

THE STATE OF PENN MEDICINE
INFORMATION SERVICES



2015-2016





Penn Medicine

Purpose of the Report:

This report demonstrates the achievements and active community service engagement of Information Services associates in supporting Penn Medicine's mission and vision. We support our organization by leveraging technology to provide service excellence in patient care, education and research through the design and delivery of innovative, advanced technology and services.

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MESSAGE FROM THE DEAN & CEO



"Penn Medicine's mission to advance knowledge and improve health through research, patient care, and the education of trainees is greatly dependent upon the ability of our clinicians and researchers to leverage the vast amounts of genetic and phenotypic data now available to them. The Penn Medicine Information Services organization continues to make extraordinary strides that further these goals and enable our Precision Medicine efforts. These include the deployment of a singular and common patient care data warehouse, high performance computing center, clinical trials management system, laboratory information management system and research oriented data warehouse known as PennOmics. Integrating the Information Services computing assets with the operational engagement of Penn Medicine's patient care and research organizations has accelerated Penn Medicine's research capabilities and enhanced the level of care provided to our patients."

J. Larry Jameson MD PhD

J. Larry Jameson, MD, PhD

Executive Vice President, University of Pennsylvania for the Health System
Dean of the Ruth and Raymond Perelman Center for Advanced Medicine at the University of Pennsylvania
Robert G. Dunlop Professor of Medicine



"The Penn Medicine Information Services team continues to display rigor, technological acumen and partnership in advancing Penn Medicine's goals and objectives. This collaborative approach has benefitted many constituents of Penn Medicine, but none more than that associated with the advanced care of our patients and the acceleration of our research efforts".

Ralph W. Muller

Ralph W. Muller

Chief Executive Officer, University of Pennsylvania for the Health System

MESSAGE FROM THE CIO



A handwritten signature in black ink that reads "Michael Restuccia".

Michael Restuccia

Vice President &
Chief Information Officer, Penn Medicine

Today's healthcare industry is characterized by daily medical breakthroughs, changing reimbursement models, ongoing organizational consolidation and rapid technological advancements. Enabling these type of changes and positioning Penn Medicine for continued success requires an Information Services delivery engine that fires on all cylinders with respect to people, process and technology.

At the core of Penn Medicine's Information Services (IS) department is our employee base. Over 600 professionals are dedicated to working collaboratively with our operational partners to enhance patient care and advance research by providing the right data to the right person at the right time in the right mode. Members of the IS team are passionate about enabling the mission of Penn Medicine as we all know each advancement will benefit our friends, families and one-day, us.

This document is a summary of key projects that the IS team either led or significantly participated in with other organization partners. The document is designed to highlight the depth and breadth of accomplishments and successful efforts that the IS team delivers.



TABLE OF CONTENTS

08 | MISSION AND VISION

09 | CIO DIRECT REPORTS

10 | TIMELINE

11 | BY THE NUMBERS

12 | PATIENT CARE

20 | BLUEPRINT FOR QUALITY & PATIENT SAFETY

26 | EDUCATION AND RESEARCH

36 | EMPOWERING TECHNOLOGIES

48 | IS DEPARTMENT PROGRAMS

50 | AWARDS AND PUBLIC RECOGNITION

51 | IN THE NEWS

52 | GLOSSARY





PENNMEDICINE MISSION AND VISION

Penn Medicine’s history of patient care began more than two centuries ago with the founding of the nation’s first hospital, Pennsylvania Hospital, in 1751 and the nation’s first medical school at the University of Pennsylvania in 1765. Penn Medicine has pioneered medical frontiers with a staff comprised of innovators who have dedicated their lives to advancing medicine through excellence in education, research and patient care.

When you choose Penn Medicine, you benefit from more than two centuries of the highest standards in patient care, education and research. The caliber of comfort and individual attention you receive is unmatched by any other hospital in the Mid-Atlantic region.

We are consistently recognized nationally and internationally for excellence in health care. The cornerstone of our reputation is our medical and support staff, who choose to dedicate their careers to serving the needs of our patients and community.

We promote innovation and teaching excellence. We advance medical science through research and create the next generation of leaders in medicine. The results of these efforts are passed directly onto you, our patient.

SUPPORTING THE BLUEPRINT FOR QUALITY AND PATIENT SAFETY

In addition to our mission and vision, The Blueprint for Quality and Patient Safety is the cornerstone of Penn Medicine’s clinical strategic initiatives. Linking clinical information systems initiatives to support the program aligns IT toward achieving the goals of the blueprint.

MISSION

We are a world-renowned academic medical center, and strive to improve the health and well-being of people through research, education, clinical care and community service. We are proud of our commitment to service and strive to use discovery and rigorous research to benefit our neighborhoods, our city and our world. We embrace the opportunity to teach others, to learn from our partners, and to care for patients with skill and dignity.

VISION

Penn Medicine has established a solid reputation regionally, nationally and globally for providing the very best in nursing practice and health care through innovation and clinical excellence. It has done this by embracing transformational leadership, teaching and research, and by providing the most comprehensive and progressive services possible.

- P = Patient Care and Service Excellence
- E = Educational Pre-eminence
- N = New Knowledge and Innovation
- N = National and International Leadership

As a leader in clinical care, education and research, Penn aims to provide an enriching environment for all employees and an exceptional health care experience for each and every patient and family.

INFORMATION SERVICES CIODIRECT REPORTS



LEFT TO RIGHT

TOP ROW: Esther Sim, Theresa Hiltunen, Robert Weidner, Brian Wells, Michael Restuccia, John Donohue, Tom Riesenber, Jim Beinlich, Barbara Hoehn

BOTTOM ROW: Christine Vanzandbergen, Linda Lee, Elizabeth Rager, Sharon Mullen, Mary Buckley
Andre Jenkins (Not Pictured)

TIMELINE

2012-2018

2018

- Enterprise Cardiology Solution
- Integrated Laboratory Solution

2016/2017

- Enterprise inpatient EMR / Hospital Billing

2016

- Clinical Trial Management System
- 300,000+ Patients using MyPennMedicine

2015

- High Performance Computing Model
- Clinical Trial Candidate Recruiting Link
- Mining of Unstructured Medical Text
- Integrate New Hospitals (CCH), LGH) and New Practices
- General Financials Insourcing
- Activating New Facilities (Washington Square, PAC, PMUC, Perelman South Pavilion)

2014

- Predictive Analytics
- Barcode Medication Administration

2013

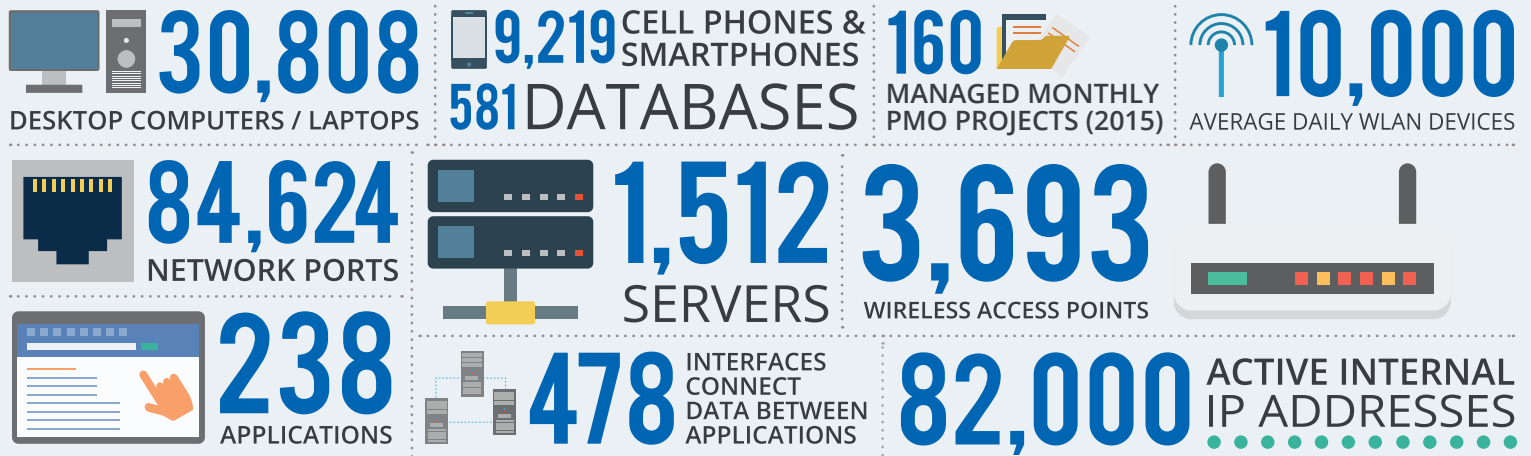
- Research Data Warehouse
- Health Information Exchange

2012

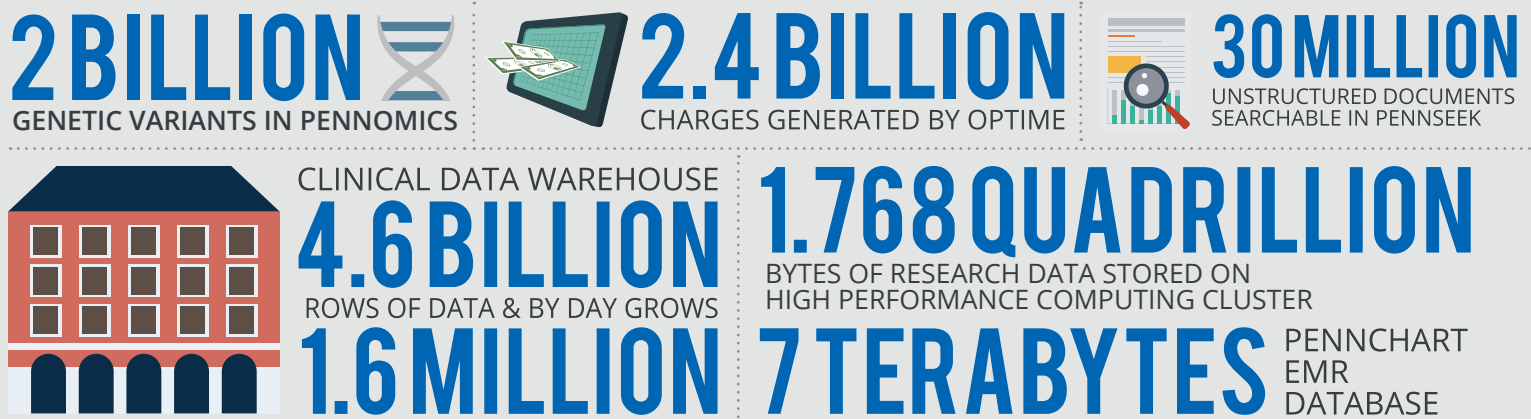
- 130,000+ Patients Using MyPennMedicine Portal
- Enterprise Lab Information Management System

BY THE NUMBERS IN 2015

INFORMATION SERVICES DEPARTMENT SUPPORTS



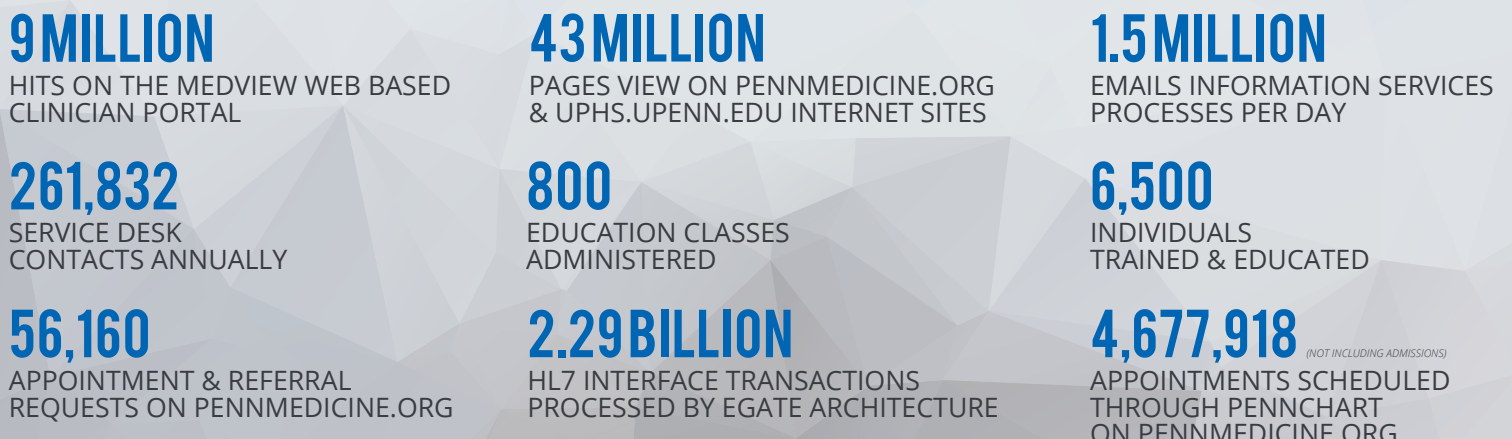
BIG DATA



FIRST IN THE INDUSTRY

- » To Move Data (Health Information Exchange) » Load Clinical Care Data into Translational Research Center
- » Installing Operating Room & Anesthesia Management with different Inpatient EMR

OPERATIONS PERFORMANCE BY THE NUMBERS



PATIENT CARE

Access to Care is the beginning of the clinical encounter between the beneficiary and Penn Medicine and its providers. Our best practice processes streamline a beneficiary's efforts to receive care and ensure that the care received is appropriate in terms of type, intensity and location of care. Providing patients with efficient access to care, results in beneficiaries receiving the right care, at the right time, at the right location for the most appropriate cost.

Provision of Health Services expands the scope of care delivery beyond treatment of illness to illness prevention and wellness promotion in order to achieve optimal health status for individuals and populations. These processes take a person-centered and empowering approach to health care. They recognize interrelationships among physical, mental, social, environmental, and spiritual dimensions of health and well-being. They require interdisciplinary and inter-professional working relationships among practitioners: supporting continuity and coordination in care while minimizing unnecessary variations in care through the use of evidence-based guidelines and system-wide clinical protocols.

Population Health Management is the coordination of health services and the monitoring of health status across a well-defined population to improve clinical outcomes and manage financial outcomes. Population health management programs are the foundation of this process and can include care coordination, case management, disease management and health promotion, all based upon managing patient care and services to an evidence based standard.



2,868,432

TOTAL RESULTS RELEASED

2,279,369

LAB RESULTS RELEASED

433,959

RADIOLOGY RESULTS RELEASED

306,200

PATIENTS ENROLLED IN
MYPENNMEDICINE

302,911

PATIENT ADVICE REQUESTS

90,382

PRESCRIPTION RENEWAL REQUESTS

51,361

APPOINTMENT SCHEDULE REQUESTS

20,713

DIRECT APPOINTMENT WITH
PRACTICE/LAB

MYPENNMEDICINE PATIENT PORTAL CHILD PROXY ACCESS

With over 300,000 users enrolled, our myPennMedicine (MPM) patient portal now allows parents or a legal guardian to access their child's health information online and act on behalf of their care through myPennMedicine. Until this feature went live in August, 2015, there was no means to access the medical information or engage providers through myPennMedicine on behalf of patients under the age of eighteen. Now "Dad Smith" can see "Daughter Smith's" lab results released to MPM and contact her primary care doctor. He can also request prescription renewals for her and review her upcoming appointments. All the features that are enabled for patients logging into their own myPennMedicine account are available to proxies of child accounts.

Within the first 30 days of making child proxy access available, over six-hundred patient accounts were enabled. As of November 30th, that number has risen to 975, with over 500 parents and legal guardians now able to manage their children's healthcare online through myPennMedicine.

Child proxy functionality paved the foundation for the development of additional myPennMedicine MPM proxy relationships. A limited access rollout for patients in the 14 to 17 age group went live in fall 2015, consistent with Pennsylvania State laws around patient privacy. Through a multidisciplinary governance group, we continue to explore options to improve portal access for this patient population while still maintaining their right to privacy.



Our patients have been very positive about digital access to results and notice information and the convenience of myPennMedicine. One user's story demonstrates the value that online patient access brings:

"I went on a trip earlier this month. The day after we arrived in Amsterdam I got very ill--GI bleeding and horrible abdominal pain. I thought it would go away and refused to see anyone. Finally, 48 hours later, our travel agent insisted I see a physician. The paramedics and an ambulance came to transport me to the hospital. I was not at all happy but realized I was in no position to bargain for a different alternative. I was taken to a premiere hospital in Europe and I was shocked when they said they were keeping me. The caregiver told me that my blood pressure was 70/40, I was in kidney failure, and my hemoglobin was 6.7.

Thankfully, European healthcare uses a different scale than the US. My adjusted hemoglobin was 10.6. I was scared out of my mind and then I remembered I had pre-existing kidney damage. I was asked what my bun and creatinine were but I couldn't remember. I asked them if they could get me to a computer. I pulled up my labs from myPennMedicine and that put my kidneys in perspective. I was in kidney failure because I was so dehydrated. They gave me IV fluids and IV antibiotics for 48 hours and I was able to catch up with the boat in Rudesheim." (Penn Medicine employee / patient)



HealthKit



APPLE HEALTHKIT

Staying engaged with patients post discharge from a hospital or between ambulatory appointments has traditionally been challenging for their providers. The technology used to remotely monitor patients and upload their biometric data into the electronic medical record (EMR) was not widely available or easy to implement until Apple developed and released the HealthKit data sharing protocol in mid-2014. Our ambulatory EMR vendor, Epic quickly added support for this protocol to their mobile patient portal application which enabled the easy integration of patient captured medical data in the Epic EMR for any patient with an Apple smartphone or tablet in late 2014.

As soon as this technology was available from Apple and Epic, the Information Services team at Penn Medicine tested and implemented it within the PennChart EMR system. Clinicians can now place orders for patients to capture and electronically submit heart rate, blood pressure, weight, step counts and other data items directly from their iPhones or iPads.

In an initial trial with 20 postpartum women with pregnancy related hypertension the following benefits were realized:

- Patients were more engaged and had a significantly lower rate of no-shows to their 7 day follow up visits post discharge.
- Providers were able to track daily blood pressure readings and intervene when needed on 3 patients even when those patients did not consider readings as indicative of an issue.
- 100% of the patients were likely to recommend this program to their peers.

INTEGRATION OF CANCER CARE PLAN TOOL WITH PENNCHART ELECTRONIC MEDICAL RECORD

OncoLink is Penn Medicine's automated cancer survivorship internal care plan tool used by oncology patients to connect to educational resources as well as healthcare professionals.

OncoLink was integrated with PennChart EMR. The integration discontinues the need for providers to manually create patient care plans and streamlines the plan into the patient record, essentially creating a standardized care plan for this patient population. Use and follow-up related to care plans has increased substantially compared to the manual method of provisioning information. The tool also provides historical views of care plans over time.

EPIC SOFTWARE UPGRADES – VERSION 2012 / 2014 DOUBLE UPGRADE

Penn Medicine is committed to keeping current on the latest software updates for our clinical and revenue cycle technology. This ensures a solid foundation for our integrated electronic patient record (PennChart). There were many ambitious goals associated with migrating from Epic version 2010 to Epic version 2012 and 2014 in one project. This project replaced the majority of our infrastructure servers and storage to significantly expand processing and storage capacity. Education was provided to 8,000+ PennChart users on new features added to the Epic platform. The results of the PennChart 2012 / 2014 double upgrade exceeded expectations and positioned Penn Medicine to continue its journey to an integrated ambulatory, inpatient and homecare integrated patient record (PennChart).

INPATIENT CLINICAL DOCUMENTATION SYSTEM UPGRADE

Penn Medicine currently uses Sunrise Clinical Manager (SCM) electronic clinical documentation system to document the inpatient medical record. The electronic clinical documentation system improves documentation legibility, minimizes duplicate testing, and provides multi-user access to an up-to-date patient chart thereby ensuring the best quality of care for our patients.

The inpatient clinical documentation system was upgraded in order to comply with Meaningful Use Stage 2 attestation requirements in accordance with the federally established EHR Incentive Program timeline. The upgrade also incorporated software changes required for the move from ICD-9 to ICD-10 diagnostic coding systems. The upgrade was successfully implemented on new hardware. Due to excellent pre-go live testing and collaboration between IS and operations resources, it was a successful on time implementation.



LABOR AND DELIVERY FETAL MONITORING UPGRADE

At Pennsylvania Hospital (PaH) and at the Hospital of the University of the Pennsylvania (HUP), expectant mothers can rely on state-of-art software systems to track the progress of their pregnancy. In order to provide the best care, these systems are regularly upgraded.

Information Services, the Office of the CMIO and the OBGYN departments at HUP and PaH worked to upgrade components of the fetal tracking software. The upgrade provided improved data reporting tools, as well as upgraded the hardware configuration for the devices that process the fetal data. As a result of this effort, patients visiting the OBGYN departments at HUP and PaH can be sure they are receiving the best care during their pregnancy.

PENNCART PHASE I IMPLEMENTATION

Penn Medicine signed an enterprise license agreement with Epic Systems Corporation. The implementation of Epic systems was branded internally within Penn Medicine as “PennChart”. The goal was set for Penn Medicine to fulfill the organization’s strategic plan by fully implementing PennChart – an electronic health record that spans the continuum of care, and creates value for patients, clinicians, and downstream consumers of health information.

In 2015, the first phase of the PennChart implementation was completed when the emergency department, transplant, and radiology applications went live at HUP, Pennsylvania Hospital, and Penn Presbyterian Medical Center. Penn Medicine Chester County Hospital implemented PennChart ED in Q1 2016.

This multi-year project included efforts from over 30 analysts, trainers, and project managers. There were 2,750 users trained in preparation for the go-live. During the 4 separate go-live events, command centers were staffed 24x7 for approximately two weeks, and there were dozens of super users providing shoulder to shoulder support to the clinicians. As a result, the ED, transplant, and radiology systems seamlessly integrate with the other PennChart applications that are used by the Ambulatory practices and by the Peri-Operative department. At Penn Medicine Chester County Hospital, PennChart ED was integrated with the current non-PennChart system.

The PennChart implementation provides the framework for Penn Medicine to secure a position of strength to meet future patient and Health System needs in an evolving healthcare landscape.

The benefits of the Phase 1 implementation include:



Emergency Department (1,000 Users)

- Seamless, instant access to comprehensive patient information
- Easy tracking of patient status to monitor high acuity patients
- The ED Navigator contains multiple tools in one place, allowing a clinician to document and view information for the entirety of a specific workflow



Transplant (250 Users)

- Over forty years of old system data was converted into PennChart
- Discrete lab interfaces for improved decision-making
- Enhanced system features in the outpatient setting with additional clinical content, forms, and multiple reports



Radiology (1500 Users)

- The implementation was integrated with Ambulatory facilities to translate into streamlined workflows and established standards of care and treatment protocols
- Radiology ordering is now a standard process throughout the Health System
- Paperless check in
- Centralized radiology scheduling
- Improved routing of radiology results for providers & links to view the images were easily accessible
- Mammography patient self scheduling through MyPennMedicine

With the implementation of PennChart, every part of the Health System will be transformed. It’s a big undertaking, hence the reason PennChart was divided into two parts; Phase I and Phase II. The second phase of the PennChart project provides even more opportunities to meet the future needs of the organization. With the guidance of Penn Medicine clinical subject matter experts, the goal is to build the best content for our patients that can be used no matter which door our patients enter; setting aside some old practices where necessary to help us all align for the future.

INTERFACE FROM INPATIENT EMR MEDICATION MANAGEMENT TO ICU

The medication interface was developed between the inpatient pharmacy system and the Penn tele-medicine system. Every drug on the formulary was mapped with an NDC code so that it could flow to the Penn tele-medicine system. This interface enhances Penn's multi-million dollar investment in tele-medicine. The e-physicians and e-nursing staff are planned to triple in number. Prior to this interface, pharmacy benchmarking couldn't be done as key data was not available. The pharmacy data now allows clinical management to improve best practices contributing to more effective patient care.

ONE-WAY INSTRUMENT SET INTERFACE TO PENNCHART OR ANESTHESIA HOSPITAL OF THE UNIVERSITY OF PENNSYLVANIA

In November 2015, a one-way interface between T-DOC Instrument Set management system and PennChart OR Anesthesia was implemented at HUP. This interface keeps the instrument set inventories in sync between T-DOC and PennChart. As a result, duplicate data entry was eliminated from needing separate entry in PennChart Operating Room and Anesthesia Management.

PENNCHART ENHANCED EMR FOR WOUND CARE PENN PRESBYTERIAN MEDICAL CENTER



The Wound Care department at PPMC implemented PennChart at their practice. PennChart now supports the workflow and workload for wound care physicians including clinical content, such as messaging features, physician orders, prescription refill management, results management, documentation of communication with patients, and managing clinical documents. Prior to this upgrade, the practice was still using paper documentation that needed to be converted to electronic records. The new integration improved the wound care provider's ability to make well-informed treatment decisions quickly and safely. The implementation from paper charts to the PennChart promotes better quality of patient care by providing accurate, up-to-date, and complete information about patients at the point of care. It enables quick access to patient records for more coordinated, efficient care and securely sharing electronic information with patients and other clinicians. It also improves patient and provider interaction and communication.

PENNCHART INSTALL - OCCUPATIONAL MEDICINE PENNSYLVANIA HOSPITAL

Pennsylvania Hospital's Occupational Medicine practice adopted the PennChart EMR, thereby making its workflow the same as the occupational medicine departments at HUP and PPMC. We installed the appropriate hardware including PCs, printers, scanners and other essential devices to patient rooms and registration desks. The install required new cabling, networking configurations, and training for users. The implementation made operational workflows and clinical documentation more efficient. Occupational Medicine continues to provide the best quality of care to patients across the enterprise.

PENN MEDICINE REFERENCE LAB TESTING CHESTER COUNTY HOSPITAL

A project to develop a bi-directional interface between Chester County Hospital's (CCH) lab system and HUP's lab system (2 different vendors) resulted in CCH lab orders being directed to HUP for processing. This lowers CCH costs, improves HUP lab utilization, and improves patient care with faster results turnaround. Significant cost savings and faster results turnaround were realized by CCH.



CHESTER COUNTY HOSPITAL



LAB RESULTS INTERFACE

Patients rely on Penn Medicine to provide the highest quality of healthcare. Lab results are important diagnostic tests that allow providers to establish treatment plans and next steps in patient care treatment. In order to review a patient's lab results, providers may have to look in several different systems. This process proved to be time consuming and inefficient.

This particular interface linked results from external lab agencies (e.g. Lab Corp, Quest) to PennChart EMR, ensuring that each result is discretely filed with the appropriate patient in the PennChart EMR.

UPGRADE DICTATION SOFTWARE

Coinciding with the PennChart upgrade to Epic 2014 version, Penn also upgraded our software used by clinicians to dictate progress notes into PennChart. The upgrade included both software and hardware configuration upgrades to provide increased speech recognition and additional functionality for users, allowing them to take full advantage of the integration with the dictation software and PennChart EMR.

HOMEWORKS / ROADNOTES UPGRADE

Penn Medicine Home Care and Hospice Services (HCHS) uses Homeworks / Roadnotes as its EMR, intake and billing solution. This system was upgraded enabling the 330 clinicians in the field and the 150 office workers treating 2500+ patients to provide quality patient care using the most current software from the vendor.

UNIFIED EXAM CODES PROJECT

Standardized radiology study names and codes were implemented in January 2015 across all hospitals and outpatient radiology centers. Prior to the implementation of the project, each Penn Medicine hospital had different names and codes for radiology procedures. The transition to a single standardized set of over 1300 radiology exam codes streamlined the management of radiology studies, from ordering to processing to billing and reporting. The standardized set was built using the national Radiology Society of North America (RSNA) framework. This implementation had various key benefits. The project simplified transmission of radiology orders and results electronically. It enabled flexible, online scheduling by UPHS clinics, across entities. It improved interoperability, data sharing, and reporting to support emerging national initiatives such as image and dose registries. The project increased accurate coding and billing by allowing the ability to map procedure names to ICD and CPT codes.

BLUEPRINT FOR QUALITY & PATIENT SAFETY

Since 2007 the Blueprint for Quality and Patient Safety has served as the framework for Penn Medicine's efforts to improve quality, patient safety and patient experience. Penn Medicine has established three imperatives to help our operating units and practices implement specific strategies to achieve the goals of improving health and assuring safe care. These imperatives are Engagement, Continuity and Value.

ENGAGEMENT

Achieving the ambitious goals of the Blueprint requires engaged staff, patients, and families. Engagement requires motivated and involved staff working in partnership with patients and families to activate health behaviors that support health improvement and safe care. Unit Based Clinical Leadership teams (UBCLs) and similar front line clinical leadership teams across the continuum are integral to achieving this imperative.

CONTINUITY

Transitions in care and coordination of care have been important components of the Blueprint since the beginning of the process. Keeping patients out of the hospital requires the delivery of seamlessly coordinated care across all settings and service lines.

VALUE

Patients and families, insurers, employers, and others are placing increasing emphasis on value-based care. For Penn Medicine, this means providing high-quality and safe care, free of preventable complications, and readmissions at a lower cost. At its essence, value-based care entails providing the right care at the right time in the right place.

As per our ongoing process to reevaluate and identify new initiatives, each operating unit is asked to define the specific initiatives they will focus on to achieve the Blueprint goals. Through the Blueprint, Penn Medicine has reinforced our commitment to providing the highest quality and safest care to all of our patients.



PENNCHART

CONVERTED MEDICATION ORDERS TO DISCRETE SIGS

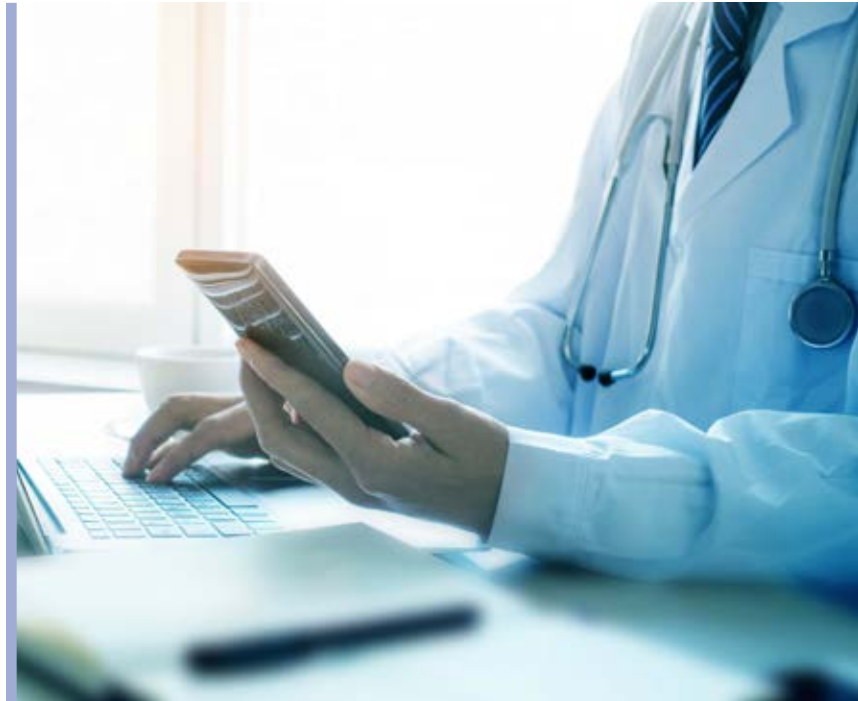
Penn Medicine continues to make improvements that contribute to providing the best care to our patients. Our team converted all ambulatory medication orders to discrete pre-defined medication lists for all dosage, route, and frequency instructions in the electronic medical record. Providers now prescribe choosing from the pre-defined options (structured data) rather than free text fields (unstructured data). This transition truly benefits patient care by minimizing medication errors and increases efficiency by standardizing the ordering process. Additionally, this project was a requirement for the Penn Chart 1 ED implementation and other provider ordering applications available on mobile devices. The Office of the CMIO and Information Services teamed up with operational and clinical pharmacy leaders to successfully roll out the changes. The team engaged subject matter experts and set up conversion labs where education and training was offered “at the elbow” throughout the Health System.

MOBERG PATIENT MONITORING IN NEUROLOGY ICU INSTALL PENN PRESBYTERIAN MEDICAL CENTER

The neurology, epilepsy and neuro-surgery departments implemented a new system (Moberg) that would allow for enhanced monitoring of patients admitted in their intensive care unit. The new monitoring provides advanced data integration, built-in continuous EEG capabilities and enhanced data visualizations, which translates into earlier discharges and advanced patient condition / status monitoring.

PENN SIGNALS

A real-time big data platform called Penn Signals was created to generate multiple predictive applications delivered to clinical teams. The initial application focused on risk stratifying heart failure patients in real-time. The goals of this project were the elimination of unidentified heart failure inpatients, the connection and provisioning of cardiology specific care and the standardization of care to a post-acute setting. The information was provided through a secure phone-based messaging application and included re-admission risk stratification and notification that the patient should be connected with Penn Medicine cardiology resources. The care team used the information to counsel the patient about heart failure disease and plan care transition with their ambulatory provider(s). Penn Signals uses big data technology combined with collaborative methodology to quickly develop and deploy real-time predictive insights to clinical teams. The product merges a streaming data pipeline with 25 million patient records to apply advanced machine learning models in real-time.



HEALTHCARE INFORMATION EXCHANGE

Electronically sharing patient data with non-Penn Medicine healthcare organizations and clinicians has the opportunity to further enhance patient care and enable a healthier community. This more fluid exchange of pertinent patient data results in better care and more seamless transitions of care.

As a member of HealthShare Exchange ("HSX"), southeastern Pennsylvania's regional healthcare information exchange ("HIE"), the Penn Medicine IS team took several important actions to support the development of the exchange.

1. Brought focus to the effort by assigning a dedicated IS manager of physician outreach systems to oversee the connectivity capabilities between Penn Medicine's electronic medical records and HSX.
2. A liaison was assigned to manage the Penn Medicine relationship with HSX and serve on HSX's Board of Directors.
3. A multi-disciplinary HIE Governance committee was formed to ensure representation from all Penn Medicine disciplines participate in the level of data sharing that takes place and insure the protection of this data once it leaves the Penn Medicine perimeter. Additionally, the governance committee focuses on education, coordination, and developing a strategic direction for Penn Medicine efforts to connect with external entities.
4. An IS HIE operations committee was formed.

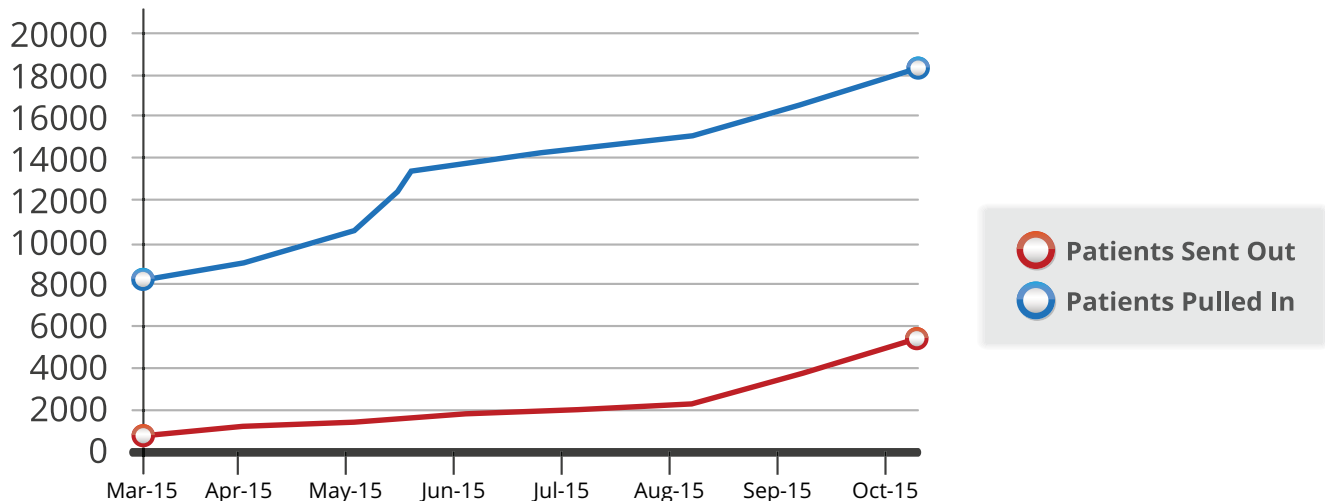
The operations committee focuses on the implementation of information exchange related processes. The HIE team is focused on understanding and centrally coordinating the external connectivity activities across the Health System. This includes the electronic delivery of care documentation and results as well as working with the new Penn Medicine partners at Chester County Hospital and Lancaster General Hospital.

Substantial progress has been made to electronically connect Penn Medicine with external providers. Using our PennChart (Epic) system's Care Everywhere module as the foundation for clinical information exchange, Penn Medicine has seen marked growth in many data sharing metrics. The number of HIE participating organizations that Penn Medicine sends data to and pulls data from has doubled between March 2015 and October 2015. In October of 2015, Penn Medicine received external information on more than 18,000 of its patients and provided data on almost 5,000 patients to external providers continuing care. Penn Medicine also delivered over 31,000 results into external EMR systems.

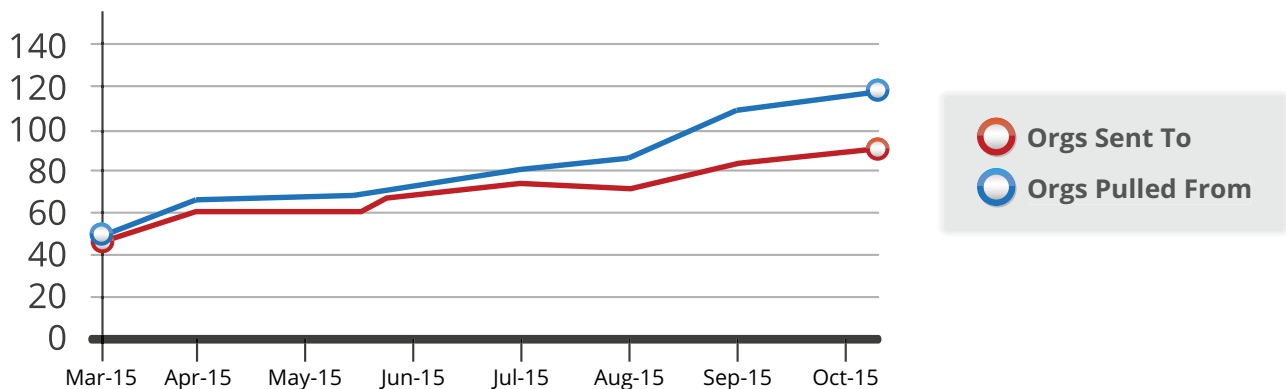
Penn Medicine now has electronic connection capabilities established with 1,750 non-Penn clinicians in the greater Philadelphia region. All of this allows our patients to get the best and most complete care possible. It allows Penn physicians to know more about their patients, and non-Penn physicians to know about patient care delivered at Penn. It also reduces the dependency on patients to remember and repeat details about the care they have received & ultimately improves the clinical outcomes for Penn's patients.



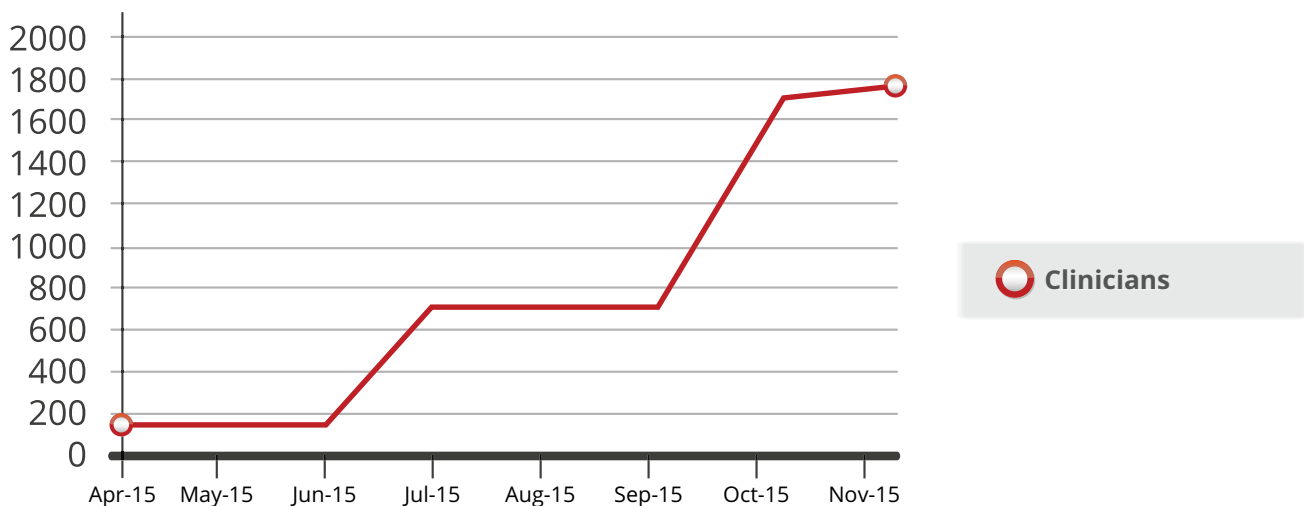
PATIENTS WITH SENT/RECEIVED DATA



ORGANIZATIONS INTERACTED WITH BY MONTH



ELECTRONICALLY CONNECT NON-PENN CLINICIANS



BUNDLED PAYMENT FOR CARE IMPROVEMENT

Penn Medicine is dedicated to reducing re-admission rates for Medicare patients and providing the best possible care. In order to do so, Penn engaged Remedy Partners to work on ensuring that Medicare patients are not re-admitted. Certain bundled diagnosis related groups (DRGs) were targeted in this pilot project for the Pennsylvania Hospital orthopedic service line, the orthopedic and cardiovascular service lines at Penn Presbyterian Medical Center (PPMC) and HUP. The project involved sending the working claim files via a secure link to provide the data to their systems. As a result, re-admission rates lowered and overall better care is provided for the patient (pre-surgical, during in-house stay and post-acute care).

IMPLEMENT BRAIN LAB AT HUP HOSPITAL OF THE UNIVERSITY OF PENNSYLVANIA

As leaders in innovation, Penn Medicine works with the various specialties to incorporate state of the art technology into their daily workflows for diagnostic patient care. The installation of the Brain Lab Cranial Navigation System was no exception to our groundbreaking leadership in medicine. The IS team partnered with the neurosurgery department at HUP to install the Brain Lab Cranial Navigation System. This system develops 3-D plans, takes volumetric measurements of brain tumors, and uses Diffusion Tensor Imaging (DTI) techniques to identify fiber tracts prior to operating. This successful implementation is used by neurosurgeons to perform research in efforts to improve patient surgical outcomes and prevent unnecessary procedures.



AMERICAN SOCIETY OF TRANSPLANT SURGEONS (ASTS) INSTALLATION

The HUP Transplant ASTS Real-time Analysis and Process Improvement Dashboard (RAPID) software deployment project was completed in June 2015. This project required the installation of a web dashboard reporting software package that analyzes transplant outcomes data as reported to the National Transplant Repository United Network of Organ Sharing (UNOS), including reports to allow for multi-year trending. The reporting package provides outcomes and quality dashboards to individual transplant centers relevant to UNOS and Scientific Registry of Transplant Recipients (SRTR). Included are pre-built reports for the kidney, liver, and heart organ programs. Quarterly self-service reloading of new UNOS data was implemented, allowing for integration of new data solely by HUP Transplant staff members.

VISICU UPGRADE

In order to provide the best possible care to ICU patients, Penn Medicine uses ICU software that monitors ICU patient vitals. This upgrade established the ability for the eICU clinicians to remotely monitor several patients at a time. In addition, the upgrade implemented one-touch authentication that allows users to sign-on automatically. The upgrade also provided discharge readiness scores assisting clinicians with discharge decisions. Thanks to this effort, ICU clinicians can provide the best quality of care using cutting edge technology.

MEANINGFUL USE STAGE 2

The American Recovery and Reinvestment Act of 2009 (ARRA) established incentive payments to eligible professionals and eligible hospitals to promote the adoption and Meaningful Use of Electronic Health Records (EHRs). In the first years of the program, Penn Medicine had successfully attested for all of its hospitals and the vast majority of its eligible providers under stage 1 of the Meaningful Use program. Beginning in 2014, the Stage 2 rules began to go into effect, requiring significant expansion of Stage 1 compliance with associated incentive payments. Significant technical build and operational changes in support of Meaningful Use Stage 2 were put into place. Some of the most significant challenges were in the areas of information exchange and EHR inter-operability. Both the inpatient and the PennChart EMR systems were upgraded and enhanced in support of these efforts. Approximately 1,600 "Continuity of Care" documents are sent electronically from our inpatient EMR to PennChart each week, and PennChart additionally sends documents in this discrete, electronic format upon certain transitions of care, so that patient information may be securely digested and acted upon in other EMRs across the continuum of care. Use of, and enrollment in, myPennMedicine patient portal was also expanded in support of Stage 2, with over 300,000 patients now enrolled in that system. These are just two of the many enhancements put into place in support of the Meaningful Use program.

All of Penn Medicine's hospitals and nearly all of the eligible providers successfully met the objectives for Meaningful Use in the most recent reporting year, 2015. The organization qualified for significant CMS incentive payments for 2014 and 2015.

EDUCATION **AND** RESEARCH

The Perelman School of Medicine's education programs develop the next generation of leaders in medicine and biomedical research. To attract the most qualified students and trainees, The School of Medicine and CPUP engage the most outstanding educators and researchers in teaching and training where educational relationships are fostered with the University and Penn Medicine network. We maintain and reward outstanding educators by providing an environment that promotes creativity and rewards teaching excellence. The Perelman School of Medicine, its faculty, and its alumni share a commitment to lifelong learning.

Penn Medicine will enhance its status as a world leader in advancing medical science by continually improving the quality and impact of its research. The areas that Penn Medicine emphasizes are the fundamental mechanisms of biology and human disease; the translation of discoveries into new approaches for the diagnosis, treatment, and prevention of disease; and the evaluation of medicine's impact on the health of the public.



PRECISION MEDICINE PILOTS

Precision Medicine is a new concept and the true benefits along with the people, process and technology challenges require more research. To identify these challenges and attempt to overcome them Penn Medicine established several pilot efforts.

Two of these pilot implementations of precision medicine concepts included:

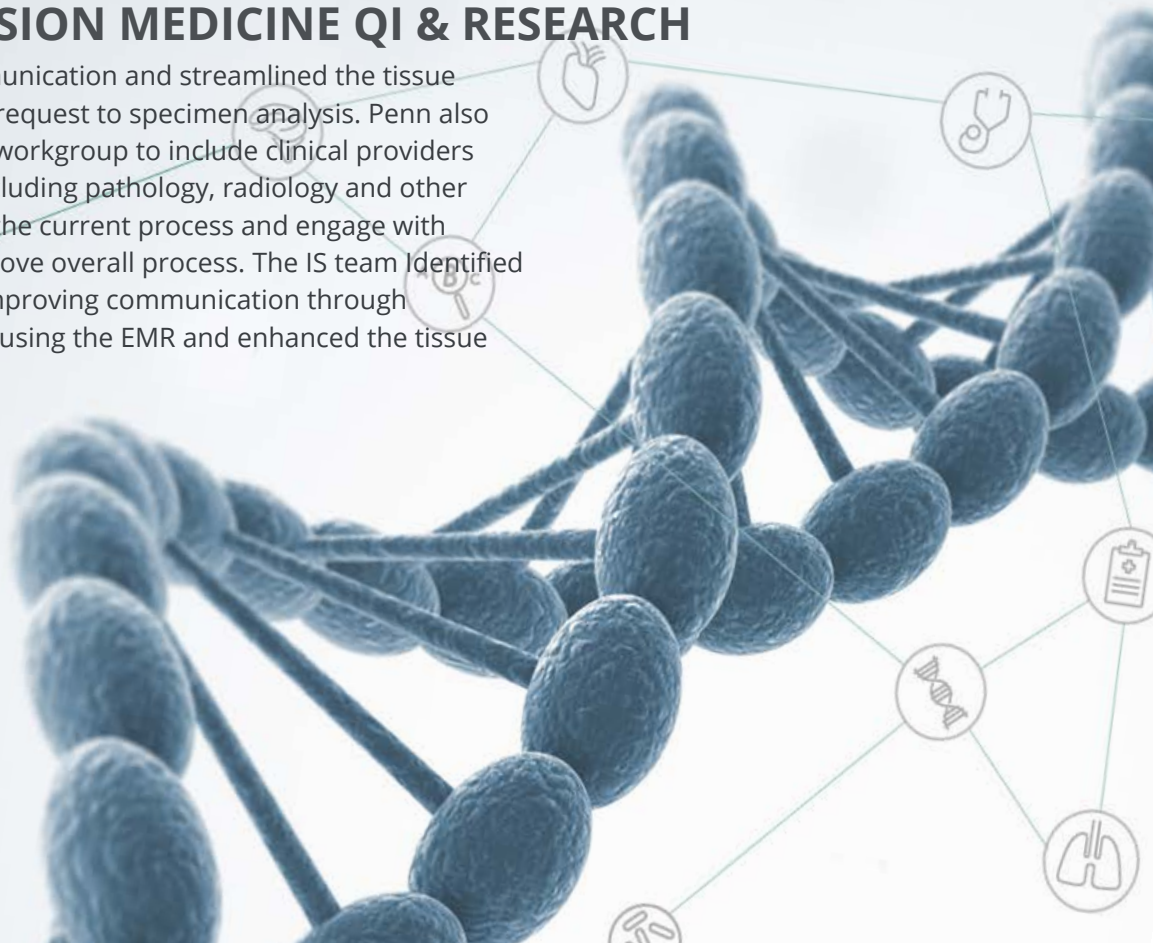
- **CYP2C19 Genotyping for Clopidogrel** – This pilot focused on determining, based on genetic testing for the CYP2C19 gene at the point of care in the cardiac catheter lab, whether a patient would benefit from Prasugrel or Ticagrelor vs. Clopidogrel for anti-platelet therapy.
- **Cardiovascular Familial Hypercholesterolemia (FH)** – This pilot attempted to answer the question “Can genetic testing be leveraged to improve cascade screening for FH?” FH is caused by mutations in the PCSK9 gene encoding key proteins involved in LDL receptor function. Genetic testing is not considered standard-of-care for the diagnosis and management of FH in the US. We are formally testing in a randomized trial whether genetic testing in patients with a clinical diagnosis of FH results in enhanced success in family-based cascade screening.

The results: Penn Medicine patients received a reduction in cost for anti-platelet therapy in the first pilot and proof that genetic testing at the point of care in certain pharmacogenetic situations is viable and desirable.

Penn Medicine has recently formed the Center for Precision Medicine which will continue to identify opportunities to apply the science of precision medicine to clinical pathways and processes.

USING PENNCHART AMBULATORY TO SUPPORT PRECISION MEDICINE QI & RESEARCH

This project improved communication and streamlined the tissue biopsy process from biopsy request to specimen analysis. Penn also implemented an integrated workgroup to include clinical providers from multiple specialties, including pathology, radiology and other procedural areas, to review the current process and engage with Information Services to improve overall process. The IS team identified multiple opportunities for improving communication through streamlined documentation using the EMR and enhanced the tissue biopsy process.



CENTER FOR PERSONALIZED DIAGNOSTICS

One approach to precision medicine requires focused genetic testing of patient tumors. This is required so that the precise treatment for the genetic makeup of the patient's cancer can be employed. Penn Medicine created the Center for Personalized Diagnostics (CPD) to perform targeted genetic testing of solid and blood-born tumors. This CLIA certified lab processes DNA from patient tumors and generates detailed genetic results reports that identify the clinically actionable variants from up to 150 genes. Appropriate therapies are recommended based on the identified variants. Reports are delivered through the EMR to the requesting oncologist. Penn Medicine is now able to provide state-of-the-art genetic results data to patients and their caregivers in a timely fashion. Approximately 80% of patient treatment plans are modified once the genetic results are known. In addition, the generated data is de-identified and stored in our PennOmics clinical research data warehouse, which can be mined by researchers to identify patient cohorts for follow-up research or clinical effectiveness studies.



CPD BY THE NUMBERS

Since the launch of operations in February 2013, the CPD has performed more than 5,000 advanced diagnostics on patients, representing a wide range of cancers: 24% lung cancer, 21% gastrointestinal cancers, 15% acute myeloid leukemia, 13% brain cancers, 8% melanoma, 19% other cancers (breast, thyroid, other).

LINKING GENETIC INFORMATION TO THE EMR

In order to leverage the power of the genetic testing being performed by the Center for Personalized Diagnostics (CPD) in support of precision medicine, the genetic test results must be available within the EMR. Ideally they will be represented as discrete indicators of the presence or absence of clinically actionable genetic variants. By being discrete, rules can be created to alert clinicians to pharmacogenomic indications or to new mutation specific treatment protocols. Currently the CPD genetic test results are integrated into the EMR as textual reports. While useful, efforts are underway to identify more powerful solutions.

Penn continues to work with our EMR vendor and our genetic database vendor to identify possible solutions where the discrete data can be interfaced into the EMR. This would permit the clinician to view the genetic test results along with relevant annotations and research material. Oncologists will be able to benefit from this future integration once completed. They will be able to define rules that will alert them and other clinicians to actionable genetic variants and delve more deeply into the results and view relevant clinical data in an interactive timeline. The ability to easily compare their patient to other patients with similar tumors and treatments is a required capability along with a quick and easy way to identify open clinical trials that match their patient's needs.

VENDOR PARTNERSHIPS – AVAYA, APPLE, ORACLE, EPIC, & INTEL

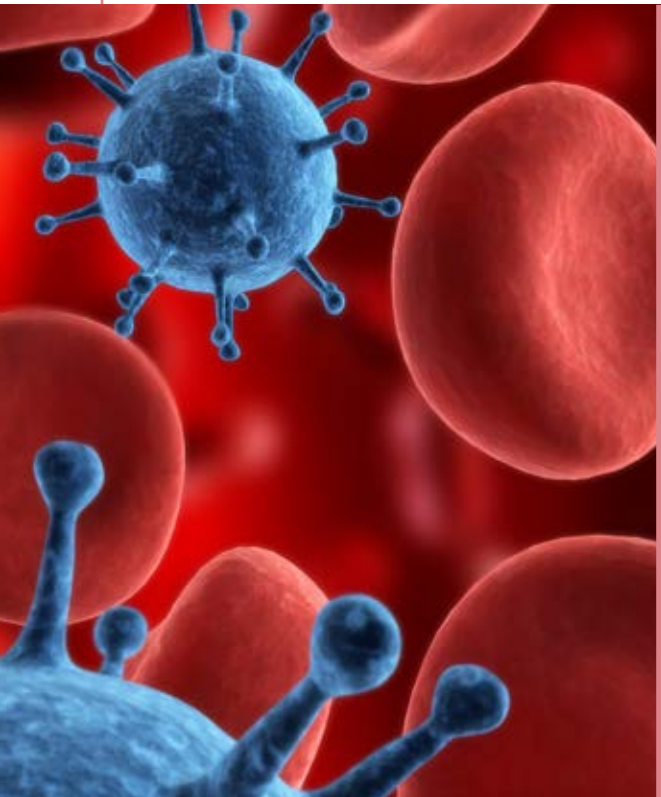
Creating and leveraging the right vendor partnerships can catapult an organization like Penn Medicine into new levels of being at the top of the curve as an industry thought leader. One key is to establish a true two-way strategic partnership with the right vendors where these vendors learn from Penn and Penn benefits from being part of a small group of customers that have early access to capabilities that they have shaped. Each of the vendors – Avaya, Apple, Oracle, Epic and Intel – have developed unique, positive relationships with Penn Medicine. We were early adopters of technology from each organization. With Epic, Penn licensed their ambulatory product in 1997 and will be live on all Epic inpatient applications in 2016 / 2017. We were the fifth customer to purchase Oracle’s Translational Research Center software. Also, we quickly adopted mobile technology and were recently featured as an early adopter of Apple HealthKit and Apple ResearchKit. Avaya has been our strategic VOIP partner. Intel is helping further develop PennSignals and other predictive analytics solutions.

INSTITUTE FOR BIOMEDICAL INFORMATICS SENIOR INFORMATICS

The Perelman School of Medicine recruited Dr. Jason Moore to build a substantial informatics program at Penn Medicine. Dr. Moore is the head of the Institute for Biomedical Informatics (IBI) at the Perelman School of Medicine. The IBI provides “an interdisciplinary home for faculty, staff and students interested in bioinformatics, clinical informatics, clinical research informatics, consumer health informatics, and public health informatics.” The goal of the center is “to improve healthcare and fundamental knowledge of biological systems by creating an informatics ecosystem through cutting-edge educational programs, computational infrastructure, and collaborative research.” IBI is accomplishing this goal by recruiting a new Chief Research Informatics Officer (CRIO) and a group of informatics faculty and researchers. In order to support the mission, these individuals will need more robust computational and analytics infrastructure.

PMACS is meeting IBI’s computational needs by providing:

- Infrastructure and IT support services for the recently created Bioinformatics Core team.
- Dedicated system administration staff with several years of scientific computing experience.
- Design, development and operation of the research platforms for deep learning and artificial intelligence projects.
- A continuum of computing resources, from small server clusters to the Penn High Performance Computing (HPC) environment, (4,600 virtual cores, 2 PB of storage and 1.8PB archive capacity).
- Planning for IBI’s new Visual Analytics Laboratory (“The Idea Factory”). Provides collaborative hardware, software, and space for connecting data with research ideas.



PENN MEDICINE ACADEMIC COMPUTING SERVICES FACULTY ANALYTICS DASHBOARD

Until recently, use of analytics in medical schools has primarily been in the research setting, focused on making sense of research data. However, with the increasing availability of business intelligence (BI) tools, medical schools are now turning their attention to using analytics to better manage their administrative and educational missions as well.

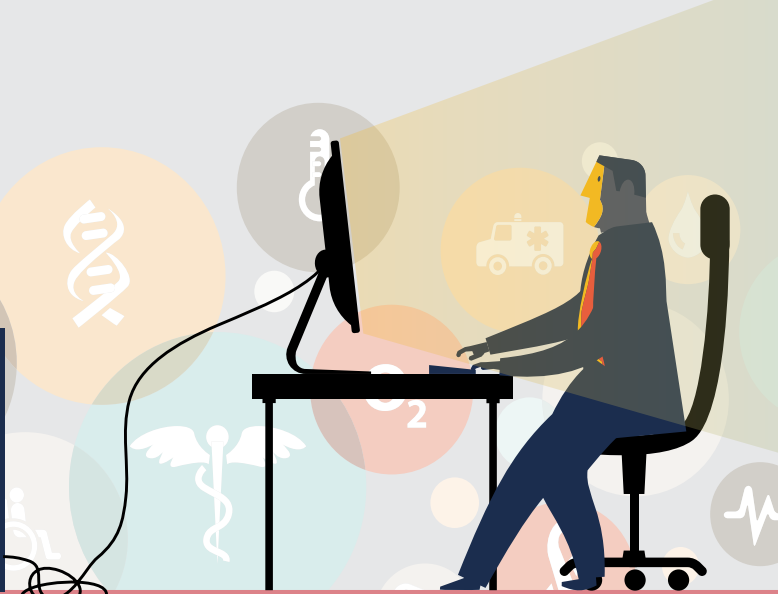
At the request of Perelman School leadership, Information Services (IS) worked with the school's Office of Decision Support and Analysis to create a new business intelligence tool named the Faculty Analytics Dashboard. This dashboard allows vice deans and department chairs to view an individual faculty member's research, clinical, and education activities at a glance and compare them to department and school level metrics. The Analytics and Penn Medicine Academic Computing Services (PMACS) teams of IS built the dashboard on an Oracle and SAP Business Objects infrastructure. The data come from various University of Pennsylvania, Perelman School, and UPHS information systems.

Following extensive discussions and demonstrations to the deans and chairs, the dashboard was implemented in July 2015. To date, the system has performed as expected, and the project sponsors are planning to expand usage to the departmental business administrators on whom the chairs rely on for most administrative duties.



PENNSEEK

PennSeek is a self-service web-based data discovery platform that gives Penn Medicine researchers on-the-spot access to both structured and unstructured data from numerous electronic medical record systems, diagnostic applications (e.g., radiology, pathology, and cardiology), data warehouses, and spreadsheets.



It provides immediate search and information discovery capability across these applications for such variables as diagnoses, symptoms, demographics, and medication regimens. Researchers even have access to messages between patients and care-providers on myPennMedicine, our patient scheduling and communications portal.

PennSeek represents a major advance over previous requirements to manually search through unstructured data. It also highlights the exact location where searched words appear in context. Previous search methods could sometimes find the report or progress note, but researchers would have to read through the entire text to find key words.



Biomedical researchers have long struggled with gaining access to data throughout multiple clinical systems, especially when that data is unstructured, such as in physicians' notes, nurse triage, discharge summaries, and medical-device data. For example, if a patient tells his doctor "I woke up in a cold sweat," that unstructured datum would typically be captured in a progress note. If a researcher later wanted to know if this phrase were an early indicator of another condition, a standard search using database tools would prove unproductive. But PennSeek allows such an investigation.

PennSeek is our implementation of Oracle's Endeca Information Discovery platform. Endeca has a hybrid search-analytical database at its core, which allows it to extract, transform, and load diverse data sources into an integrated, user-friendly format in response to queries from our researchers. To ensure patient confidentiality, PennSeek servers sit inside our internal firewall and are only accessible to accredited Penn researchers.

Penn Medicine established the PennSeek Education Team to help our researchers gain maximum benefit from the enormous wealth of data housed within our health system. Two dedicated PennSeek experts work with researchers to ascertain their needs and customize PennSeek templates, visualizations, interfaces, and tag clouds of their most important search variables. They also provide training and technical assistance to ensure that researchers spend their time efficiently.

Insights into Early Indicators of Aortic Stenosis Using Unstructured Data

Stratification of clinical data across multiple systems presented a challenge to Dr. Daniel Kiss of Penn Cardiology. Dr. Kiss was interested in a complete view of a patient cohort in order to determine early indicators of aortic stenosis, a potentially fatal cardiac condition. This challenge was magnified because Dr. Kiss was interested in extracting information that was stored in both discrete and unstructured fields - traditionally this type of data would be searched manually. Solving this challenge would significantly decrease the cost and time of identifying patients with early indicators of aortic stenosis, as well as increase accuracy by reducing the need for manual abstraction.

The Penn Medicine Data Analytics Center built a PennSeek application that brought together discrete and unstructured data across nine clinical categories. By combining this data, Dr. Kiss was able to layer Boolean operators combined with discrete filters and free-text search to return results that helped narrow over 4 million patients down to just thousands who potentially expressed indicators for developing aortic stenosis. Dr. Kiss reduced his chart review and abstraction time from 1,200 to 267 hours, while also saving more than \$90k in study-related costs.



iCONNECT

Penn Medicine sought a way to provide patient friendly information, to improve patient recruitment for research and positive patient engagement. A patient portal was implemented that integrates with the Institutional Review Board and other Penn research systems to provide up to date information on all available research opportunities at Penn Medicine. The portal allows patients to actively search all current and available research studies based on department, disease type, genetics and other criteria in a patient-friendly format. A volunteer registry was also created to inform patients of future potential research opportunities, including opportunities existing at CHOP (Children Hospital of Philadelphia). Patient engagement increased as a result of the project. Principal research investigators and research staff are actively engaged in using the tool and improving research recruitment effectiveness.

CENTRALIZED BIO-SPECIMEN DATA INTO ONE COHESIVE SYSTEM

Penn Medicine bio-banking operations have been de-centrally managed. While the freezers must remain physically separate because of space demands, the software systems managing the sample inventory was also managed individually, specific to each area and study. A team of principal investigators, lab technicians, managers and technologists gathered to survey the landscape of Laboratory Information Management Systems (LIMS), as well as evaluate custom-built solutions that were already in place for smaller bio-banking operations on campus. After mapping technology and security compliance requirements to capabilities the team selected the LabVantage system to manage bio-samples.

Implementation of the system was phased in, selecting individual pilot labs and their bio-sample inventories for transition to the centralized LIMS. The data was harmonized among the individual labs, standardizing data for import into the LabVantage data model. The team also developed sample tracking methodologies and processes for each lab. Existing sample identifiers were maintained while simultaneously assigning each sample a value that was unique among all samples in the entire system.

With a LIMS system replacing disparate bio-sample management methods, such as Excel sheets and small custom applications, labs have a better understanding of what samples are in their inventories, the status of those samples, and have normalized metadata associated with those samples. Now, little to no manual data manipulation is needed in order to easily run reports to access a lab's bio sample inventory. This makes both the physical bio-samples and the data associated with these samples easier to access, and more accessible while conducting research activities.

EXPANSION OF THE CLINICAL TRIAL MANAGEMENT SYSTEM

The Abramson Cancer Center uses the Velos CTMS system to manage its studies and has employed this system for almost a decade. PMACS worked with the vendor to upgrade Velos to a newer version as well as create data efficiencies. This effort paved the way to expand the use of Velos across a majority of clinical trials in many departments. Key goals of this effort are greater visibility into clinical trials operations at PSOM, improved compliance with federal regulations, as well as the ability to interface clinical trial data with data warehouses such as PennOmics.

In 2016, the CTMS will be integrated with the Epic EMR such that patient demographic data, study data and subject enrollment status is automatically passed between the two systems thereby eliminating double data entry and ensuring accurate tracking of clinical research subjects. In 2017 research billing reconciliation will be EMR based.



THE POWER OF SELF DISCOVERY IN CLINICAL TRIAL RECRUITING

While there are many research and clinical databases available at Penn Medicine, most are highly restrictive, preventing researchers from answering simple questions without having a technical expert merge the data and IRB permission to view the results. Researchers needed a way that allows them to answer preparatory questions quickly and easily through clinical and research data. For example, Scott Damrauer, M.D. needed to determine if the HUP and PPMC teams performed enough vascular surgeries to perform a clinical trial to evaluate adverse events following the procedure.

PennOmics was implemented at Penn Medicine as a foundation to house this kind of data taken from multiple clinical and research sources including Penn Data Store, the Tumor Registry, the Center for Personalized Diagnostics, and several smaller genetic result datasets from research groups across campus. The final data warehouse complimented the clinical data with genomic data in a way that now allows users to ask phenotype and genotype based questions about patients simultaneously. The system presents users with a self-service interface application named Cohort Explorer.

Dr. Damrauer performed three queries through the Cohort Explorer interface to determine the rate of poor Troponin values, myocardial infarctions, and stroke following a vascular surgery. There are now over 150 Cohort Explorer users performing complex queries through Cohort Explorer and using the results data to prepare for grant and IRB submissions as well as performing basic data analysis. Dr. Damrauer found sufficient patients that met his inclusion/exclusion criteria and his team initiated the Vascular Events Trial with recruitment at HUP and PMC.

PENNOMICS

PennOmics is a transformational research data warehouse serving all Penn Medicine hospitals and the Perelman School of Medicine. It plays a crucial part in supporting precision medicine at Penn Medicine. With PennOmics, which became operational in 2014, our physicians and researchers can gain access in one unified platform to massive amounts of anonymous, aggregate patient data from millions of electronic health records and cancer genomics data from six formerly stand-alone data-collection systems. Previously, these data were stored with little or no integration or simple query methods.

The PennOmics platform uses a vendor-supplied hardware and software suite and features a high performance database machine that stores and retrieves data from various databases. Data are mapped to international-standard coding systems to enable ready query within clinical-concept categories. To maintain the security and privacy of patients and research subjects the data are de-identified and secured behind multiple firewalls. Access to identified data is only possible with institutional review-board approval and patient and research-subject consent.

The liberation of patient phenotype and genetic data via PennOmics has transformed the manner in which Penn Medicine provides treatment to our patients and advances discoveries. Specifically, researchers have access to aggregate demographic and phenotypic information plus the rich detail supplied by gene sequencing. This allows them to assess large populations of patients for optimal treatment modality efficiently and quickly, e.g., women with mutations of the BRCA 1 and 2 genes (which raise the risk of breast, ovarian, and certain other cancers). This can spare patients from unnecessary prophylactic surgery, including preemptive surgical removal of the breast, and help others better monitor themselves for early signs of cancer.

The business and clinical value associated with PennOmics is wide and varied by achieving the following outcomes:

- Significant time savings in identifying patient cohorts for clinical trials and clinical care treatments;
- Leverages data to expand clinician and research capabilities beyond efforts previously entertained;
- Positions Penn Medicine for additional national and industry grant opportunities;
- Advances and strengthens Penn Medicine's relationship with new trading partners in the pharmaceutical and clinical trial industries;
- Serves as a valuable tool and enabler for the recruitment of hard-to-find biomedical and research informatics expertise;
- Creates a new and unique collaboration between Penn Medicine clinicians and researchers in the discovery and implementation of new treatment discoveries.

PennOmics allows clinicians to tailor their care decisions by comparing patients within a population to each other. For example, by evaluating individuals with similar medical profiles, a physician might conclude that one blood pressure medication would be more effective than another. And using PennOmics, our physicians can ask questions of the data, e.g., find all lung cancer cases with EGFR-activating mutations that have failed primary EGFR therapy, with disease-progression presenting as new metastatic disease.



PROVIDER STORIES - PENNOMICS

A number of our physician-scientists report how using PennOmics to obtain data for feasibility assessments of potential studies efficiently improves their process and improves patient care, without need for assistance or special requests to the service desk.

- Scott Damrauer, MD, a vascular surgeon, says: “With PennOmics, I spend 20 minutes conducting a search that may have taken up to 10 days in the past. PennOmics quickly helps me determine whether enough data exist to conduct crucial studies and, if the data are present, I can complete the study infinitely faster. For example, I recently used PennOmics to assess the feasibility of a sponsored clinic trial in which a positive troponin following vascular surgery was one of the primary outcomes. By determining the number of patients who had troponins lab values in the 30 days after undergoing an index procedure and then exporting the lab values for analysis, I was able to determine the likely event rate. This information was important in helping to determine the power of the study and the necessary enrollment. We have subsequently secured the study contract and started the trial.”
- Joan O’Brien, MD, director of the Scheie Eye Institute at Penn, is completing a comprehensive study on primary open-angle glaucoma in African Americans that requires extensive genetic and clinical information. One of her study coordinators used PennOmics to identify patients meeting her study’s criteria.
- Michael D. Feldman, MD, PhD, associate professor of pathology and laboratory medicine, says: “PennOmics allows our oncologists to identify patients whose tumor-profiles and genomics match existing clinical trials. This helps us assign patients to the trials, which hold the best hope for helping them. PennOmics also helps determine the feasibility of starting new clinical trials to address the needs of certain patients better than through existing trials. And it allows us to assess how different genomic variations in patient tumors affect care-delivery and cost.”

PARTNERING WITH INDUSTRY TO IMPROVE TRIALS

Conducting industry sponsored clinical trials is expensive. Much of the costs and delays relate to subject recruitment. Until recently, inclusion and exclusion criteria defined by the sponsor could not be validated against real data. This resulted in unrealistic criteria and a trial design that could not be fulfilled. Unfortunately, this situation is often not realized until months or years of unsuccessful recruiting.

Penn Medicine partnered with two vendors – Oracle Health Sciences Network (HSN) and TriNetX – to provide solutions and make our rich clinical data available to other healthcare industry partners to validate the trial criteria long before the trial begins recruiting. Our high quality data in PennOmics and Penn Data Store has been de-identified and uploaded to secure cloud solutions that can be accessed by authorized industry partners as desired. The industry users can only receive counts of the number of patients that match the clinical trial criteria. They cannot see detailed patient data.

Penn Medicine is benefiting from this innovation in many ways. We are improving our stature with industry partners by assisting them with trial design, defining more realistic recruiting criteria and setting achievable recruiting goals. We are also attracting more trials to Penn Medicine. This ultimately reduces trial costs and positions Penn Medicine as a leader in designing innovation around clinical research trials.

EMPOWERING TECHNOLOGIES

Supporting major clinical and business applications properly requires a robust technology and infrastructure layer. This layer must be carefully planned, designed, implemented and then updated with a proactive and responsible refresh cycle. The technology and infrastructure layer must be architected to be highly resilient, eliminating single points of failure and to be able to survive the loss of key components without impacting the clinical and business operations. The following technology and infrastructure projects have helped to empower Penn Medicine to continue to move forward on key IS initiatives which drive efficiencies, reduce costs and maximize resources.





mHEALTH

One of the hottest topics in healthcare today is mHealth. How do organizations improve the quality and efficacy of patient care through the use of mobile devices and mobile enabled applications? That is the challenge being addressed by mHealth initiatives. Penn Medicine's goal in this area is to have providers and patients access the right application from the right device at the right time. All of this must be accomplished in a secure way that supports HIPAA compliance requirements. As an initial step, Penn Medicine created a mHealth governance committee which includes representatives who are physicians, nurses, HR professionals, finance leaders, and administration. Early objectives for this group included:

- Developing a Bring Your Own Device (BYOD) policy
- Improving infrastructure and applications development alignment
- Strengthening the partnership with LGH and CCH mobility needs
- Evaluating mHealth application needs
- Establishing priorities for development and deployment

CARELIGN

THE PROVIDER CLINICAL DATA AND HANDOFF APPLICATION TOOL

Carealign was developed to remove inpatient caregiver's dependence on paper reports for patient handoffs in end of shift transitions. A handoff document contains essential patient information passed from one provider to another, enabling better care of their shared patients. Paper handoff documents are problematic, since the data becomes quickly out-of-date, and notes taken on paper cannot be easily shared between care team members. Carealign is a mobile web application that addresses this problem by providing fast and easy access to real-time patient data and handoff information. Since August 2014, Carealign was developed by IS's Application Development team in partnership with the Center for Health Care Innovation and a design team of clinicians. Carealign has provided real-time patient data drawn from nine different Penn Medicine clinical systems in a seamless, intuitive presentation for healthcare providers. Using Carealign, providers can see important clinical information on their patients, including their care team, up-to-date vital signs, allergies, inpatient and home medication lists, labs, studies, and handoff information.

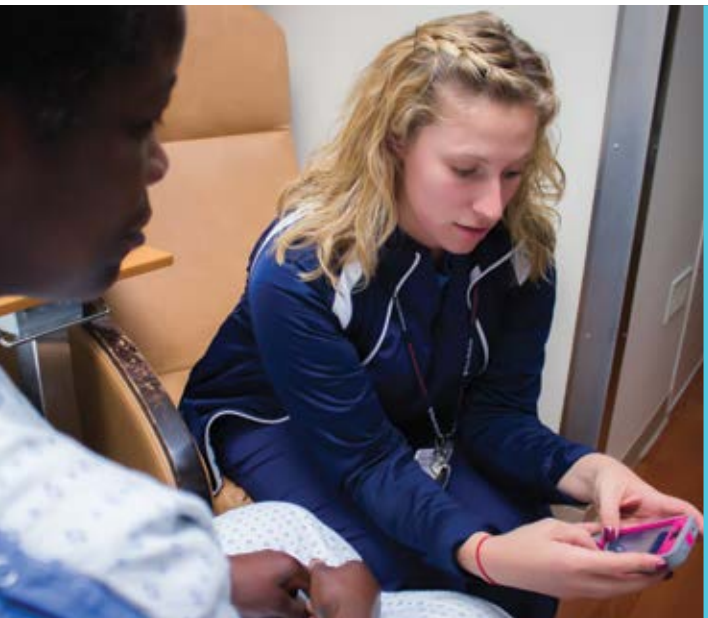
Expanding upon the data review capabilities by incorporating an interactive read-write handoff tool, Carealign Version 2 was rolled out to the downtown facilities as the new Penn Medicine "signout document" throughout the spring of 2016. This new patient centered handoff tool aimed to pull together the entire care provider team - physicians, nurses, therapists, social workers, etc. to provide the safest transitions of care possible.

Carealign has achieved its goals: to help clinical staff provide better care for our patients by increasing communication between providers and providing quick, convenient access to patient data. Over 1000 Penn Medicine clinicians use Carealign each month.

AEROSCOUT

PENN PRESBYTERIAN MEDICAL CENTER

AeroScout is a staff duress tracking management system. AeroScout was piloted and implemented at Penn Presbyterian Medical Center. Information Services provided the necessary infrastructure assessment and installation to support the application. New station cabling aides were installed to support the application excitors and antennas. "Staff duress" tags were distributed to behavioral health, emergency, and trauma providers. Temperature monitoring tags to PMUC clinical refrigeration devices were also delivered. This application improves the response time by PPMC Security for staff in distress and provides a safer work environment. This also adds on an environmental friendly approach of eliminating paper temperature recording for clinical refrigeration units, and provides immediate notification to operational leads of any temperature aberrations in their monitored devices.



SECURE TEXT MESSAGING

Effective care team communication has always been a key aspect of delivering world class healthcare. With the proliferation of mobile devices, care givers began to use texting to communicate with their peers and the overall care team. While effective for communicating, texting does not have the right level of security for Protected Health Information (PHI). As a result, IS collaborated with key clinical resources to evaluate a secure messaging platform. Penn Medicine rolled out a secure messaging platform called Cureatr. This platform runs on both Penn Medicine provisioned and "Bring Your Own Device" (BYOD) phones and includes the properly level of encryption with the messages. This patient centered mobile application was specifically developed for secure healthcare communications and has been successfully received by providers.

MANAGED DISK ENCRYPTION SOLUTION

Managed Disk Encryption for all laptops was implemented throughout Penn Medicine, providing protection of data stored on laptops. A centralized database of managed laptops continuously provides up-to-date security statuses for all devices. Regulatory compliance procedures are easier to implement with policy enforcement and reporting provided by this solution. This solution prevents unauthorized users from reading lost or stolen media. Another significant feature of this project is that it permits users to recover forgotten passwords with self-help and does not require a service desk call.

COMMUNICATIONS INFRASTRUCTURE

As healthcare applications have become progressively more mobile in nature, a robust communications infrastructure must be in place to make access seamless and resilient. Therefore, IS has been investing in both Distributed Antenna Systems (DAS) and Wireless (Wi-Fi) technologies across the Health System. All new construction is done with the corporate standard for both DAS and Wi-Fi. IS also began replacing the aging ATT-only DAS across the entities with a more current, Penn owned, vendor agnostic DAS that will support all wireless phone vendors. Similarly, IS has been refreshing the Wi-Fi service across all entities with a newer generation wireless systems to support smart phones, tablets and laptops. The number of mobile devices grew significantly in the past two years with both Penn Medicine provisioned equipment and BYOD. Keeping up with the requirements to support these devices along with clinical and business requirements has required diligence and careful planning and execution. Penn Medicine now has over 1,000,000 square feet of Wi-Fi coverage.

INFORMATION SECURITY

One of the hottest topics in IT is information security. Recent headlines demonstrate how vulnerable organizations can be to hackers and breaches. Even organizations that are spending a significant amount of time, money and resources have been working hard to stay ahead of potential IS security problems. The Information Security team maintains a vigilant focus for Penn. We have made several key investments both at the perimeter and edge/device level.



ENTERPRISE TELEPHONY MIGRATION AT HUP PHASE 1

Penn Medicine's telephony migration project team updated telephones and standardized the systems across the Penn Medicine enterprise. The project consisted of the planning, design, and install of the new enterprise system from Avaya and the migration of our existing systems to Voice over Internet Protocol (VOIP) technology. Cabling, telecommunication components, telephone systems, and data control servers were installed on the UPHS data network in order to begin enterprise wide VOIP migrations at HUP.

The team developed migration targets and worked with the departments at HUP to determine priorities, telecommunications capabilities, and integration strategies for deployments. This also included user training, activations, and support methodologies for the VOIP environment. The team determined the best course of action to retire the existing systems and devices. As of June 2015, almost 5000 Telephones have been deployed at HUP, resulting in a projected operational savings of \$1.1M in hosted telecommunications charges. As of June 15th, 27% of UPHS owned lines have been reduced, resulting in a direct operational savings of an additional \$120K in annual carrier charges.

VENDOR NEUTRAL ARCHIVE PENNCART IMAGE LIBRARY

A vendor neutral archive is a medical imaging technology in which images are stored (archived) in a standard format with a standard interface, so that they can be accessed in a vendor-neutral manner by other systems. The VNA has been rebranded as PennChart Image Library. The primary goal of this project was to build an image repository for all medical images and finalized medical reports across all entities (HUP, PPMC, PAH, and PMCCH). The archive has the ability to launch a clinical image viewer (non-diagnostic) within Penn Medicine's EMR and patient portal to provide further functionality for the clinicians and patients.

This project required purchasing additional storage capacity and servers to provide the processing power and computing intelligence for the application. The physical hardware to support the archive has been implemented and we have migrated existing images. Data Migration is an extensive process and requires collaboration with the PACS vendors, VNA vendor, and department PACS administrators. The collaboration resulted in developing a migration strategy for specific departments. The Medical Imaging Steering Committee governs this initiative and decides the order of practices to perform migration to the archive.

HOLOGIC MAMMOGRAM SCANNER REPLACED WITH NEW 3D UNIT

Penn Medicine has an energized approach for providing quality care for the patients that they service. In an effort to continuously ensure the best quality of care, Penn Medicine routinely replaces outdated machines for new technical solutions and equipment models. The existing Hologic mammogram scanner was replaced with a new 3D unit which improves diagnostic scanning images. The team reviewed existing network connections and replaced cabling to support the new 3D unit. With this new revolutionized scanner in place, providers are able to view superior quality scans.



REDC - DULLES COMPUTED TOMOGRAPHY REPLACEMENTS

HUP replaced their radiology CT machines to provide improved multi-slice technology for the department. Secure IP device configuration was provided to ensure proper network communication for the machines. The team worked with the third party vendor to define standard addressing and ensure port activity for both treatment rooms and control room areas. This increased census for patients by 33% due to upgrades and installation of additional medical equipment.

IT INTEGRATION WITH CHESTER COUNTY HOSPITAL

As Penn Medicine has grown over the last few years key relationships like Chester County Hospital (CCH), have resulted in the call to integrate Information Services to fully leverage the relationships with both organizations. IS staff first focused on network connectivity, domain integration and Active Directory federation. These activities made it possible to share applications and key patient and business data, including establishing a “trust” between the two email systems. These initial infrastructure investments have contributed to the currently integrated patient care and business operations.

INSOURCING OF GENERAL FINANCIAL APPLICATIONS CHESTER COUNTY HOSPITAL INTEGRATION

After 15 years of running in a vendor hosted and managed outsourced environment, in 2015 Penn Medicine completed the insourcing of our general financial applications. It took 1-year to plan, test, train users and complete the insourcing of payroll, general ledger, accounts payable, human resources. Insourcing these applications allow Penn Medicine to more easily integrate new practices and healthcare entities when needed.

As part of this initiative, Chester County Hospital’s general financial applications were merged into the Penn Medicine instance. This project substantially reduced annual operational costs. As a fully integrated part of Penn Medicine, CCH now leverages the buying power, centralized financial reporting, consolidated payroll execution and human resources functionality needed to reach their business goals.

USING PENNCHART MOBILE TO TAKE CLINICAL IMAGES

The Department of Dermatology was taking 400 to 1,000 clinical photographs per month as part of their clinical care workflow. This was an arduous process involving cameras, memory cards, card readers cabled to a workstation, and the importing of each photograph onto respective patient charts. Often the images would be imported after the patient left, which interrupted other duties and led to a backlog of images to be loaded. This resulted in delays for physicians completing their notes.

Dermatology challenged Information Services to help design and improve this workflow and a pilot workflow began in July, 2014. Two sites were chosen for the pilot. The PennChart mobile app “Haiku” was used on the iPod Touch devices which let medical assistants quickly bring up the schedule that they work from and take clinical images within a few clicks. Clinical images now go to PennChart in real-time with the workflow taking only seconds. Physicians can use tools within the EMR to pull the photographs into their note. The image backlog is gone. Dermatology now takes more than 2,500 images per month, a 150% increase.



PENN MEDICINE UNIVERSITY CITY ACTIVATION

PENN PRESBYTERIAN MEDICAL CENTER

In August, 2015 Penn Medicine University City opened its doors as the newest of Penn Medicine's outpatient facilities. This new facility also boasts the latest in IT and telecommunications technology. In support of the 8 floors that Penn Medicine and Good Shepard Penn Partners currently occupy in the 3737 Market Street building, many months of planning and focused execution, have resulted in an extremely smooth opening. What's first to be noticed by patients entering the building lobby is a digital physician directory.

This technology provides clinical staff information from a central database. Six hundred telephones, 1300 PCs / printers and a sundry of peripheral devices were installed. New Voice over IP (VoIP) network infrastructure was deployed building-wide. VoIP technology leverages the use of a single cabling network for combined voice and data transmissions. The 6 ORs in the ambulatory surgical facility, along with building conference rooms, are serviced by state of the art audio visual integration and video conferencing functionality. To top it all off, a vendor-neutral distributed antenna system (DAS) was installed to provide reliable cellular communication throughout the building.

PENNCHART IMPLEMENTATION FOOT AND ANKLE

PENNSYLVANIA HOSPITAL

In order to support continuity of care, Penn Medicine is committed to ensuring that all affiliated practices use PennChart. The PennChart Ambulatory Practice Management (APM) and PennChart Electronic Medical Record (EMR) were implemented for the Foot and Ankle orthopedic practice at Pennsylvania Hospital (PaH). Activating the PennChart system included completing a hardware and network refresh along with the application implementation and user education on the system. The expansion of Penn Medicine Orthopedic Services provides patients with additional locations for continuity of orthopedic care, improves practice efficiencies by implementing PennChart APM and EMR for patient care documentation and improves the patient experience by offering an electronic patient portal.



TRAUMA MOVES TO A NEW LOCATION

On the heels of the Emergency Department expansion at PPMC, Penn Medicine's Level 1 Trauma Center was successfully relocated from its home at HUP to the new Pavilion for Advanced Care on the Presbyterian Campus. The transition plan involved the hard work of hundreds of staff and leaders encompassing over thirty-seven departments and divisions across Penn Medicine. This complex organizational change was really a unique opportunity and a first, not only for Penn Medicine but also for trauma centers nationally. To our knowledge this was the first time a Level 1 trauma program anywhere was moved between hospital entities within an academic Health System. IS played an integral role in this successful transition. The team, consisting of infrastructure, telecom, clinical engineering and software applications, worked together under the leadership of a well-defined project management model.

PENN CARE FOR KIDS PENNCHART EMR INSTALL

Penn Medicine clinical care services extend through various satellite locations. In April 2015, the Clinical Care Associates PennCare for Kids practices located in Limerick and Phoenixville were brought on to PennChart electronic medical record and transitioned away from a paper based practice. This project included a hardware and network refresh along with the application implementation. The patient experience and practice efficiencies improved, specifically for patient care documentation by creating multi-user access, clear legibility, lowered risk for redundant testing and errors. In addition, the implementation improved the transition of care for patients transferring to a CCA internal or family medicine practice for care.



NEW PATIENT PAVILION

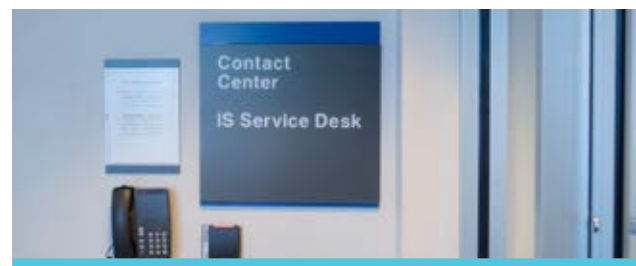
Penn Medicine will be building a new Bed Tower (named PennFirst) in the location of the existing Penn Tower building and garage. Over 900 staff was relocated to other locations across the Health System. User equipment was relocated (PC's, printers, fax-machines). The existing Penn Tower is now empty and being razed in advance of the PennFirst Bed Tower. The new patient pavilion will offer up an opportunity to enhance the role of technology in care delivery.

INTEGRATING SOUTHERN CHESTER COUNTY HOSPITAL

Penn Medicine desired to build a stronger presence in the Southern Chester County area. Expanding our business in this area improves access to care for patients making it possible to see specialty healthcare providers close to home. The new state of the art building was constructed and ready for services in June 2015. The project involved building a new two story, 70,000 square foot building. The Information Services team cabled the space for network, installed Wi-Fi service, VoIP phones and a distributed antenna system for improved cell services. The local practices were moved into the new building and provided substantial support for Penn Chart needs and all other clinical and operational applications needed to fully integrate the practices with Penn Medicine standards.

CLINICAL CARE ASSOCIATES (CCA) PENNCHART IMPLEMENTATION CHESTER COUNTY HOSPITAL

Penn Medicine PennChart EMR integrates all necessary patient record information from downstream systems in one central location accessible to caregivers and business providers. PennChart is accessible across all of the Penn Medicine entities and affiliated locations. As part of Penn Medicine, Kennett Care Medical Associates (Penn Family Medicine Longwood) practice implemented PennChart for ambulatory care in October, 2015. A current and future state workflow analysis, infrastructure, telephony and hardware assessments were implemented in PennChart for patient registration, billing, and clinical documentation. This implementation was necessary to comply with Meaningful Use Attestation requirements. The Penn Family Medicine Longwood practice was also integrated with the Clinical Care Associates (CCA). Operational adoption of CCA clinical workflows and processes was necessary to ensure a continuity and consistent delivery of outpatient ambulatory care to Penn Medicine patients.



WORLD CLASS SERVICE DESK IMPROVES PATIENT CARE

With the focus on quality patient care, prompt handling of every request for IS service is required. It's with this important mindset that IS Service Desk analysts approach every caller or e-contact. The IS Service Desk was insourced in January, 2013. In the last two years, the IS Service Desk has reduced the average call wait time from 45 seconds down to just 8 seconds. With over 700 phone calls and 350 e-contacts received each day, the commitment to have a "real person" answer the call within seconds or respond to an e-contact in minutes has dramatically improved user satisfaction and has resulted in user trust that the IS Service Desk shares the commitment to improving patient care.

Along with a rapid response, the IS Service Desk also connects with the user on an empathetic level. Every caller is given the standard greeting: "Welcome to the IS Service Desk. How can I assist you with patient care?" Each Service Desk analyst wants every caller to know they truly understand that Information Services is an extension of the care which is delivered to the entire Penn Medicine patient body. With first contact resolution rates over 60%, along with high impact patient care issues being personally managed by an escalation team through to completion, the road to a patient's recovery has been improved.

The need for ease of reporting IS issues and learning about ticket status has been dramatically improved. In 2015, the IS Self-Service portal was introduced. Users now report any issue, request IS services and check ticket status on their own via a web application. In the first year of adoption, ~3,000 unique users use the portal monthly, posting 4,500+ online requests for assistance, and checking ticket status 10,000+ times. With the ratio of phone calls to e-contacts improving to 60% (phone) vs. 40% (e-contacts), user satisfaction has been further improved.



APPRECIATION OF TECHNOLOGY SUPPORT FROM A USER

"I just wanted to let you know that I had a wonderful interaction with one of your technologists, related to putting access to PennChart on my computer. He was extremely efficient, patient and funny, making the successful installation of VPL a joy. I have sought IT help for many reasons over many years His help was extremely important to my work flow and I want to complement him on how he handled the entire process."

- A Professor of Radiation Oncology.

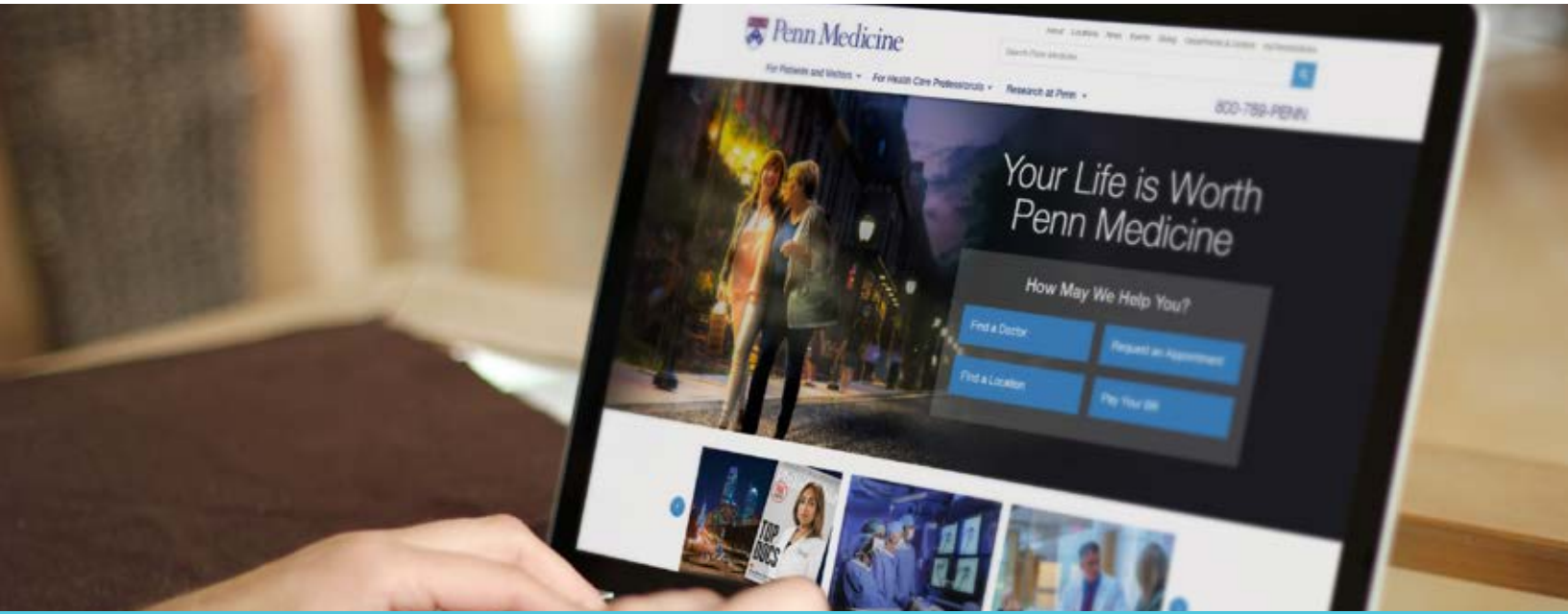


LEFT TO RIGHT
 MIKE ALBANO, DAMON WORTHINGTON, ADAM ALBAUGH, JOHN IRELAND :BACK ROW
 EMMANUEL EDU, JENNIFER PONE, JACOB WONG, RON PRAK, DAVID REMELY, WILLIAM TALAVERA,
 CONNOR HIGH, STEVE IRBY, JIM SIERK, CHRIS MARUCCI :2ND ROW
 JOANN BEAUBRUN, CHRIS ROGERS, SHERYL REILEY, ADAM MASELLI, RICHARD VAZQUEZ,
 DANEISHA DANIELS, RAKY VAN :FRONT ROW
 JOY WINNER :FRONT FLOOR

DUE TO THE PHYSICAL ISOLATION OF THE IS SERVICE DESK FROM THE PATIENTS WE ULTIMATELY SUPPORT, WE WEAR LAB COATS TO CONSTANTLY REMIND US OF OUR CRITICAL ROLE IN PATIENT CARE.

SITE SCAN - REMOTE MDF MONITORING

This software package was deployed and configured for remote Service Desk monitoring. The benefits of installing Site Scan allows for remote environmental monitoring of infrastructure within the Newark Data Center (NDC). Site Scan allows monitoring and control of virtually any piece of critical support equipment. Web-based data center monitoring provides centralized oversight of Liebert precision air, power and UPS units, as well as many other analog or digital devices. The benefits of this software is a more proactive approach and reduced downtime.



MARKETING CONTENT MANAGEMENT SYSTEM

Penn Medicine hosts many websites which provide important information to our patients. Examples of these websites are www.pennmedicine.org and www.penncancer.org. To help manage these sites more efficiently, Penn Medicine purchased a content management system used to publish, edit and modify website content. In this environment, web editors only need to handle the content one time while the changes are made globally. Team members from Penn Medicine's Marketing, Information Systems and the office of the CMIO partnered to plan, design and implement the CMS. As a result, Penn Medicine is equipped to manage and control our web content, provide governance of web content across the enterprise, provide operational support, and integrate with clinical systems. Additional benefits include enhanced blog and news features. The marketing department is now able to use the new CMS features to benefit their current and future marketing campaigns.

SCHOOL OF MEDICINE UNDERGRADUATE MEDICAL EDUCATION EMAIL INTEGRATION WITH HEALTH SYSTEM

Penn Medicine is committed to staying in compliance with HIPAA security and privacy regulations as it pertains to protected health information (PHI) for their patients. The Perelman School of Medicine made the decision to transfer email accounts for students in the Undergraduate Medical Education (UME) to the UPHS infrastructure. In order to secure the data exchange, it was imperative to review and implement security standards. UME students routinely use email for clinical purposes during their education and securing this information was an absolute must! IS worked with the UME office to educate the students on HIPAA compliance and provided training to establish a better understanding of confidentiality of patient information. Penn Medicine has successfully secured patient data that is communicated among the Undergraduate Medical Students. In addition, the SOM is beginning to make use of corporate leveraged resources in the area of messaging.

HEALTH INFORMATION MANAGEMENT SMART INTERFACE

PENNSYLVANIA HOSPITAL

This project eliminated manual processes used to move HIM coded information from existing HIM systems into SMART (a PwC system) and from SMART back into existing HIM systems. This automated existing manual processes. This project required new schedules to be established and the implementation of a new interface. This project resulted in improved department workflow and reduced FTE involvement.

PROFESSIONAL FEE ABSTRACTION ON IP CHARGES

PENNSYLVANIA HOSPITAL

Penn Medicine implemented professional fee abstraction for Pennsylvania Hospital's inpatient services. Many HUP and PPMC service lines with fee abstraction interfaces from med-coding to Penn Chart provide the same services at PaH. Thus, the expansion of the fee abstraction solution to PaH was implemented. This project made it possible to automate the fee abstraction process and create a standard across the Health System. It also provided enterprise CFA reporting, improved coding accuracy, and improved clinical documentation.



BUCKS COUNTY DERMATOLOGY IMPLEMENTATION ON PENNCHART

Penn Medicine expanded its dermatology outpatient practice with the acquisition of a private dermatology practice in Bucks County, PA. Three providers and 20+ staff joined Penn Medicine. Penn Medicine's IS team and operational staff from dermatology worked together to deploy new hardware, implement PennChart APM and EMR, create a UPHS network for the site, and provide on-site support for the Bucks Dermatology users. The three providers who were on-boarded had a thriving practice with a high volume of new Penn patients. In many cases, patients were being referred to other Penn Medicine specialist physicians. The office location is brand new and offers many different services such as general dermatology, MOHs surgery, and phototherapy. The new office is large enough to accommodate the addition of four additional providers. As a result of this effort, patients in Bucks County area can receive Penn Medicine quality care closer to their home.

IMPLEMENT A NEW GRADUATE MEDICAL EDUCATION (GME) SYSTEM

Penn Medicine Graduate Medical Education (GME) department needed to upgrade the software being used for all GME functions (e.g. scheduling, grade tracking, projects, etc.). The system being replaced had limited functionality. After a thorough market evaluation, GME elected to replace the existing system with a new secure SaaS system which has substantially improved features and department workflows. The new system was easily integrated with other Penn Medicine applications.

PENNSPOT - PENN PROVIDER MASTER FILE PROCESS

PennSPOT is Penn's "Source Provider of Truth". PennSPOT was designed to improve the technical and procedural challenges associated with maintaining a single provider database that can feed relevant provider data to many computer systems within Penn Medicine. Penn Medicine now has accurate Penn employed and non-Penn provider data being fed to all computer systems. This data includes provider addresses, phone numbers, fax numbers, specialties and other key data. This information is kept up to date through a formal change management process that is managed by Penn Medicine Marketing and includes external market provider data received monthly via updates from a 3rd party vendor. When Penn Medicine computer systems present provider data to users, it can be trusted! In this world of e-communication with providers, having trusted provider data readily available for patient registration, electronic provider notices (e.g. results, summary of care, admit / discharge notifications), and mass patient communication is a must have.

LOINC ACTIVATION IN LAB/PATHOLOGY

The Logical Observation Identifiers Names and Codes (LOINC) is a database and universal standard for identifying medical laboratory observations and assists with standardization across EHRs and facilitates electronic exchange of lab result information across Health Systems. Meaningful Use phase 2 mandated specific lab requirement for LOINC including uniform coding for all lab tests in all electronic medical record systems. As part of the Penn Medicine's adherence to CMS's Meaningful Use Stage 2 guidelines, Corporate IS and the Office of the CMIO worked with our lab, ambulatory, and inpatient EMR systems to map all relevant lab orders to appropriate Logical Observation Identifiers Names and Codes (LOINC).

IMPLEMENTATION OF COBIUS AUDIT MANAGER

Penn Medicine complies with all federal billing regulations. Penn's Billing Compliance Office needed to upgrade the software it uses to manage audits and to ensure Penn Medicine remains in compliance. Compared to the prior software version used, this new software package provides substantial department workflow improvements and improved audit compliance features. This new software has been implemented for all inpatient and ambulatory visits and is used by all Penn Medicine entities.

IS DEPARTMENT PROGRAMS

WE CARE

COMMUNITY ACTIVITY REWARDS EVERYONE

WeCARE (CARE = Community Activity Rewards Everyone) is a volunteer group of IS team members who organize various activities that supports the needs of local charity organizations. Activities range from collecting blood donations for the Red Cross to supporting the Ebola Crisis in West Africa to canned good collections to support local food banks. Over the last 2 years, the WeCare program has been able to serve the underprivileged and underserved by providing monetary donations, school supplies, canned goods, professional attire (to assist those getting back into the workforce), gifts at holiday times for single mothers and their children and teens who are in homeless shelters during the holiday season. WeCare participation improves employee morale and teamwork.

16,736 POUNDS OF CANNED/PACKAGED FOOD TO PHILABUNDANCE

\$4,000 IN GIFTS TO LOCAL FAMILY AND TEEN SHELTERS DURING THE HOLIDAYS

\$660 IN SCHOOL SUPPLIES FOR 2 WEST PHILADELPHIA GRADE SCHOOL

\$550 DONATION TO CARIE - CENTER FOR ADVOCACY FOR THE RIGHTS AND INTERESTS OF THE ELDERLY

9,952 POUNDS OF CANNED/PACKAGED FOOD TO PHILABUNDANCE



WE CARE - BACK TO SCHOOL EVENT | SEPTEMBER 2015

SOCIAL COMMITTEE

For IS departments that service hospitals and practices across a broad geography, virtual working relationships are common. The Penn Medicine IS department has steadily grown in the number of staff and the number of locations that house IS staff. Email and conference calls are the common communication tools. Aside from quarterly IS Town Halls and department celebration events, opportunities to enjoy each other's company are too few in number. After some informal talks between our CIO and staff, the "ISSC" Information Services Social Council was born.

Over the past several years, the Social Committee has focused on creating opportunities to bring IS colleagues and, at times, their families together in relaxed, casual, non-work environments. This has allowed IS staff to step away from their keyboards, take off their headsets and put a name to a face. The goal has been to take a highly diverse group of employees and foster a sense of inclusiveness. Recent ISSC events include social hours, bowling events, weekend ski trips to the Poconos (family), Penn football game tailgating (family), ice skating, Phillies baseball game (family) and friendly in-office competitions.

At a recent ISSC event, in collaboration with our WeCare team, a new IS employee with 20 years of experience at Penn Medicine stated "I have been at Penn Medicine for 20 years and never experienced anything this enjoyable. It is nice to know that business can be placed on hold while we get to better know our colleagues and in this case for a worthwhile cause". These events have created a greater sense of IS community and improved teamwork.



DEAR PENNCHART EDUCATION TEAM,

Thank you so much for participating in the Home Cook Heroes program Saturday evening at Gift of Life Family House! Your willingness to invest time and effort to ensure a home cooked meal for our guests demonstrates your spirit of generosity and belief in the important mission of the Family House. Our guests are so very grateful to you for providing a delicious dinner, which offered them the opportunity to eat, spend time with others, and find comfort in a pleasant setting. You may never know how much your part in the Home Cook Heroes program means to our guests, but I can assure you, they are very appreciative. As a community supported non-profit organization, the Family House depends upon the kindness of people just like you to help carry out our critical mission.

Gratefully,
Diana
Resident Manager



READ STRONG!

The Read Strong program was started by Joseph Oaster and his wife Robin in 2012 to help the city's poor and homeless with GED and adult literacy. Read Strong received grants from both WeCare and PennCares in 2015 for its work in the community and was recently featured in the Philadelphia Inquirer (http://articles.philly.com/2016-03-25/news/71786977_1_deep-poverty-extreme-poverty-wall) on its work with one graduate of the program.

AWARDS AND PUBLIC RECOGNITION

2015
HEALTHCARE
INFORMATICS
INNOVATOR
AWARD



2015 - 2016 WINNER



2015 - 2016
AAMC PIONEER INNOVATION AWARDS



2015 HIMSS ANALYTICS EMRAM STAGE 6



2015 - 2016
WINNER



Awards on this page are not in the order they were received by Penn Medicine Information Services.

Carelign

2015

- » HEALTHCARE'S MOST WIRED: INNOVATION AWARD
- » AMIA: PROVIDER INNOVATION IN INFORMATICS (PI2) AWARD FINALIST
- » DIGITAL EDGE 25 AWARD FOR LEVERAGING DIGITAL TECHNOLOGY IN AN INNOVATIVE WAY

IN THE NEWS

InformationWeek

25 CIOs TRANSFORMING HEALTHCARE

InformationWeek Healthcare's second annual list of IT executives highlights the exceptional thinkers and doers who are moving patient care forward. Read More at: <http://www.informationweek.com/government/leadership/25-cios-transforming-healthcare/d/d-id/1104955>

PRESENTATIONS

Christine Vanzandbergen: <http://www.patientengagementsummit.com/christine-vanzandbergen>

John Donohue: <http://boston.healthprivacyforum.com/cybersecurity-what-minimally-acceptable>

Adam Maselli & Vasee Sivasegeran:
<http://ny.itsosummits.com/agenda.php>

Andre Jenkins: http://2015.phillytechweek.com/events/converging_technology-data-clinicians_to_improve_community_health

BECKER'S

Hospital Review

10 GREAT CIOs TO KNOW

The following leaders have shown their abilities to leverage technology to improve patient care and achieve business objectives while preparing their organizations for the future. Read More at: <http://www.beckershospitalreview.com/healthcare-information-technology/10-great-cios-to-know.html>

MORE NEWS ON facebook

<http://www.facebook.com/PennMedicineIS/>

HEALTHCARE INFORMATICS

TOP 10 TECH TRENDS:

MAKING DOCTORS MOBILE:
ZEROING IN ON CLINICAL
WORKFLOW

Penn Medicine's thinking about mobile tools has evolved, says Glenn Fala, senior director of software development. Of the 75 applications developed in-house, about 10 percent are mobile apps. "As more users shift to mobile, we try to present a subset of the data in a mobile app. And anything we start new these days, we are thinking immediately of the mobile part of it." Read More at: <http://www.healthcare-informatics.com/article/making-doctors-mobile-zeroing-clinical-workflow>

Radiology Today

ARCHIVE STRATEGIES: THE ISSUE IS WHAT TO DO WITH DATA — NOT JUST WHERE TO PUT THEM

Taking on a project of this nature requires a great deal of planning. Switching to VNA raises a fundamental question: What types of data need to be managed? Read More at: <http://www.radiologytoday.net/archive/rt0815p24.shtml>

Healthcare IT News

BRIAN WELLS ON LIBERATING DATA

Brian Wells, Associate VP of Health Technology and Academic Computing at Penn Medicine, talks about the PennSeek application and the effort to index and connect different types of data to make it accessible and effective for precision medicine. Read More at: <http://www.healthcareitnews.com/video/big-data-byte-brians-wells-liberating-data>

GLOSSARY

ARRA

American Recovery and Reinvestment Act

BI

Business intelligence

BYOD

Bring Your Own Device

CCH

Chester County Hospital

CCA

Clinical Care Associates

CIO

Chief Information Officer

CMIO

Chief Medical Information Officer

CPD

Center for Personalized Diagnostics

CPUP

Clinical Practices of University of Pennsylvania

CRIO

Chief Research Informatics Officer

CTMS

Clinical Trial Management System

DAS

Distributed Antenna Systems

DTI

Diffusion Tensor Imaging

ED

Emergency Department

EHR

Electronic Health Record

EMR

Electronic Medical Record

ETL

Extract Transfer Load

EUS

End User Support

FH

Familial Hypercholesterolemia

GME

Graduate Medical Education

HCHS

Home Care & Hospice Services

HIE

Health Information Exchange

HIPAA

Health Insurance Portability & Accountability Act

HIM

Health Information Management

HIT

Health Information Technology

HPC

High Performance Computing

HSX

HealthShare Exchange

HUP

Hospital of the University of Pennsylvania

IBI

Institute for Biomedical Informatics

ICU

Intensive Care Unit

LGH

Lancaster General Hospital

LOINC

Logical Observation Identifiers Names and Codes

MedView
Web-based clinician Portal that displays patient data

MDM
Mobile Device Management

MU
Meaningful Use

PACS
Picture Archiving and Communication System

PaH
Pennsylvania Hospital

PAM
Penn Access Manager

PCAM
Perelman Center for Advanced Medicine

PDS
Penn Data Store (Clinical Data Warehouse)

PHCHS
Penn Home Care and Hospice Services

PHI
Protected health information

PMACS
Penn Medicine Academic Computing Services

PMAR
Penn Medicine at Rittenhouse

PMO
Project Management Office

PMR
PennOmics Medical Record

PPMC
Penn Presbyterian Medical Center

PSOM
The Perelman School of Medicine

RAPID
Real-time Analysis & Process Improvement
Dashboard

RFID
Radio Frequency Identification

SCM
Sunrise Clinical Management System

SICU
Surgical Intensive Care Unit

SRTR
Science Registry of Transplant Recipients

QI
Quality Improvement

UBCL
Unit Based Clinical Leadership

UME
Undergraduate Medical Education

UNOS
United Network of Organ Sharing

UPHS
University of Pennsylvania Health System

VOIP
Voice over Internet Protocol Technology

PENNCART / EPIC SYSTEM MODULES

EMR Ambulatory (EpicCare Ambulatory)

APM (Ambulatory Practice Management)

- Registration (Prelude)
- Scheduling (Cadence)
- Professional Billing (Resolute PB)

ED Emergency Department /Trauma (ASAP)

Oncology (Beacon)

PeriOp Manager (OpTime)

Anesthesia (OpTime)

Transplant (Phoenix)

Pharmacy (Willow)

ADT / Access (Grand Central Station)

HomeCare / Hospice (Home Health)

Hospital Billing (Resolute HB)

Health Information Management (HIM)

EMR Inpatient (EpicCare Inpatient)

- Clinical Documentation (Clin Doc)
- CPOE (Orders)
- Obstetrics (Stork)
- Clinical Decision Support (CDS)

Cardiology (Cupid)

myPennMedicine Patient Portal (MyChart)

Radiology (Radiant)



Penn Medicine



VIEW THE ONLINE VERSION
[HTTPS://ISSUU.COM/PENNMEDICINEIS/DOCS/2015-2016_STATE_OF_IS_FINAL_WEB_](https://issuu.com/pennmedicineis/docs/2015-2016_state_of_is_final_web_)