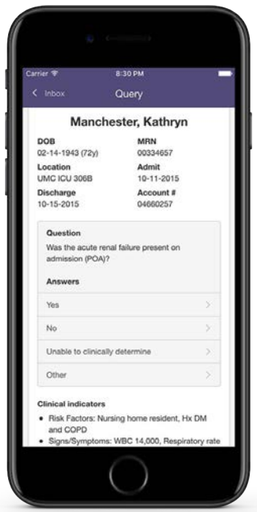
"You don't want to be to be frustrated by limitations in technology," says Warren. "Having a phone and messaging system that supports that would make me as a nurse feel better at the end of the day."

Jones says she can see potential longterm, institution-wide benefits with CORUS.

"Nothing replaces good face-to-face communication," says Jones. "I think this offers opportunities in this world of vastness. In these departments and floors we can be siloed. I think this really helps to bridge."

Artifact Health: *Clarifying* **Physician Documentation to Drive Quality**

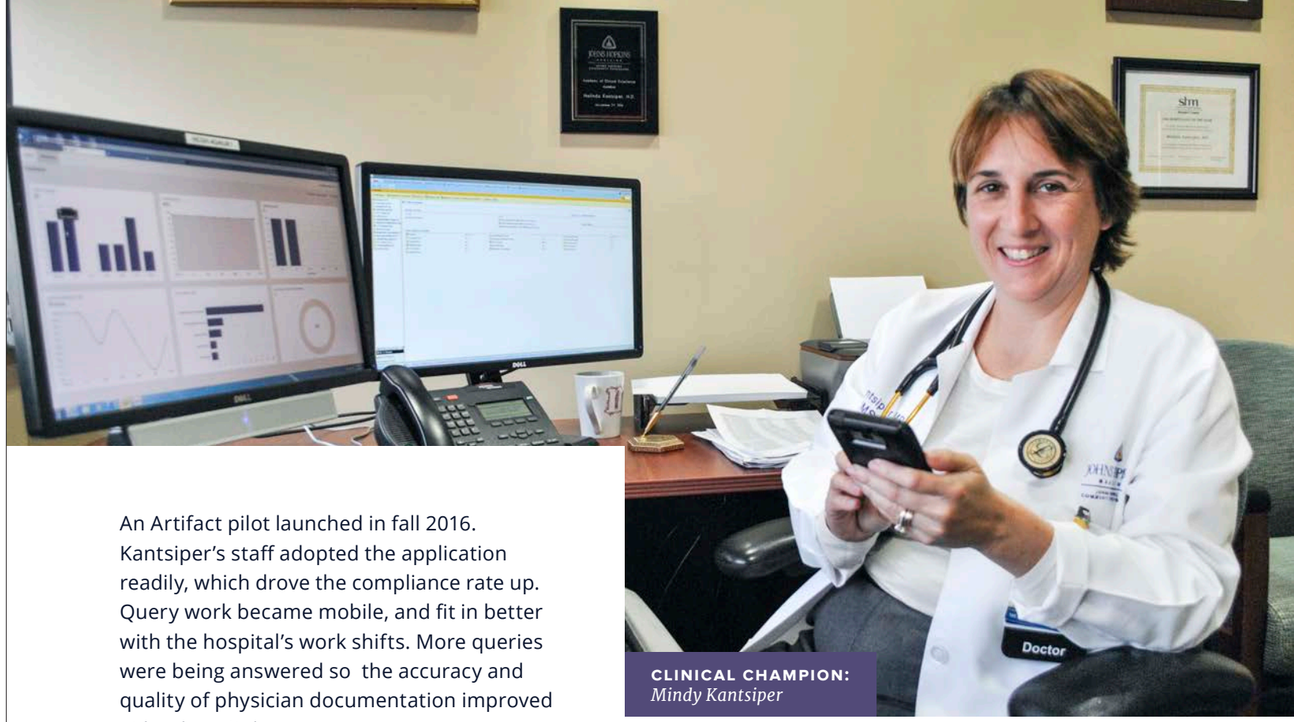
Over a decade ago Marisa MacClary spent a day with physician billing coders and noticed forgotten stacks of bills in every cubicle. Those bills were claims that could not be processed because they were missing information from a clinician. They were likely to be written off as bad debt.



The experience led MacClary to design software to solve that problem, and more recently to becoming the CEO of Artifact Health.

Artifact is a cloud-based platform that manages clarifications of clinical documentation between providers, clinical documentation improvement (CDI) specialists and hospital coders. MacClary and co-founder, Meir Gottlieb, worked for two years to build a partnership to test the software at Johns Hopkins Health System. Soon, the opportunity landed in the hands of Dr. Mindy Kantsiper, an Assistant Professor of Medicine and Hospitalist at Howard County Hospital.

> **We weren't happy with the query process as it stood,"** *said Kantsiper.* **"It was a neat opportunity to pilot something new."**



CLINICAL CHAMPION:
Mindy Kantsiper

An Artifact pilot launched in fall 2016. Kantsiper's staff adopted the application readily, which drove the compliance rate up. Query work became mobile, and fit in better with the hospital's work shifts. More queries were being answered so the accuracy and quality of physician documentation improved at her hospital.

"Compliance can be time suck for frontline staff," said Kantsiper. "[But this] seems to save us time and yet improve our performance."

The high adoption rate among the 70 physicians participating in the pilot is thanks in part to the Artifact team spending weeks at the hospital understanding the workflow of providers, CDI specialists and coding staff and creating an application that saves them time. Artifact worked with the Technology Innovation Center to get their application integrated into the electronic medical record.

In many hospitals, physician queries are sent via fax or email. Physicians wait until they are at a desktop computer with access to the electronic medical record to answer queries. The process is disjointed, and many messages go unanswered.

"To be able to answer a query on my phone and have it go directly into the medical record is much easier and more convenient," said Kantsiper. The application also engages physicians by leveraging behavioral tendencies; it shows the users their response rate and average response time in relation to their peers.

Kantsiper says Artifact's potential impact on patient care is indirect, but important: it helps the hospital get credit for its quality of care and avoid unnecessary penalties. Less money spent on penalties means more resources for taking care of patients.

ARTIFACT'S JOHNS HOPKINS CHAMPIONS:

PETER GREENE, MD
Chief Medical Information Officer

REDONDA MILLER, MD, MBA
President of the Johns Hopkins Hospital

BuffyCare: *Surfacing* Data to Motivate More Comfortable Care

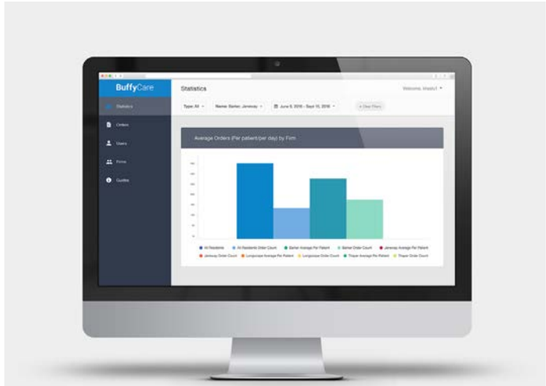
A new Technology Innovation Center dashboard for internal medicine is helping residents understand how many tests they are ordering, how to take less blood, and how to provide higher value care to patients.

"Patients don't want to be stuck [with a needle] at all, let alone multiple times a day," says Dr. Lenny Feldman, Associate Professor of Medicine and Pediatrics. "In reality, residents aren't aware of how many times a day they are sticking their patients."

Sticks are the amount of times a clinician uses a needle on a patient to collect blood for a lab test.

The number of sticks ordered is recorded by the electronic medical record for every internal medicine resident that comes through Johns Hopkins Hospital, but until now, there was no comprehensive way for residents to see their individual numbers compared to the average.

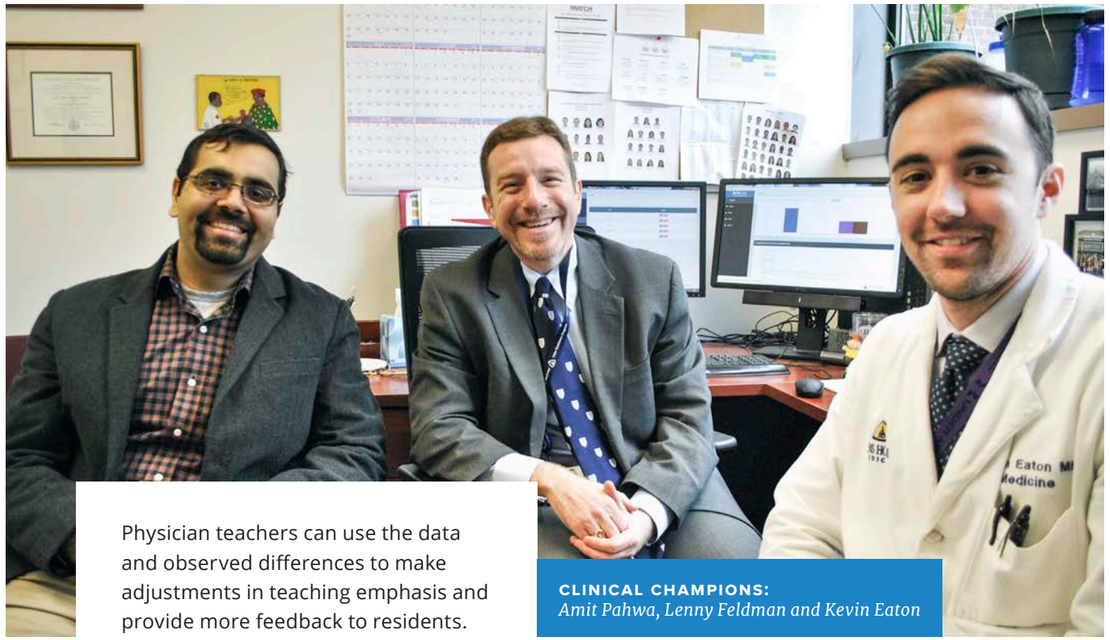
BuffyCare displays graphs that track resident ordering behavior and stick counts. Feldman and Dr. Amit Pahwa, an Assistant Professor of Medicine who has led the project with Feldman, plan to use these numbers, and the behavioral changes resulting from showing this information to residents, to track whether there is an ideal amount of ordering for specific tests.



The dashboard catalogs resident data over months on the individual level, and by 'firm' – the four general medicine resident teams at Johns Hopkins Medicine.

This data will give senior residents and attending physicians who lead the firms insight into specific, cultural differences in ordering behavior between firms.

"So much of the stuff that we want to do, you can't do it unless you have the data," *says Pahwa.* **"Data is time consuming to get if it is not automated. This is a huge step forward."**



CLINICAL CHAMPIONS:
Amit Pahwa, Lenny Feldman and Kevin Eaton

Physician teachers can use the data and observed differences to make adjustments in teaching emphasis and provide more feedback to residents.

"As a resident, you are going so fast," says Dr. Kevin Eaton, an internal medicine resident. "It is much easier to log in and see everything quantified in bar graphs. It is more striking. This is a great way to do personal reflection."

Buffy Care is a Choosing Wisely application. Choosing Wisely's goal is to advance a dialogue on avoiding wasteful or unnecessary medical tests, treatments and procedures.

"I'm very hopeful this dashboard will excite the rest of the internal medicine world," says Feldman.

BuffyCare is currently in pilot and will soon be rolled out to more than 150 residents.

Pahwa says the application will be successful when the average number of sticks goes down.

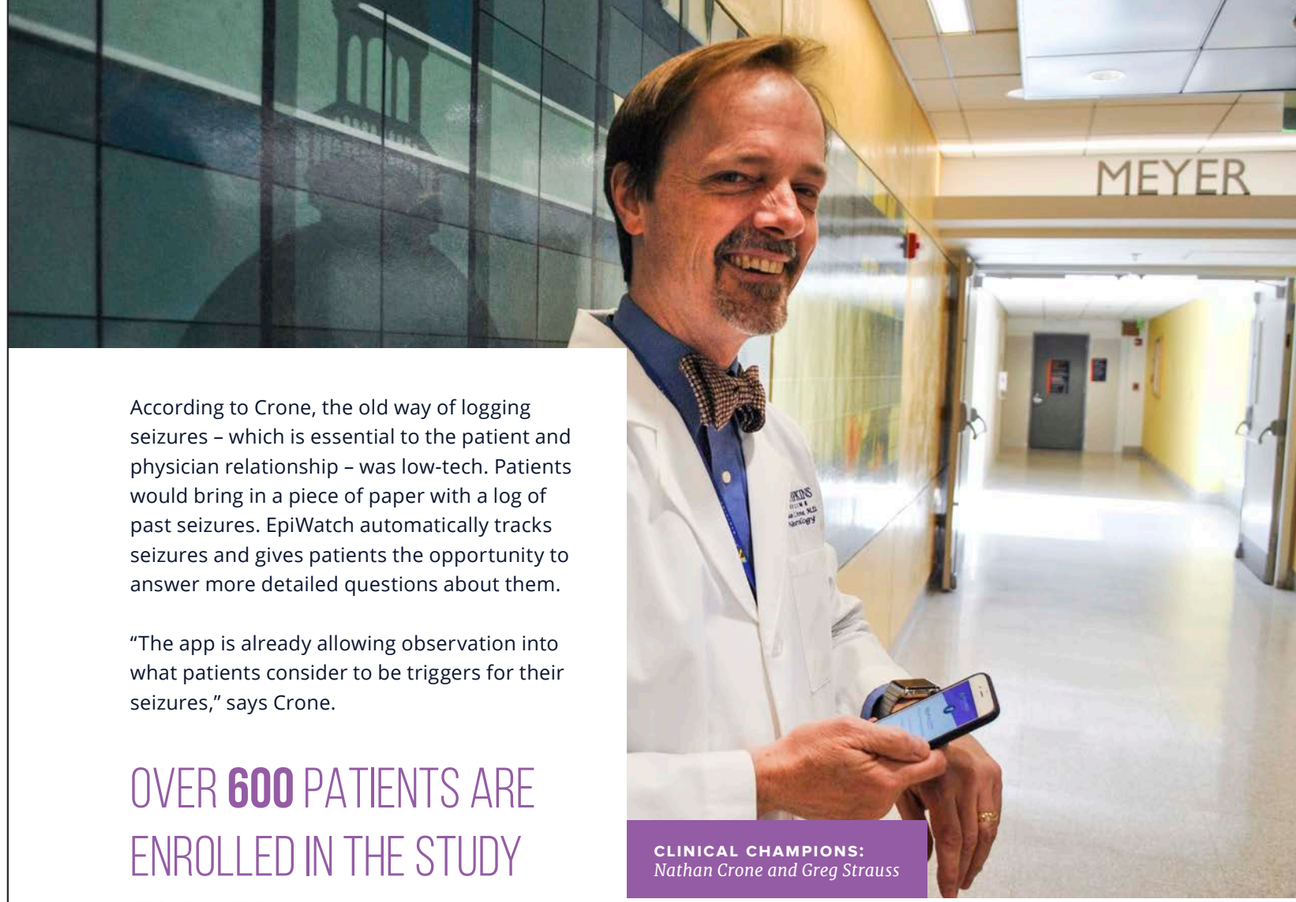
EpiWatch: *Empowering* **Patients with Life-Saving Seizure Data**

"This is an unprecedented opportunity in history really to get in on the ground floor and make sure we are where our patients are," says Dr. Nathan Crone, Co-Director of the Epilepsy Fellowship Program and Professor of Radiology.

Crone is talking about his collaboration with Dr. Gregory Krauss, Professor of Neurology, on EpiWatch, the first Apple ResearchKit app built for the Apple Watch. The app helps individuals manage epilepsy by tracking seizures, possible triggers, medications and side effects. In 2016, Crone and Krauss began growing the app from a research study into a detection tool that can serve all epilepsy patients nationwide.

Crone and Krauss set out to build EpiWatch because the Apple Watch had just come out with high-powered sensors with the potential to serve the medical world. Epilepsy is an unpredictable disorder, and there was an unmet need for seizure monitoring and alerting.

> **"We want to empower patients to get more involved in their care and to get more control over their conditions,"** *says Crone.*



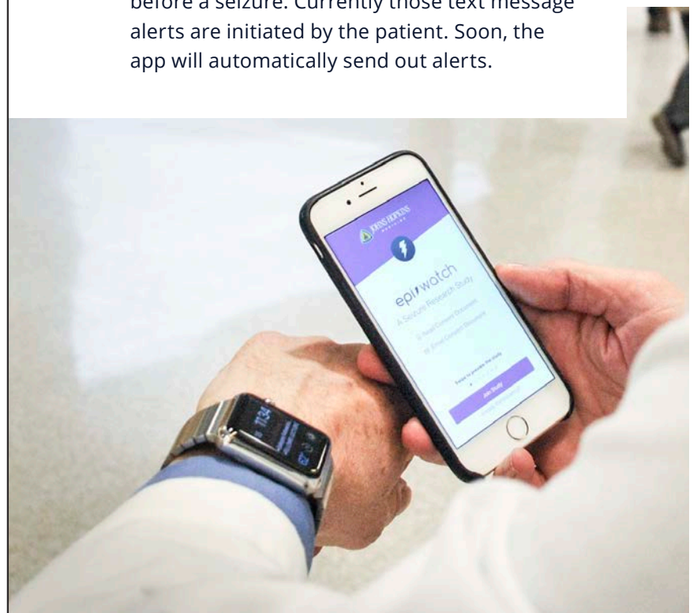
CLINICAL CHAMPIONS:
Nathan Crone and Greg Strauss

According to Crone, the old way of logging seizures – which is essential to the patient and physician relationship – was low-tech. Patients would bring in a piece of paper with a log of past seizures. EpiWatch automatically tracks seizures and gives patients the opportunity to answer more detailed questions about them.

"The app is already allowing observation into what patients consider to be triggers for their seizures," says Crone.

OVER **600** PATIENTS ARE ENROLLED IN THE STUDY TO DATE.

Crone says he has heard from patients that they are using the app to alert a caregiver before a seizure. Currently those text message alerts are initiated by the patient. Soon, the app will automatically send out alerts.



Crone and Krauss built the first version of the app with an outside vendor, and began working with the Technology Innovation Center in 2016 to build the next version of their app that could provide automatic alerts, and more.

"It's really been a great experience working with the [Technology Innovation Center] because of the proximity and availability..."says Crone. "It is a more collaborative relationship with people who have the right expertise for this project."

Crone also has a vision for what apps like EpiWatch can do for Johns Hopkins Hospital: "I think this can keep us on the leading edge of medical discovery and ensure our place as a center for excellence in patient care," he says.

Liver Space: *Connecting* **Patient Communities on Facebook**

Dr. Doug Mogul, Assistant Professor of Pediatrics, wanted to understand how families caring for children with liver disease discuss health-related issues online. So, he joined the dozens of Facebook groups that addressed liver disease.

LIVER SPACE MOBILE COMING SOON

"I saw them asking good questions and, in many cases, getting very good answers from the community," says Mogul. "But one problem with Facebook is that content is lost to the world as time goes. Unlike sharing photos or personal experiences, the cumulative experience of medical concerns is much more valuable. People should have the ability to search for content in a way that Facebook just doesn't allow."

Mogul conducted a survey of participants in these groups to find out if their needs were being met.

He found that families were lacking some support. They wanted the cumulative experience, including:

- Answers to questions in searchable forums
- Latest news about a new drug or study
- A way to track their child's labs over time

CLINICAL CHAMPION: *Douglas Mogul*

Mogul connected with the Technology Innovation Center and launched Liver Space in the summer of 2016. Liver Space is built within a Facebook application, which allows users to access the community from the social platform (where they are already participating). Notifications of new studies or forum posts are sent through Facebook. Users can also message Mogul directly with generic liver questions.

Mogul says the Technology Innovation Center helped him where outside vendors hadn't in seamlessly integrating design and software development so that his Liver Space vision could come to life. There are now over 100 users on the site.

So far, a favorite feature of users is that they receive the latest news that directly relates to their diseases.

"The individuals and families feel very isolated when children are diagnosed with these diseases since they're rare diseases," says Mogul. "In general, they feel very isolated because none of their friends or family members have heard of these diseases, and there is rarely any information about these diseases in the news."

Mogul breaks the benefit for patients down into four things:

It enhances community between patients

It's a bridge between patients and doctors

It facilitates patient-centered research

It provides tools for self-care

PROSTATE ACTIVE SURVEILLANCE

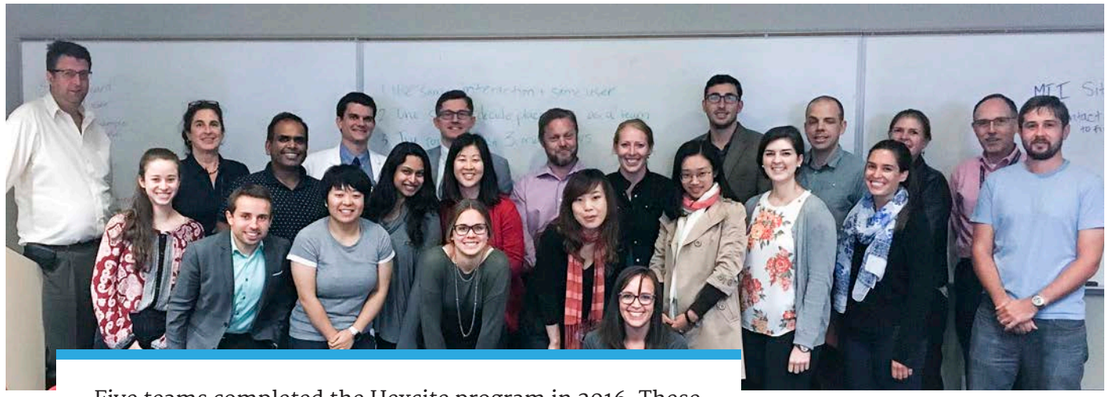
“I have never been so proud to be a part of Hopkins as today. The progress that you have all made in developing patient/physician support tools that are understandable and informative will help not only patients at Hopkins, but also outside our institution.”

Ballentine Carter, M.D.
Active Care tool will be piloted in 2017

PROGRAMMING

HEXCITE: BUILDING HEALTH IT START-UP TEAMS THAT CAPTURE THE JOHNS HOPKINS SPIRIT

HEXCITE: Health | Experiential | Clinical | IT | Entrepreneurial



Five teams completed the Hexcite program in 2016. These applications are coming to a Johns Hopkins location soon.

About HEXCITE

The Hexcite program was created to help launch Health IT products and start-up teams directly from the problem space. Clinicians submit ideas that could positively impact patient care and are paired with business, design, and technical team members to experience 16 weeks of intensive technical and business design.

Teams leave the program with a much clearer idea of their start-up business model by conducting customer interviews, prioritized requirements and wireframes for their software, and plan for building and deploying their product.

VIDEOS FOR EARLY AUTISM DIAGNOSIS

EVAS: Autism is typically diagnosed 2.5 years after it can be detected. Earlier diagnosis, facilitated by EVAS (Early Video-guided Autism Screener), results in better outcomes and significant cost savings for the family and payers. EVAS is more accurate than similar screeners because it shows videos that compare behaviors of children without autism to children with autism.

PICTURES OF SURGERY WORTH (MORE THAN) 1000 WORDS

DEPICTATION: With the rise of electronic medical records, surgeons lost the ability to visually sketch anatomical changes from complex surgeries. Depictation adds the visual nuances of surgery back into the medical record through a drag-and-drop, 3-D visualization tool that allows care providers to comprehensively record and review complex surgeries.

A GUIDE THAT REDUCES OVER-PRESCRIPTION OF ANTIBIOTICS

ANTIBIOTIC NINJA: 50% of antibiotics prescribed in the United States are unnecessary. While guidelines exist for antibiotic use, many clinicians cannot accurately and quickly scroll through encyclopedic recommendations to come up with an actionable diagnosis for their patients. Antibiotic Ninja is a mobile tool that guides users through diagnostic pathways to determine if an antibiotic is necessary for treatment. It also makes dosing recommendations.

A SINGLE, MOBILE VIEW FOR PATIENT STATUS

SYNOPTSIS: Clinicians click an electronic health record 4000 times a day in order to view historical and current vital sign and diagnostic information about a patient. Patient Status Dashboard reduces the time clinicians spend navigating an EHR. It also integrates waveform data, to provide an intuitive, mobile status of the patient on one dashboard.

A WEBSITE THAT EMPOWERS PATIENTS TO GUIDE TREATMENT

BACKUP DOC: Backup Doc is a simple website that patients can use post-thyroid diagnosis to discover the next best steps for their individualized treatment, based on national guidelines. While providers may not have the time to read, and infer treatment recommendations for individuals from these guidelines, the patients can arrive at the clinic with a simple recommendation to help guide their care.

FEATURED TIC CLINICAL INNOVATION LEADS

KRISHNAJ GOURAB MD

JOHN ADAMOVICH MHA

Team ReHAP

ReHAP is software as a service for physical and occupational therapy. It helps providers prioritize the sickest patients when therapy resources are strained.

Post Hexcite, the ReHAP team raised money through the Thalheimer award and began building its software product with the Technology Innovation Center. A prototype version of ReHAP is already in use at Johns Hopkins Bayview and a more advanced version will be available in 2017. The ReHAP team received an exclusive invitation to pitch at the 2016 Innovation Showcase, Baltimore's signature commercialization event, through the Johns Hopkins Alliance for Science and Technology Development.

PETER KAMEL MD

SIIM Medicine Hackathon Grand Challenge

In 2016, Incoming radiology resident Peter Kamel, with guidance from the TIC, won the 2016 Society for Imaging Informatics in Medicine Hackathon Grand Challenge.

The three-day coding competition challenged participants to use integrations for allowing external applications to access the EMR, radiology and workflow information. Peter built an application that helped radiologists view information from multiple sources in one, simple dashboard.

The **Technology Innovation Center's** success in 2016 was bolstered through Maryland-based programs, start-ups, and organizations that have partnered with and supported our growth. These entities each add something special to the work we do.

Johns Hopkins Programs

- Department of ART as applied to MEDICINE
- Business Development and Strategic Alliances
- Center for BIOENGINEERING INNOVATION & DESIGN
- DHSi
- inCMED
- Enterprise Business Solutions
- Johns Hopkins Applied Physics Laboratory
- Johns Hopkins Carey Business School
- Johns Hopkins inhealth
- Johns Hopkins Technology Ventures
- Johns Hopkins Malone Center for Engineering in Healthcare
- Johns Hopkins University Global mHealth Initiative
- Johns Hopkins Medicine Marketing & Communications
- HEALTHCARE SOLUTIONS
- SIBLEY innovationhub

Start-ups

- Analytical Informatics, Inc
- EduMD
- ARTIFACT HEALTH
- emocha Mobile Health Inc.
- QuantifiedCare
- PROTENUS

Partner Organizations

- TEDCO Leading Innovation to Market
- MICA
- VERGE SCIENTIFIC

Designing the Future of Health IT

EXAMPLES OF PROJECTS COMPLETED:

A web application to show resident ordering behavior

Data visualizations for hospital operations administrative staff

A mobile application to aide epilepsy research

Testing for an application to help prioritize patients in need of the most care

Developing a Healthcare-centric Technology Workforce

In 2016, the Technology Innovation Center worked with diverse student talent as part of its internship program. Specialized business, design, and software development interns work with the Technology Innovation Center throughout the year on a part-time basis. An intensive, full-time internship program is hosted in the summer.

"It's been a great experience working here. In addition to learning the skills I need to jumpstart my career as a software engineer, I've gotten the chance to work with some of the best physicians in the world and even had the chance to make a positive impact on the quality of care that those physicians can provide."

JOSEPH DANIELS

Former Software Development intern and current Software Engineer

Collaborating and Learning with University Developers

The Technology Innovation Center recognizes the latent opportunity that results from bringing Johns Hopkins software developers together in a forum setting to discover the work of their peers.

The forums are an opportunity to share best practices, discuss what technologies are already here, and what is coming next. Speakers sign up to teach a new skill, showcase a technology, or challenge the forum participants to code along with them.

TOPICS COVERED IN 2016 :

- Accessing data in real-time
- Researching for user experience design
- Extracting knowledge from reports using machine learning
- Developing with open-source medical imaging software

In 2016, the center hosted 3 Developers' Forum events.

Adding User-Centered Design to the Healthcare Conversation

The Technology Innovation Center includes a design team that completes user-centered design research and bases user experience and interface design for its applications on that research. The team's design thinking expertise lends itself to design problem-solving throughout the Johns Hopkins Health System. Below are a few of the events the TIC helped lead in 2016 with the support of Rhonda Wyskiel and the Armstrong Institute for Patient Safety and Quality.

SEAM Design Conference:

In March 2016, the design team led a healthcare design session as part of a two-day, interactive colloquium produced by students of the Design Leadership program at Johns Hopkins University & Maryland Institute College of Art.

Medical Student Design Challenge:

As part of a two-day intensive elective course for first-year Johns Hopkins Medicine medical students, Technology Innovation Center staff hosted a design challenge for students to use mobile technology to solve a health problem from the provider, patient, or population perspectives.

Ambulatory Operations Roadmap Design:

As collaborators and creators of the technology that powers ambulatory operations management, the TIC team led a design session to help administrators and other ambulatory team members think big about what they could accomplish by harnessing data in the coming year.

The team facilitates design thinking sessions that bring diverse collaborators to complete key steps:

1 LISTENING AND SHARING INSIGHTS

2 DEFINING THEIR PROBLEM

3 BRAINSTORMING SOLUTIONS

4 CHOOSING A SOLUTION

5 PROTOTYPING

Answering Data Questions with Analytics Leadership in Patient Safety

The Technology Innovation Center partners with the Armstrong Institute for Patient Safety and Quality to help faculty and staff answer some of Johns Hopkins' most elusive data questions through the Analytics Leadership in Patient Safety (ALPS) program. This nine-month program provides training for future analytics leaders at Johns Hopkins Medicine to apply advanced clinical analytics and transform the safety and quality of care. During the 2015 to 2016 cohort, the Technology Innovation Center hosted over 17 participants. Each participant completed an analytics project that will positively impact patient care at Johns Hopkins. Below is an example of one of those projects:

ALPS Fellow Profile

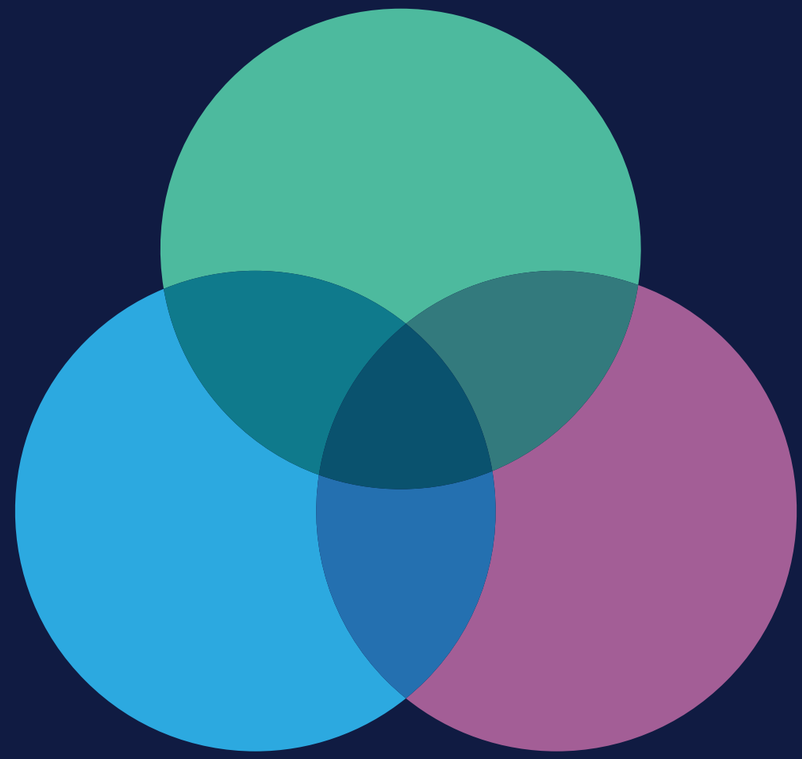
DAWN CORUN

POSITION: Senior Project Administrator at Integrated Healthcare Delivery

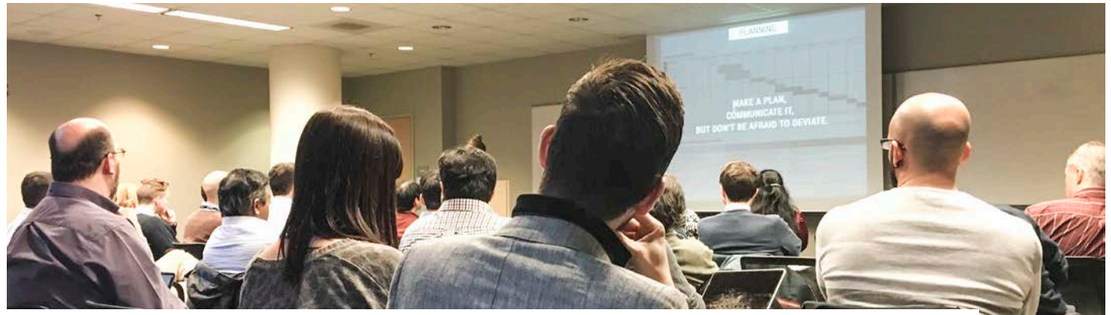
PROJECT: Clinical Asset Inventory

DESCRIPTION: Integrated Healthcare Delivery was looking for a data tool to show them where (which departments or clinics) services are provided and who was providing them. Which provider assets does Johns Hopkins, a large, academic medical center, have available for patients? Clinical Asset Inventory is a discovery tool for understanding what services are available with the goal of providing a better integrated experience for a patient.

> ALPS opens up a knowledge base. It thoughtfully brings together all the various folks responsible for data analysis along with their expertise in tools and data sources. This facilitates efficiencies in data projects especially when it comes to finding the data you need to answer questions. Many times someone else has already tried to solve the problem you are working on or something close enough that you can leverage their knowledge. It seems like ALPS is really onto something with bringing people together to learn from each other." *Dawn Corun*



COMMUNITY



Collecting Community with Health & Technology Events

The Technology Innovation Center organizes events that pull in the essential people and organizations for creating a robust community for advancing healthcare technology. Those parts include the students that will become a future Health IT workforce, the network of innovation center partners that exchange ideas, and the clinical entrepreneurs who bring designers and developers into the clinical space. The TIC helped organize over a dozen events in 2016.

Hacking with a Future Workforce

The TIC staff provide key mentorship to the Johns Hopkins students who join one of the annual hackathons held by university organizations. Staff help with workshops, mentoring, and judging for events like HopHacks and MedHacks, which attract thousands of students to design innovative technology solutions, demonstrated at the end of one weekend spent coding. Hackathon support is an important way for the Technology Innovation Center to bring its experience in Health IT to eager student minds, while helping to shape the future healthcare workforce in IT.

In 2016, the center's team met and exchanged ideas with:

- INTERMOUNTAIN HEALTHCARE
- MEMORIAL SLOAN KETTERING
- UNIVERSITY OF WISCONSIN MADISON
- UNIVERSITY OF MICHIGAN
- UNIVERSITY OF VIRGINIA

Connecting with Healthcare Innovators

A core value of the Technology Innovation Center: take a team-based approach. We host healthcare and industry leaders to share ideas on what we have learned about innovation in healthcare. We actively look for partnerships and have hosted several innovation centers from other medical systems to share successes as well as failures with healthcare and technology innovation work. That's why we make it a priority to meet and share successes as well as failures with healthcare and technology innovators across the country who do similar work.

Gathering & Showcasing Entrepreneurs

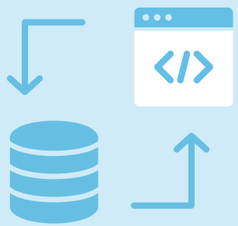
The Technology Innovation Center unearths ideas from the clinical problem space (and the passionate entrepreneurs behind them) and brings them to the surface for potential Johns Hopkins collaborators to experience. In 2016, the TIC partnered with the **Johns Hopkins *in*Health Initiative** to host a Shark Tank event. The event hosted 10 finalists for quick pitches in front of local entrepreneurs and key personnel.

First and second place pitchers received entry into the Hexcite program while a third finalist received consulting hours from Johns Hopkins *in*Health.

Where Healthcare Technology is Headed in 2017

The Technology Innovation Center has a lot of technologies, initiatives, and innovations to be excited about in the coming year.

HERE ARE JUST A FEW



FHIR

The first roll out of FHIR, Fast Healthcare Interoperability Resources, is being implemented in the Epic implementation at Johns Hopkins. FHIR holds enormous potential to enable inventors to move faster and integrate with more as they develop the next generation of hospital technology. The TIC has developed significant expertise in interoperability in HL7 FHIR, HL7 v.2, and DICOMWeb. The TIC plans to host several FHIR-based events and discussions in 2017.

PRECISION MEDICINE

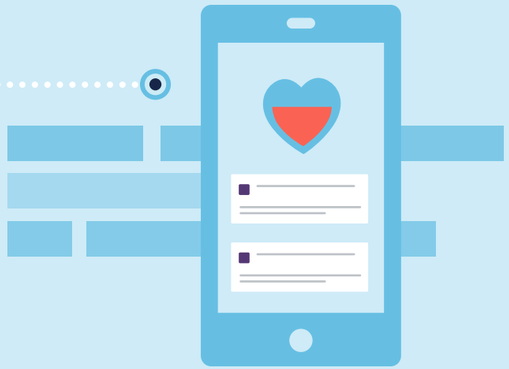
In 2016, Johns Hopkins Medicine and Johns Hopkins University Applied Physics Laboratory announced a Precision Medicine partnership to transform diagnosis and treatment through data analysis and systems engineering. The TIC joined in the effort, and is currently completing the build of infrastructure and a clinically-integrated application that aides monitoring and treatment of prostate patients enrolled in active surveillance.

CLOUD-BASED WEB SERVICES

The TIC has built over 50 software applications; this year, the center began to build applications that are easier to deploy at hospitals beyond Johns Hopkins. New applications like CORUS are built on Cloud-based Web Services. The platform is secure and allows the TIC to quickly launch an application at Johns Hopkins while also making it available to quickly scale to other institutions that might benefit from it.

APPLE KITS

In 2016, TIC took over work on EpiWatch, the first ResearchKit app to use the Apple Watch for monitoring data from epilepsy research participants from across the country. ResearchKit is just one of many software development kits released by Apple to enable quick app builds on top of new platforms. CareKit is now available to promote better management and understanding of conditions.



MYCHART INTEGRATION

Clinicians are looking for new ways to collect data from and ultimately provide better care to patients. MyChart, the patient portal available to all patients at the Johns Hopkins Hospital, provides that connection. Patients can use MyChart to set up medication reminders, track follow-up appointments, and even integrate their FitBit data. For the first time in 2017, the TIC will launch an app that is integrated with MyChart mobile. It's the start of specialized apps built for clinical teams to access important patient information through MyChart. Better integration pathways for connecting patients and their caregivers promises a brighter future for health outcomes.

ACCOMPLISHMENTS

In 2016, the Technology Innovation Center expanded as a business, convener, and enabler of better care delivery. **Just how much did the TIC's work effect its communities in 2016?**

ADDING VALUE

$2.672M

TIC projects revenue

$556K

expected external revenue

CONNECTING

592

people attended TIC events

108,243

TIC tweets viewed

IMPACTING

544,069

new user logins, added separately across 42 TIC tools*

2,598,401

times TIC tools were used

*Logins calculated and added per tool. Each time an individual uses a different tool, we count that person as another login.

Special thanks to:

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