DEEP LEARNING IN HEALTHCARE
Acknowledgment

We are particularly grateful to all of the members of AllSpire Health Partners and to all of the gifted staff who have contributed so generously to the production of this inaugural volume of the AllSpire Innovation Journal 2018.

All praise for the success of this volume should go to them, as well as to the management and staff of AllSpire Health Partners.

Any errors or omissions are mine alone.

Michael Hale
Editor
FORWARD

BY PAUL J. TIRJAN

In this, our inaugural edition of our annual publication, AllSpire Innovation Journal 2018, we have chosen Deep Learning in Healthcare as this year’s theme. Deep Learning in Healthcare has multi-level meanings.

Deep Learning Artificial Intelligence to enable Enhanced Decision Making

The term Deep Learning describes a field of computer science dedicated to advancing capabilities towards true Artificial Intelligence approximating the neural processing of the human brain. It involves a data architecture with multiple levels of data and machine learning algorithms that continuously improve their own performance utilizing vast waves of data inputs and outcomes. The technology has existed and progressed for decades as efforts to create artificial neural networks have made quiet but steady advancements. These efforts have accelerated dramatically over the last few years as practical market applications have appeared in popular culture, social media and consumer electronics. The full power and likely impact of artificial intelligence technology is difficult to overstate. Like the assembly line, mechanized agriculture, the automobile, the computer and automated assembly, AI promises gains in efficiency and productivity that may obviate the need for millions of workers who may struggle to adapt and find other employment. Like electricity, refrigeration, cellular communications and the Internet, AI has the potential to enhance and extend human lives in ways we cannot entirely foresee.
Deep Learning towards Understanding Root Causes

Healthcare itself needs a dose of Deep Learning. Innovation within the practice of medicine has perhaps effected more people, in more profound ways, than any other field or industry, yet it lags decades behind other sectors of society in the critical realm of management of information and communication. When mass media covers innovation in healthcare, they traditionally talk about tangible products in the form of breakthrough treatments composed of new biologic, chemical or radiologic treatments or medical devices and diagnostics. Less frequently, they dig deeply into process improvement, new procedures or healthcare finance. Increasingly, however, the focus of healthcare innovation is shifting to the more complex needs of managing an aging population with multiple chronic conditions. These require treatments that can complicate each additional condition and especially in uncontrolled environments.

The unmet needs are vast and urgent in that our current demographic trajectory and cost trends point to an unsustainable business model of healthcare in the United States that is rapidly approaching a crisis point of affordability for patients, employers and our government payor programs. While the third-party payor system that emerged nearly a century ago was a necessary mechanism to defray risk and mitigate the catastrophic consequences from employability loss, it may require profound restructuring for the next hundred years.

In order to shift our innovation efforts to the needs of the next century, we must begin to address in earnest, the root causes of disease. A sufficient body of knowledge already exists regarding social determinants of health, genetic predispositions and disease progression pathways. What is missing, is the will to move out of our collective comfort zone of treating the consequences of a lack of health and move into the realm of supporting truly healthy living. To do this, we must face the three-headed beast of a deeply entrenched anti-nutrition culture, the reality of today’s sedentary lifestyle and myriad economic access barriers to chronic sustainable health management.

Deep Learning to expand Medical Knowledge Transfer

Throughout the formal and informal health care provider universe there is an overwhelming body of information that no one human could assimilate. Much of the practice of medicine has involved the
exchange and dissemination of information between a provider and a patient in a one-to-one face-to-face dialog. True, that system has served us well. It is precisely because that system served us so well that making the kind of change today’s society requires will be so difficult. The simple fact is that learning from Medical Knowledge Transfer must penetrate far deeper into our healthcare system, both formal and informal.

The formal healthcare sector includes the full spectrum of clinical providers for whom providing care is their chosen profession, including: physicians, nurses, pharmacists, clinical laboratory staff, diagnostic imaging specialists, behavioral health counsellors, nutritionists and others. Traditionally it has been the primary and nearly sole purview of physicians to be keepers and sharers of knowledge directly with patients. Looking into the future, the role of physicians may evolve away from that activity leaving more time available to focus on both data based decision making as well as on being more engaged in patient relationship management. The technologies that exist today could enable the automation of that repetitious regurgitation of established knowledge and standardize the delivery of that knowledge through other formal care givers.

The informal healthcare sector includes families, friends, neighbors, community groups, non-healthcare service providers and patients themselves. This vast workforce of caregivers has been nearly left out of the Medical Knowledge Transfer ecosystem, leaving patients and their informal caregivers to their own devices to make continual decisions and actions without the benefit of training, accurate and appropriate data, or decision support tools. It was never the formal caregiving system’s conscious decision to neglect the informal network. It simply was not cost effective or practical to engage them, until now.

AllSpire’s innovation strategy is built upon a vision of the future that leverages emerging technologies, enhanced processes and creative new business models for the benefit of the communities we serve.

As a multi-health system collaborative think tank and incubator, AllSpire endeavors to help prepare our member health systems for the waves of regulatory change, rising costs, falling reimbursement and potentially disruptive innovations that have reached our sector. We will use both adoption and mitigation strategies to ensure our version of the triple aim, which is better care, better experience and lower cost.
QUALITY VS INNOVATION

BY PAUL J. TIRJAN

QUALITY VERSUS INNOVATION IN HEALTHCARE
STRIKING THE DELICATE BALANCE

One of the challenges of the journey of innovation in healthcare is managing the delicate balance between traditional approaches to enhancing quality by reducing variability from established best practice, against the inherently disruptive process of innovation necessary to discover ever higher standards of care.

Consider some typical definitions of the terms quality and innovation:

**Quality**
The Institute of Medicine defines health care quality as “the degree to which health care services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge.”

**Innovation**
According to Merriam-Webster the definition of innovation is

1. the introduction of something new
2. a new idea, method, or device: novelty

On the surface, these two concepts are mutually exclusive. How can any truly new idea, method or device be consistent with current professional knowledge? This may be a rhetorical question with no satisfying answer.

The first key to finding balance is to consider both quality and innovation principles in evaluating each opportunity for innovation. We must recognize that there is simply no risk-free progress in innovation. We must also remember that there is often no greater risk than to fail to take one. If we take no risk, we make no progress.
The second key is careful planning and documentation in all innovation endeavors. In other words, apply the scientific method to the entire process: start with a coherent thesis, articulate a well-controlled process, carefully measure and document results, then analyze and summarize your outcomes and conclusions.

Sometimes the most significant value from experimentation involves insights learned about why something worked or didn’t work, rather than just the outcome itself.

Part of the power of innovation is the expansion of our understanding, our Deep Learning in Healthcare.
INNOVATION PROGRAM

BY JOANNE RESNIC

A formalized structure supports the systematic promotion of innovation within and among AllSpire Health Partners (AHP) members. Key components of the program are:

1) Innovation developed within the member health system institutions,
2) Evaluation and potential acquisition of emerging innovation from external sources, and
3) Engagement with specific partners from industry to develop new technologies and/or pioneering companies.

DEFINITION OF HEALTH CARE INNOVATION

The Agency for Healthcare Research and Quality defines health care innovation as the implementation of new or altered products, services, processes, systems, policies, organizational structures, or business models that aim to improve one or more domains of health care quality or reduce health care disparities.

One of the founding tenets of AllSpire Health Partners is to commit to health care innovation and excellence in patient care. Additionally, AllSpire seeks to leverage the collaborative nature of the consortium to provide opportunities to deliver the most effective and efficient care to all patients, improving affordability and/or reducing costs. The Innovation Program will focus on projects or initiatives that will provide the flexibility to all members required to thrive in a dynamic economic environment.

SHARING STRENGTHS FOR BETTER HEALTH

The overarching goals of the AllSpire Innovation Program are:
**Promote Internal Initiatives**

**Rationale:** Connect member health systems’ innovators with each other as well as with industry partners and other providers.

**Develop Collaborative Initiatives**

**Rationale:** Facilitate AllSpire-wide projects and create new joint venture enterprises that leverage the collective talent and resources of the member health systems.

**Provide Visibility To Change And Emerging Opportunities**

**Rationale:** Provide enhanced awareness of developing technologies, new market entrants and new business models that may have either positive or negative impacts on integrated delivery networks.

**Facilitate Early Adoption**

**Rationale:** Rapidly assess, select and deploy new technology that can help fulfill our mission and realize our vision.

**Facilitate Early Mitigation**

**Rationale:** Disseminate strategies to mitigate anticipated regulatory, reimbursement, technology and competitive threats.

**Identify Impact Investments In Significant Innovator Companies And Incubate New Ventures From Concept**

**Rationale:** Create and capture economic upside from making select investments.

---

**AHP INNOVATION PROGRAM COMPONENTS**

To support the needs of AllSpire members and the mission of AHP, the AllSpire Innovation Program is comprised of three related components. The three components consist of the AHP Internal Innovation Network which serves to promote innovations from the member health systems across all of AllSpire, AHP Technology Transfer and Evaluation which evaluates and procures new-to-market technology for AllSpire, and AllSpire Innovation Ventures, which creates new companies to commercialize disruptive technology that satisfies unmet needs of the membership.

The three components of the AllSpire Innovation Program are governed by associated Advisory Councils, supply chain Collaboratives, governance Boards and standing Committees.
The AHP Innovation Program consist of three strategic and synergistic components: The AllSpire Health Partners Internal Innovation Network, AllSpire Technology Transfer & Evaluation and AllSpire Innovation Ventures.

**THE ALLSPIRE HEALTH PARTNERS INTERNAL INNOVATION NETWORK**

The AllSpire Health Partners Internal Innovation Network (AHP IIN) provides a platform for AHP membership to share current and emerging innovations developed at member institutions. This approach offers the members the ability to: validate initial findings by reproducing results; leverage best practices across settings; and demonstrate scalability across multiple sites, systems and states. To do this effectively, a web-accessible platform, the Innovation Portal, is utilized for opportunity inventory purposes. This portal provides an efficient on-line mechanism, the Innovation Pipeline, to catalog and prioritize innovations to evaluate technology and to identify needs not addressed in current member innovation planning.

<table>
<thead>
<tr>
<th><strong>ATTRIBUTES</strong></th>
<th><strong>AHP INTERNAL INNOVATION NETWORK</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus</td>
<td>Current or emerging innovations at member sites</td>
</tr>
<tr>
<td>Goal</td>
<td>Share and promote internal innovation among membership and beyond</td>
</tr>
<tr>
<td>Project Types</td>
<td>Short term</td>
</tr>
<tr>
<td>Funding Model</td>
<td>Participating member financed</td>
</tr>
<tr>
<td>Partnership Focus</td>
<td>AllSpire member health system</td>
</tr>
<tr>
<td>Participation Model</td>
<td>Opt-in only</td>
</tr>
<tr>
<td>Governance</td>
<td>AHP IIN Council and the AHP Clinical Leadership Council</td>
</tr>
</tbody>
</table>

### TABLE 1.

Innovation sharing can occur in two ways: via an AllSpire Development Committee member to the full Development Committee, or directly into the AllSpire Innovation Pipeline for vetting by the AHP IIN Council. For any innovation with direct patient impact, approval from the AHP Clinical Leadership Council is required. The AHP IIN Council will be comprised of select AHP Development Committee members and subject matter experts from member health systems.

AHP staff review all innovation projects submitted specifically for consideration to launch at additional member sites and submit to the AHP IIN Council for review. A list of projects and AHP IIN Council recommendations are presented to the AHP Development Committee. The final selection(s) of internal innovation projects rests with the AHP Development Committee and any projects requiring significant investment require official approval by the Executive Committee. Project terms are short in time frame and any implementation costs are funded entirely by the member site(s). All pilot program initiatives have defined metrics that are recommended by the council and agreed upon by the Development Committee. These metrics will serve as a method to evaluate the ongoing feasibility of the innovation’s reproducibility and scalability. Monthly review of the Innovation Pipeline is the responsibility of the AHP IIN Council with quarterly updates to the Development Committee.

Additional ongoing financial support of a given initiative may be determined at the discretion of the Development Committee with consideration by the Executive Committee as appropriate. Milestones are developed annually to achieve continued shared innovation across the AHP membership.
The AHP IIN is comprised of:

- AHP IIN Council: consists of select Development Committee members and/or Member Subject Matter Experts
- Industry Partners and Vendors as deemed appropriate by the IIN Council
- AHP Staff and Consultants as necessary
- On-line Innovation Portal with Innovation Pipeline: secure platform to gather and store data, catalog, search, and provide project reports/updates, along with requests for innovation
- Policies, procedures, data, meetings, calls, agreements and supporting documentation

**AHP IIN OPERATIONAL STRUCTURE AND MANAGEMENT**

AHP IIN Council oversees the activities of the Internal Innovation Network. This council reports to the AHP Development Committee. Any specific project workgroups or councils report to the AHP IIN Council. Projects are reviewed quarterly at a Development Committee meeting. Monthly progress reports are presented at the AHP IIN Council. AHP Innovation Portal management resides with the AHP Staff.

**AHP TECHNOLOGY TRANSFER & EVALUATION (TT&E)**

As innovative products and services are identified by AHP members, the AH GPO is leveraged to support evaluating and procuring these innovations with terms that are advantageous to the membership. The current infrastructure of the AH GPO will provide the resources required to vet and secure contracts for innovative products and services for the AH GPO membership. Within the Innovation Portal, the Innovation Pipeline of new technologies and identified unmet needs will be routinely reviewed by AH GPO staff, by the existing Value Analysis Teams and Collaboratives. If required, an ad hoc committee for a specific opportunity will be established to further review the new product, service or technology. Additional ad hoc committees for entirely new categories or business models may be developed as identified by the AH GPO Operating Committee and/or AHP Development Committee.

Key attributes of AHP Innovation Ventures:

<table>
<thead>
<tr>
<th>ATTRIBUTES</th>
<th>AHP INNOVATION VENTURES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Focus</strong></td>
<td>Venture development</td>
</tr>
<tr>
<td><strong>Goal</strong></td>
<td>Create new distinct corporate entities</td>
</tr>
<tr>
<td><strong>Project Types</strong></td>
<td>Long term (2 to 5-year horizon)</td>
</tr>
<tr>
<td><strong>Funding Model</strong></td>
<td>External investors at the portfolio company level</td>
</tr>
<tr>
<td><strong>Participation Model</strong></td>
<td>Industry Partners</td>
</tr>
<tr>
<td><strong>Participation Model</strong></td>
<td>All-in at holding company level; Opt-in at the project or subsidiary level</td>
</tr>
<tr>
<td><strong>Governance</strong></td>
<td>AHP Executive Committee with guidance from the AHP Development Committee</td>
</tr>
</tbody>
</table>

**INNOVATION PRODUCTS, SERVICES AND TECHNOLOGY EVALUATION PROCESS**

The process for evaluation of innovation to add to the AH GPO portfolio begins with a request being submitted via the Innovation Portal. All submissions must have an Executive Sponsor identified. An Executive Sponsor is defined as a current member of the AH GPO Operating Committee, AH GPO Board, AHP Clinical...
Leadership Council, AHP Development Committee or AHP Executive Committee. Screened innovation requests are routed through the Clinical and Non-Clinical Collaboratives, Value Analysis Steering Committee, the Operating Committee with the final decision resting with the AH GPO Board. Communication regarding steps in the process and final feedback on any decisions, as well as rationale for moving forward or declining a product, service, or technology, are channeled back to the submitter via the Innovation Pipeline. Monthly review of product/service procurement are the responsibility of the Value Analysis Teams with quarterly update reports to the Operating Committee.

AHP TT&E leverages the existing structures established at the AH GPO:

- AH GPO Staff
- AH GPO Clinical and Non-Clinical Collaboratives
- AH GPO Value Analysis Teams
- On-line Innovation Portal with Innovation Pipeline: secure platform to gather and store data, catalog, search, and provide project reports/updates, along with innovation requests.
- AH GPO Operating Committee
- AH GPO Board
- AHP Clinical Leadership Council: for any innovation with direct patient impact, approval from the AHP Clinical Leadership Council is required.
- AHP Technology Transfer & Evaluation Reports: newly acquired products and services have update reports available in the Innovation Portal.

AHP TECHNOLOGY TRANSFER & EVALUATION OPERATIONAL STRUCTURE AND MANAGEMENT

AH GPO Operating Committee provides oversight of AHP Technology Transfer & Evaluation. The AH GPO staff make recommendations regarding innovation products and services to be evaluated by the AH GPO Operating Committee. The Value Analysis Teams, Value Analysis Steering Committee and Clinical and Non-clinical Collaboratives support the Operating Committee in evaluating requests. For any innovation with direct patient impact, approval from the AHP Clinical Leadership Council is required. The AH GPO Vice President of Clinical Resource Management is responsible for processing requests and routing to the appropriate Value Analysis teams and Collaboratives. Products, services and technologies approved through this process are reviewed quarterly with the AHP Development Committee.

AHP INNOVATION VENTURES

The development of AHP Innovation Ventures (AHP IV) serves to promote AllSpire Health Partners’ commitment to pro-active engagement with disruptive technology innovation in healthcare. AHP IV is an incubator of new companies affording AHP members the opportunity to explore creative and potentially out-of-mainstream care delivery opportunities, while minimizing financial risk to the member organizations.

Innovation ventures that provide profound clinical benefits, new revenue streams, significant cost savings, and/or actionable insights into emerging technologies are prioritized.

Industry partners benefit from minimized risk in product, service and technology development with the prospect of a pre-defined customer base.
Key attributes of AHP Innovation Ventures:

<table>
<thead>
<tr>
<th>ATTRIBUTES</th>
<th>AHP INNOVATION VENTURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus</td>
<td>Venture development</td>
</tr>
<tr>
<td>Goal</td>
<td>Create new distinct corporate entities</td>
</tr>
<tr>
<td>Project Types</td>
<td>Long term (2 to 5-year horizon)</td>
</tr>
<tr>
<td>Funding Model</td>
<td>External investors at the portfolio company level</td>
</tr>
<tr>
<td>Participation Model</td>
<td>Industry Partners</td>
</tr>
<tr>
<td>Participation Model</td>
<td>All-in at holding company level; Opt-in at the project or subsidiary level</td>
</tr>
<tr>
<td>Governance</td>
<td>AHP Executive Committee with guidance from the AHP Development Committee</td>
</tr>
</tbody>
</table>

TABLE 3.

AHP IV Process:
The process for evaluating potential ventures to develop new products, services and technology is listed below:

1. AHP IV focuses on innovation opportunities in the following disruptive technology categories:
   - **Connected Health**
     Individual patient information and communications
   - **Computational Health**
     Population scale health data with predictive analytics
   - **Medical Robotics**
     Process automation and smart machines
   - **Precision Medicine**
     Customized care based on genome and proteomics

2. Specific enabling technologies targeted:
   - Passive Biometric Sensors
   - Regenerative Science
   - Artificial Intelligence
   - Augmented Reality
   - Internet of Things
   - Blockchain
   - RFID/NFC
   - Cloud

3. Initial product, service and technology company planning includes preliminary market analysis, competitive factors, evaluation of use cases, projected volumes and potential investment. Six initial, potentially interconnected, concepts for new enterprises to be considered are:
   - The Sensor Company—Products & Technology
   - Central Telemetry Company—Clinical Services
   - Dr. Nexus—SaaS Platform
   - AllSpire Research Institute—A collaborative research institute utilizing government and industry grant funding, focused on selected disruptive technologies
   - AllSpire Living Communities—Healthy Residential Communities—technology enabled real estate
   - AllSpire Venture Fund—Outside Risk Capital
   - Sophia Physis—“Wisdom of Life”—Data Warehouse, AI, and Analytic Service Bureau
DIVERSIFIED BUSINESS MODELS AND NEW REVENUE SOURCES

The Sensor Company
Product & Technology

Central Telemetry Company
Clinical Service

Sophia Physis
“Wisdom of Life” AI and Analytics Service Bureau

AllSpire Venture Fund
Outside Risk Capital

AllSpire Research Institute
Government and Industry grants, royalties and partnerships

Dr. Nexus
SaaS Platform

AHP IV EXTERNAL PARTNERSHIP CRITERIA
To be considered for partnership by AHP IV, the potential partner must be aligned with the overall strategy and mission of AHP. New corporate entities may be developed under the direction of AHP IV along with industry partners to satisfy an unmet need identified by members of AHP or by AHP staff based on industry trends.

AHP Partner Categories
There are three industry partner categories:

Global Innovation Partners
- Supporting mass production and distribution
- Worldwide sales and marketing
- Large scale science and engineering

Strategic Business Partners
- Large scale domestic business service companies

Technology Development Partners
- Rapid product development

INDUSTRY PARTNER ROLES
Industry Partners may serve in one or more of the following capacities while working on an AHP IV project:

- Personnel—embedded and dedicated design, product development, project management team members
- Scientific Advisory
- Technology
• Engineering / Manufacturing / Production
• Distribution
• Global Sales and Marketing
• Regulatory
• Investment

AHP AND MEMBER ROLES
AHP Staff and AHP Members may serve in one or more of the following capacities while working on AHP IV project(s):

• Market Needs Assessment
• Disruptive Threat Assessment
• Physician / Clinical Advisory / Patient Survey
• Product Specifications
• Project Management
• Business planning and financial modeling
• Pilot Strategy and Execution
• Financial Management
• Legal / Regulatory
• IT / EHR integration
• Human Resources
• Office and Medical Facilities
• AH GPO Contracting
• Investment

The AHP Innovation Program consist of three strategic and synergistic components: The AllSpire Health Partners Internal Innovation Network, AllSpire Technology Transfer & Evaluation and AllSpire Innovation Ventures.
INTRODUCTION TO DISRUPTIVE TECHNOLOGIES

BY PAUL J. TIRJAN

There are times when technology lurches forward in an explosion of industrious creativity. Our current era may be one of those extraordinary moments that historians will recognize as an inflexion point in the evolution of society. Unlike 1993 when the world-wide-web was opened to the general public for commercial exploitation, or 2007 when Apple released the first iPhone and almost instantly restructured the nature of communication throughout the world, the current wave of technologic innovation is not driven by a single system, product or platform.

We are grappling with no fewer than eight emerging technologies that would each independently constitute such a profound step forward. These are the enabling technologies that we believe are driving disruptive innovation within healthcare and demand our attention. Many are synergistic with other technologies and most can be applied to multiple of AllSpire’s focused use-cases of Connected Health, Computational Health, Robotics, and Precision Medicine.

<table>
<thead>
<tr>
<th>CONNECTED HEALTH</th>
<th>COMPUTATIONAL HEALTH</th>
<th>MEDICAL ROBOTICS</th>
<th>PERSONALIZED MEDICINE</th>
</tr>
</thead>
<tbody>
<tr>
<td>(individual patient level)</td>
<td>Big Data (Population Health)/AI/Machine Learning</td>
<td>Automated Healthcare</td>
<td>Care Pathways specific to an individual patient or genotype</td>
</tr>
<tr>
<td>Small Data/Sensors/Surveillance</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Displace and obviate need for physician and non-physician care**
- Reduce need for acute and skilled nursing facility beds
- Reduce low acuity ED use

**Reduce need for specialist expertise**
- Reduce demand for acute inpatient care
- Change needs for management skills

**Obviate need for physician and non-physician including diagnostic, medical care and surgery**
- Change professional and product liability risks
- Obviate the need for human labor in repetitive non-clinical roles

**Either reduce or increase utilization of high cost therapies, diagnostics and vaccines**
- Demand new clinical skill sets
- Change the nature and shift attribution of professional liability risks
The Enabling Technologies:
- Passive Biometric Sensors
- Regenerative Science
- Artificial Intelligence
- Augmented Reality
- Internet of Things
- Blockchain
- RFID/NFC
- Cloud

PASSIVE BIOMETRIC SENSORS
The human body emits vast quantities of medically relevant data in many forms into the surrounding environment. This information can be gathered intermittently or continuously through passive sensors without direct patient contact. Radical efficiencies and substantial improvements in the long-term care of high-risk patients, and especially those with multiple chronic conditions, can be realized if continuous automated surveillance and remote clinical support can be rendered in a near effortless, near real-time and extremely low-cost manner.

REGENERATIVE SCIENCE
According to the NIH’s National Institute of Biomedical Imaging and Bioengineering:

“Regenerative medicine is a broad field that includes tissue engineering but also incorporates research on self-healing—where the body uses its own systems, sometimes with help [from] foreign biological material to recreate cells and rebuild tissues and organs.”

This rapidly evolving field is enabling a radical new dimension within personalized medicine. Rather than mass produced and globally distributed medical devices, or transplantation of organs or tissues from other people or animals, it is now possible to create new tissues and organs genetically identical to the patient because the root source material comes from the patients themselves. Much of the science has matured from decades of stem cell research and is finally becoming commercially available.

While most of the attention in this sector has rightly been focused on the potential impact on patient lives, there are several less obvious issues that make this a disruptive innovation category. First, the actual procedures and workflows necessary to 1—extract the patient’s source material, 2—grow an organ or tissue and 3—reintroduce the “product” into the patient, may be significantly different from prior standards of care. Substantial retraining of physicians and support staff is likely to be a challenge. Second, the entire supply chain will need to be rethought for these programs. What is being replaced? And with what exactly? Will purchasing or product procurement be replaced with a licensing or service arrangement? Lastly, there may need to be a rethinking of the revenue cycle for these procedures. Can we bill to give the patient back their own tissue even if it has been enhanced? Or will there be no technical component for reimbursement of these procedures? Will the services require new procedure codes and if so how granular and patient specific must they be? Will coverage of procedures be dependent on genotypes, or phenotypes or will they be subject to individual tissue growth milestones for each patient?
ARTIFICIAL INTELLIGENCE

Encyclopedia Britannica defines it this way:

“Artificial intelligence (AI), the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings. The term is frequently applied to the project of developing systems endowed with the intellectual processes characteristic of humans, such as the ability to reason, discover meaning, generalize, or learn from past experience.”

In spite of the ongoing debates regarding risks of mass job losses, privacy concerns, and the occasional science fiction film depicting the overthrow of humanity by a robot rebellion, AI is already embedded in many aspects of healthcare and thoroughly entrenched in the personal lives of patients. Search engines and social media sites utilize AI as a central core capability to sell advertising and data, retailers to sell products, actuaries to project risks, investors to evaluate markets, economists to forecast, weathermen to predict and so on. It is a natural and healthy process to study and contemplate deeply the full implications of such a powerful new tool.

However, within healthcare, we resist or delay embracing AI at great peril. No human can review hundreds of thousands of medical journal articles before making every clinical decision. No human can absorb millions of biometric vital sign data elements around the clock for months to precisely predict a change in condition.

AUGMENTED REALITY

Encyclopedia Britannica defines it this way:

“Augmented Reality, in computer programming, a process of combining or “augmenting” video or photographic displays by overlaying the images with useful computer-generated data. The earliest applications of augmented reality were almost certainly the “heads-up-displays” (HUDs) used in military airplanes and tanks, in which instrument panel-type information is projected onto the same cockpit canopy or viewfinder through which a crew member sees the external surroundings. Faster computer processors have made it feasible to combine such data displays with real-time video.”

Augmented Reality is early in its entry into healthcare applications, but already there are several very broad general categories of use cases that are beginning to emerge. The first, and perhaps most obvious, is the direct remote provision of robotic surgery or trauma care. One can imagine it is a relatively small step to evolve from today’s robotic surgery conducted by a surgeon in an operating room with a patient to one where the patient is inaccessible remotely or in a hostile environment (civil unrest, natural disaster, biohazard etc.) and life-saving care can be rendered by an onsite robot or even remotely guided non-physician clinician. A second scenario is with clinician training and education using immersive and life-like virtual constructs and gamification to play out various care pathways and outcomes. Another application is in the realm of behavioral health, where patients can be safely immersed in situations to role play and respond to stimuli. Further, clinicians and other patients can be added to a virtual environment and freely interact with one another in safety and without regard to time or distance. Coupled with AI and clinical robotics, augmented reality will eventually provide a new site of care and potentially even automated providers.

INTERNET OF THINGS

For AllSpire purposes the Internet of Things (or IoT), is the realm of connectivity among all electronic devices, as well as non-electronic devices that are capable of transferring information that could be converted into a format that could be transmitted electronically.
without conscious human intervention. In other words, IoT is that piece of cyberspace where the devices talk to each other.

In healthcare, IoT electronic devices include everything from cell phones and computers to MRIs, blood pressure cuffs, refrigerators, ovens, lights, elevators, cars and pretty much anything else you can turn on. Some examples of the non-electronic “Things” might be anything with a unique identifying number, a bar code, a QR code, an RFID/NFC tag or any other scannable or detectable tag or token attached to any “Things” including humans, animals and boxes of inventory.

Early applications are already common throughout the supply chains of health systems, but the proliferation into sites of care and even into implantable medical devices is mushrooming. Challenges are arising in new forms of cybersecurity threats, management of the sheer volume of data being produced by all of the device to device communication, envisioning new ways to capture efficiencies by eliminating waste, improving competitive advantage through better service quality and achieving better population health outcomes via enhanced remote patient management.

**BLOCKCHAIN**

According to Price Waterhouse Coopers:

“Blockchain is, quite simply, a digital, decentralized ledger that keeps a record of all transactions that take place across a peer-to-peer network. The major innovation is that the technology allows market participants to transfer assets across the Internet without the need for a centralized third party…”

Collaborative technology, such as blockchain, promises the ability to improve the business processes that occur between companies, radically lowering the “cost of trust.”

It is far too early to predict where Blockchain technology will take root in healthcare, but some likely prospects include the claims processing and revenue cycle of the provider community, the entirety of the health insurance payor industry, medical product liability insurance companies, both primary and secondary medical device markets and capital equipment manufacturers. For the latter, imagine a chip imbedded in an MRI machine that contained not only every owner throughout its lifecycle, but the name of every clinician that ever used it, every technician that ever maintained it, every manufacturer of every component and every warehouse and distribution point that carried it. Now consider the impact on product liability and life cycle management from knowing every potential fail-point.

Applications of Blockchain in healthcare may never be as flashy as Bitcoin, but the underlying transactions are real, valuable and in desperate need of incorruptible reliability and security.

**RFID/NFC**

RFID Insider defines radio frequency identification (RFID) and near field communication (NFC) as follows:

“RFID is the process by which items are uniquely identified using radio waves, and NFC is a specialized subset within the family of RFID technology. Specifically, NFC is a branch of High-Frequency (HF) RFID, and both operate at the 13.56 MHz frequency. NFC is designed to be a secure form of data exchange, and an NFC device is capable of being both an NFC reader and an NFC tag. This unique feature allows NFC devices to communicate peer-to-peer.” And...
“At a minimum, an RFID system comprises a tag, a reader, and an antenna. The reader sends an interrogating signal to the tag via the antenna, and the tag responds with its unique information. RFID tags are either Active or Passive.

Active RFID tags contain their own power source giving them the ability to broadcast with a read range of up to 100 meters. Their long read range makes active RFID tags ideal for many industries where asset location and other improvements in logistics are important.

Passive RFID tags do not have their own power source. Instead, they are powered by the electromagnetic energy transmitted from the RFID reader. Because the radio waves must be strong enough to power the tags, passive RFID tags have a read range from near contact and up to 25 meters.”

RFID tags have been in use in distribution, warehousing and other aspects of Supply Chain management, including across the healthcare industry, for decades. What is new is that all major mobile phone makers have incorporated NFC capabilities in their products, which you might recognize as the technology that allows one cell phone to “bump” data to another or make a digital payment with a phone, key fob or proximity card. Applications in clinical care are expanding in the area of collecting biometric data from implanted medical devices such as long term heart rhythm monitors, cochlear implants and neurologic implants. Home health and long term care facilities have adapted these systems to track patient activity, provide safety and security alerts, and support medication adherence via body worn tags on doors, beds, chairs, medicine cabinets and pill bottles. RFID and NFC systems are an essential sub-component of the broader Internet of Things infrastructure.

In the future, pieces of electronic medical records and electronic prescriptions might be transferred cell phone to cell phone via NFC between patient and provider, then paid for the same way in an entirely peer-to-peer, instantaneous transaction.

CLOUD
According to Investopedia:

“Cloud computing is a method for delivering information technology (IT) services in which resources are retrieved from the Internet through web-based tools and applications, as opposed to a direct connection to a server. Rather than keeping files on a proprietary hard drive or local storage device, cloud-based storage makes it possible to save them to a remote database. As long as an electronic device has access to the web, it has access to the data and the software programs to run it.”

“In its essence, cloud computing is the idea of taking all the heavy lifting involved in crunching and processing data away from the device you carry around, or sit and work at, and moving that work to huge computer clusters far away in cyberspace. The internet becomes the cloud, and voilà—your data, work and applications are available from any device with which you can connect to the internet, anywhere in the world.”

Most major administrative function software applications in healthcare have already moved to the cloud. Increasingly, clinical applications including the vital electronic medical record (EMR) systems are making the transition as well.

What is new here is the evolution of the Cloud from a storage site to a processing site, and in so doing, enabling not only remote work but remote robotic process automation or RPA. RPA acts essentially
as a virtual robot in the cloud that can conduct repetitive low skilled but high volume tasks that otherwise would waste human labor.

Initial RPA activity is in purely administrative support functions such as verification of warranties, matching invoices with purchase orders, contract compliance reviews, credentialing, patient registration, and cross referencing medical claims against coverage determinations. However, as virtual care expands, it is inevitable that care delivery itself will move to the cloud. These services will be provided by remote humans in most cases, but eventually some may be provided by pre-programmed RPA clinical algorithms at a fraction of the cost of human labor.

This rapidly evolving field is enabling a radical new dimension within personalized medicine. Rather than mass produced and globally distributed medical devices, or transplantation of organs or tissues from other people or animals, it is now possible to create new tissues and organs genetically identical to the patient because the root source material comes from the patients themselves. Much of the science has matured from decades of stem cell research and is finally becoming commercially available.

Early applications are already common throughout the supply chains of health systems, but the proliferation into sites of care and even into implantable medical devices is mushrooming. Challenges are arising in new forms of cybersecurity threats, management of the sheer volume of data being produced by all of the device to device communication, envisioning new ways to capture efficiencies by eliminating waste, improving competitive advantage through better service quality and achieving better population health outcomes via enhanced remote patient management.
CONNECTED CARE

BY PAUL J. TIRJAN

Connected health is commonly used as an umbrella term for telemedicine (use of medical information exchange from one site to another via electronic communication), telehealth (allows consumers access to health education and support for self-management through the Internet via their home computers or wireless devices), and mobile or M health (services accessed through mobile technologies). Clinicians are leveraging connected health strategies to further advance care of patients, particularly with chronic conditions, in their homes and beyond.

WHY IT’S IMPORTANT

While there has been remote monitoring of patients in some capacity since the early 1970s, in January 2015, the Centers for Medicare & Medicaid Services (CMS) issued a rule to allow for reimbursement of remote (non-face-to-face) chronic care management (CCM) services for patients with multiple chronic conditions. Eligible providers include physicians, nurse practitioners, physician assistants, registered dietitians and others. Additionally, in January 2017, CMS adopted a new telehealth specific place of service (POS) code for providers to utilize to indicate that the service took place via telehealth. CMS’s expectation is that the new POS code will help “track telehealth utilization and spending.” Several studies have shown that remote monitoring is beneficial to many patient groups, and given the growth of the high medical need elderly population, there will be an ever-increasing need to provide patient care as efficiently as possible.

Specifically, with the rapid rise of the graying segment of the population, there is an anticipated 40% increase in heart disease and a 50% increase in cancer by 2023. Management of these conditions can be frustrating since only 10–15% of an individual’s health status is attributable to the health care he or she receives. The remainder is conditions, access to food and education status. Being able to impact individual behavior may help stem the increase in chronic and acute diseases.

Another dynamic to consider is that many people reside in rural locales or other areas of provider scarcity and suffer from poor access to effective primary care. Embracing connected health care delivery fully extends primary provider capacity, improves access to specialty providers and in so doing enhances patient satisfaction and provider network loyalty while driving better adherence to treatment plans. For entities that participate in an ACO, connected health provides a direct means for aggressively managing and achieving cost savings across the populations for whom they assume risk.
HURDLES: DATA VOLUMES, INTEGRATION, SECURITY, PRIVACY AND CULTURAL NORMS

Challenges for connected health strategies are important issues around data integration and governance, data security, patient education and engagement, clinician workflow and reimbursement. While some progress has been made regarding data integration and reimbursement, many health IT leaders say the biggest challenges to connected health strategies are cultural rather than technical. Changing these cultural norms around care delivery will require dedicated clinical champions to constantly reinforce the benefits of the new delivery avenues and educate fellow clinicians about new practice standards using the most updated care delivery methods.

Significant hurdles also remain in discerning meaning from massive amounts of raw data generated from the internet of things (IoT). Weaving this data into useful clinical information poses a significant challenge. Data is housed in many disparate repositories that are not yet integrated, including across the entire spectrum of healthcare providers, pharmaceutical companies, diagnostic companies, medical device companies, health insurance payor entities and other life sciences organizations. More often than not, these organizations are not used to sharing data and “ownership” of data is problematic. This data also is presented in many different formats—digital files, numerical data, scanned paper documents, bar codes, QR codes etc.—all contributing to an overwhelming sense for clinicians of finding needles in haystacks. Regulations governing shared ownership and transfer of such data need to be solidified, along with standard file formats and security procedures. Once significant blocks of data elements are tied together, algorithms will need to be developed to provide meaningful interpretation and decision support to both patients and clinicians around health status and treatment plans.

CURRENT EXAMPLES

There are already many well established examples that underscore the power of connected health delivery. A recent 90-day transitional study of post-acute COPD and HF patients in underserved areas with telemonitoring support showed significant reduction in all cause readmission for the cohort in the program as compared to the control group. 30-day readmissions were reduced 50% and a 13–19% reduction in readmissions at 180 days. Patients also reported improved functional status at the end of the program.

Patients are using wireless blood pressure cuffs, connected blood glucose monitors and wellness apps, which enable providers to reach into patients’ homes and capture patient-generated health data.

From the consumer demand side, ZocDoc allows people to find a provider in their neighborhood and schedule an appointment.
in a few minutes for a specific time. It is free and only takes a few clicks, you can filter by problem, specialty or accepted insurance. Most people can see a provider the same day or within 72 hours at the latest. TeleDoc takes this process one step further. You can book a virtual visit with a provider for many illnesses including behavioral health and see them right from your phone, iPad or computer. This can be arranged at a future date or within 10 minutes of accessing the TeleDoc app. This company is addressing a highly consumptive, instant gratification culture that is surely to rise as more of these platforms become available.

National virtual urgent care providers including TeleDoc, American Well and MD Live provide video consults using rotating pools of on-call shift physicians, while major EMR systems such as EPIC provide a basic version of the video consult direct to patients from their own physician with documentation directly into the patient chart. These are a good start and provide a solid foundation for the next generation of connected health.

WHAT ALLSPIRE WILL FOCUS ON

As part of its Innovation Strategy, AllSpire plans to develop a better, faster and far more broadly affordable, clinical surveillance reality. The central premise is that radical efficiencies and substantial improvements in the management of high-risk, chronically ill patients will be realized if continuous, heavily-automated surveillance with direct-to-patient clinical support can be rendered in an effortless, near real-time and extremely low-cost manner.

All humans emit, reflect and refract enormous amounts of data signals continuously in every direction. These emissions span the electro-magnetic spectrum from radio frequency, microwaves and infrared through the visible light range to ultra-violet, x-ray and gamma rays. Additional signals can be detected from acoustic vibrations, bio-electric fields and airborne chemical secretions.
To date, nearly all patient monitoring requires trained personnel and body-worn sensors connected by wires to analytic equipment. Most output is manually selected and transferred into an electronic health record, all of which generally requires a controlled and heavily regulated environment (e.g. an expensive site of care). Additionally, the mere presence of restrictive wires and equipment creates an impediment to ambulation, which is often required for optimal health and healing.

Passive biometric sensors are sensors that neither requires contact with the patient, nor staff to operate them. These sensors function automatically and continuously detect naturally emitted patient biometric data. Many such sensors have been developed for use in non-clinical applications, but recently have become the subject of considerable research and development for health and medical use.

In the near future, it is likely that all patient rooms, regardless of site of care, will be equipped with advanced medical surveillance technology enabling immediate virtual care from physicians, nurses, pharmacists and other care providers. Further, it is unlikely that these monitoring systems will require disposable supplies, staff to apply or set up the devices for each patient, or staff to operate the equipment and transcribe the output data.

CONCLUSION

Connected health technology, including the use of mobile devices and apps, sensors, wearables and remote patient monitoring, has the potential to transform healthcare delivery, by enabling providers to track and care for patients outside the four walls of hospitals and practice offices. It will address the new patient consumer—paying for more and more of their healthcare out of pocket—who is engaged, empowered and more data focused. Care will be delivered wherever the patient is and on their schedule. Healthcare of the future will have a “Med-app for that”

Sources:
11. TelaDoc.com
SEPSIS PROGRAM

BY MEREDITH DISKIN

What is sepsis?
The Society of Critical Care Medicine define Sepsis as “Life-threatening organ dysfunction caused by a dysregulated host response to infection.”

What is the clinical impact of sepsis on the population?
The CDC Data & Reporting for Sepsis published in 2017 found that “7 in 10 patients with sepsis had recently used healthcare services or had chronic diseases requiring frequent medical care.”
In adults, these common infections can lead to sepsis:

- Lung infection such as pneumonia: 35%
- Kidney or urinary tract infection: 25%
- Gut, stomach, or intestine infection: 11%
- Skin infection: 11%

Using Knowledge Transfer principles, AllSpire Health Partners fosters a collaborative environment where all Member organizations share tangible and intellectual property, expertise, learning and skills to foster continuous improvement. AllSpire Members participate in small group initiatives to develop tools for education, community awareness, and to expand patient resources. The wealth of AllSpire resources is driven by continuous input by an ever-growing community of healthcare leadership and industry expertise.

FORMING THE ALLSPIRE SEPSIS CLINICAL INITIATIVE COMMITTEE

The core tenet of AllSpire Clinical Initiatives is the pursuit of clinical excellence across the full breath of the Member health systems along with the deep and rich talent pool of which they are comprised.

Similar to many hospitals across the US, AllSpire member health systems struggled with reducing mortality rates due to sepsis-related illness. The Member Health Systems that make up the AllSpire network decided to form a specific committee to study the issues and share their clinical insights and workflow processes to facilitate an opportunity for new clinical improvements.

The objective of the AllSpire Sepsis Clinical Initiative is to use data to identify areas for improvement as well as facilities that have shown success in controlling mortality related to sepsis. Each facility has innovative programs and workflows to tackle the main problems with treating sepsis.

AllSpire Clinical Leadership had asked several key questions:

1. How do we identify at-risk patient groups?
2. How do we facilitate faster diagnostic protocols for all patients?
3. How can we reduce time to treatment (fluid and antibiotics) for patients diagnosed with sepsis?
4. Are there opportunities to intervene in the pre-hospital setting (EMS and SNF)?
5. How can we improve post-discharge follow-up and care communications?

The Sepsis Committee is comprised of clinical leadership on Member Systems including Emergency Department and internal medicine physicians, hospitalists, nursing, quality, and data leadership with strong analytics teams supporting their data gathering projects. The initial meetings and discussions created a baseline inventory of current state at the individual facilities and compared issues facing all health systems. Data subgroups formed to carve out metrics to gather similar data sets that could be compared across all AllSpire facilities. Creating custom data templates, goals, and metrics was a complex task but has proven to be a valuable tool in targeting common opportunities for improvement and gaining insight into the sepsis landscape. Utilizing knowledge transfer techniques, members collaborate to improve the quality of care delivery to save lives.

ALLSPIRE SEPSIS METRICS—CONSENSUS REPORTING

After the AllSpire Sepsis team determined what data to collect, the Member Systems came to consensus on what to report each month. An agreement was reached to discuss this data over an initial 24 months period.
Sepsis Statistics

More than 1.5 million people get sepsis each year in the U.S.

About 250,000 Americans die from sepsis each year

1 in 3 patients who die in a hospital have sepsis

Metrics for consensus reporting models:

1. Observed to Expected (O:E) Mortality for patients with Severe Sepsis (with and without shock)
2. Readmissions: 7 and 30 days returning with sepsis. Index Diagnosis of All Cause and Sepsis
3. Time to Fluids (any increase in fluids above standard as patient appropriate)
4. Time to Antibiotics (Broad spectrum)
5. Present on Admission (POA) cases vs Not Present on Admission (NPOA) cases

Population:

Sepsis Data: Population by ICD 10 Code
R6520 Severe sepsis without septic shock
R6521 Severe sepsis with septic shock

1. Inclusions:
   a. All patients over 18 years of age
   b. Principle and secondary diagnosis of Severe Sepsis or Septic Shock

2. Exclusions:
   a. Behavioral Health patients
   b. Elective readmissions for scheduled treatments (for example, surgery or chemotherapy)

Innovative Approaches to Treatment

One of the key focus areas of the AllSpire Sepsis Clinical Initiative is to share innovative ways to diagnose and quickly deliver care to patients with sepsis. One approach to early intervention was to address options for identifying patients in the community such as Skilled Nursing Facilities (SNF) and EMS transport vehicles pre-hospital. In addition, targeting vulnerable patient groups is a critical aspect of mitigating the progression of Severe Sepsis to Septic Shock. The general consensus of the AMA is that patients over the age of 65 and those with co-morbidities or chronic health conditions are at greater risk for sepsis.

EMS Training Programs:

Atlantic Health System and LVHN both have early intervention training programs for EMS staff. While LVHN produced a comprehensive training curriculum and education lecture series for EMS staff, Atlantic Health System took a further step.

In 2014, EMS leaders within the Atlantic Health Network partnered with Atlantic Health System’s Sepsis Workgroup to address the unmet needs of sepsis identification and early intervention protocols for EMS staff in the pre-hospital setting.

Atlantic Health System emergency physicians reached out to the EMS teams that were the primary support for their service area. It started with asking the key question, “What do you need?” EMS teams were supplied with portable thermometers and test equipment to evaluate lactic acid levels. From there, EMS teams were trained to identify potential sepsis in the field, take basic tests and perform an initial diagnostic workup. This information is then called into the ED staff so orders for fluid resuscitation and other interventions can begin during transport to the hospital. Once the patient is received at Atlantic’s Overlook Hospital staff evaluates the patient and delivers diagnostically appropriate first hour treatment compliant with the Sepsis Bundle.
Dr. Christopher Amalfitano, MD, Chair of Emergency Medicine at Overlook Medical Center, Atlantic Health System, is the clinical leader for the program. He credits the training of EMS staff and strategic resources to the success of the program. Time to fluids and time to antibiotics was greatly reduced due to this intervention. More importantly, patients received rapid treatment and the health was in better compliance with the 3-hour sepsis bundle. Now, two additional health systems in the AllSpire network are evaluating their EMS training programs and working within state regulations to build on the Atlantic Health model.

TARGETING VULNERABLE PATIENT POPULATIONS: SNF PROTOCOLS

Both Hackensack-Meridian Health System and WellSpan Health have specifically targeted SNFs for sepsis intervention training programs as a key priority in reducing the number of septic patients.

Through thorough evaluation of patient charts coded for R6520 (Severe Sepsis) or R6521 (Severe Sepsis with Shock), WellSpan Health created a set of heat maps to target those ZIP Codes in their service area that had higher populations of septic patients. Analysis of the heat map yielded the identification of three SNFs with abnormally high levels of septic patients. Armed with this information, Sepsis teams reached out to offer targeted training programs for the SNF staff. Now educated on early warning signs and intervention protocols, these staff members can provide patients with early care, greatly reducing mortality for this population.

Hackensack-Meridian Health System is developing a “Sepsis Improvement Project@HMH” with a test site at Bayshore Hospital. The Meridian Nursing and Rehab facility at Bayshore will also participate in some of this focused training on early detection and recognition of sepsis warning signs. Focus areas for HMH are centered around development of screening tools, communication and use of Advanced Practice Nurses (APNs). Epic tools development is a crucial part of this program as a new EMR alert algorithm is under development to assist in targeting these patients.

Elements of this alerting tool include:

- Symptoms patient is exhibiting (fever, changes in urine output, shortness of breath)
- Evaluation of existence of SIRS criteria (Systemic Inflammatory Response Syndrome criteria—temperature, white blood count, heart rates, oxygenation levels)
- Results of focused patient examination and any diagnostics

These early interventions are a critical factor in the reduction of Present on Admission (POA) cases that present in emergency departments. Improvements to training, interventions and recognition of early warning signs of sepsis continues to be of the highest level of priority.

REDUCING TIME TO TREATMENT: TIME TO FLUIDS AND ANTIBIOTIC INTERVENTIONS

According to the AMA, key factors in the fight against sepsis-related mortality are a patient-appropriate increase in fluids (as some patients may not be able to tolerate the full bolus recommended in the CMS bundle); targeted antibiotic treatment (right antibiotic at the right time); and finally, time to treatment is of key importance.

Tower Health and Lehigh Valley Health Network each took innovative and progressive approaches to the issues around reducing time to fluids and antibiotic protocols. The issues around these interventions are complex and require nuance, training and strong team coordination.
At Tower Health’s Reading Hospital, for example, their Emergency Department sees more patient volume than any other hospital in the AllSpire network and has one of the highest patient volumes in the state of Pennsylvania. Identifying and treating the severely septic patient population within this setting required a multi-level strategy. First, they determined that if time to treatment was a factor, they should not transport patients away from treatment areas in order to perform testing. They implemented protocols for bed-side testing in the ED. This included portable chest x-rays, catheterization for urine cultures, blood testing in place and bringing other diagnostics to the patient. Results are faster and staff are initiating treatment protocols for the patients in less time. In addition, staff members were trained on the warning signs of sepsis and Epic order sets were developed to implement treatment to those patients with confirmed diagnosis. Since acquiring an additional 5 hospitals in 2017 to form the Tower Health Network, they are developing a standardized system-wide training program for identifying suspected sepsis and implementing diagnostic and treatment protocols to improve delivery of care. Most sepsis protocols for treatment mandate that time to fluids and time to antibiotics (generally broad-spectrum) be administered in less than one hour of suspected severe sepsis.

Lehigh Valley Health Network (LVHN) implemented a 3-pronged approach to care delivery for the suspected sepsis patients. First, training programs and extensive education for staff to understand the warning signs and the time-sensitivity of the condition. Second, workflows and order sets were created to implement diagnostic testing, confirmation and appropriate treatment. The third element was their implementation of an ED pharmacy that coordinated with their lab results to more accurately prescribe targeted antibiotics to better meet the time sensitive needs of specific infection groups.

**FUTURE OBJECTIVES FOR THE ALLSPIRE SEPSIS CLINICAL INITIATIVE**

As we enter the second phase of the initiative, AllSpire members will begin to further identify the real and unmet needs for septic patient served in their markets. Through a shared assessment of process and knowledge, members will share best practices and innovation approaches to care. The group will engage in collective Epic tools development, workflows and creative problem-solving techniques that can be used to further the advance sepsis treatment throughout AllSpire. Additionally, industry partnership opportunities will be evaluated and presented to the group to assist in delivering cost effective quality care for the septic patient.

**TERMINOLOGY AND INTERNATIONAL CLASSIFICATION OF DISEASES CODING**

<table>
<thead>
<tr>
<th>CURRENT GUIDELINES AND TERMINOLOGY</th>
<th>SEPSIS</th>
<th>SEPTIC SHOCK</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991 and 2001 consensus terminology¹, ²</td>
<td>Severe sepsis Sepsis-induced hypoperfusion</td>
<td>Septic shock³</td>
</tr>
<tr>
<td>2015 Definition</td>
<td>Sepsis is life-threatening organ dysfunction caused by a dysregulated host response to infection</td>
<td>Septic shock is a subset of sepsis in which underlying circulatory and cellular/metabolic abnormalities are profound enough to substantially increase mortality</td>
</tr>
<tr>
<td>2015 Clinical criteria</td>
<td>Suspected or documented infection and an acute increase of ≥2 SOFA points (a proxy for organ dysfunction)</td>
<td>Sepsis⁴ and vasopressor therapy needed to elevate MAP ≥65 mm Hg and lactate ≥2 mmol/L (18 mg/dL) despite adequate fluid resuscitation³</td>
</tr>
</tbody>
</table>

**Recommended primary ICD codes⁵**

- ICD-9: 995.92, 785.52
- ICD-10: R65.20, R65.21

**Framework for implementation for coding and research**

Identify suspected infection by using concomitant orders for blood cultures and antibiotics (oral or parenteral) in a specified period⁶.

Within specified period around suspected infection⁷:

1. Identify sepsis by using a clinical criterion for life-threatening organ dysfunction
2. Assess for shock criteria, using administration of vasopressors, MAP <65 mm Hg, and lactate ≥2 mmol/L (18 mg/dL)⁸
Sources:

Abbreviations: ICD, International Classification of Diseases; MAP, mean arterial pressure; SOFA, Sequential (Sepsis-related) Organ Failure Assessment. *Included training codes.
* Suspected infection could be defined as the concomitant administration of oral or parenteral antibiotics and sampling of body fluid cultures (blood, urine, cerebrospinal fluid, peritoneal, etc). For example, if the culture is obtained, the antibiotic is required to be administered within 72 hours, whereas if the antibiotic is first, the culture is required within 24 hours. * Considers a period as great as 48 hours before and up to 24 hours after onset of infection, although sensitivity analyses have tested windows as short as 3 hours before and 3 hours after onset of infection. * With the specified period around suspected infection, assess for shock criteria, using any vasopressor initiation (eg, dopamine, norepinephrine, epinephrine, vasopressin, phenylephrine), any lactate level >2 mmol/L (18mg/dL), and mean arterial pressure <65mmHg. These criteria require adequate fluid resuscitation as defined by the Surviving Sepsis Campaign guidelines.

The core tenet of AllSpire Clinical Initiatives is the pursuit of clinical excellence across the full breath of the Member health systems along with the deep and rich talent pool of which they are comprised.
(RE)WRITING THE FUTURE OF CANCER CARE

BY HACKENSACK MERIDIAN

Hackensack Meridian Health offers a comprehensive range of oncology services across seven of its hospitals, including John Theurer Cancer Center at Hackensack University Medical Center. Together, this broad network of services brings together clinical experts, Phase I research, advanced technology focused on positive outcomes in the following cancers: breast, gastrointestinal, genitourinary, gynecological, head and neck, leukemia, lymphoma, multiple myeloma, neuro-oncology, skin and sarcoma, hepatobiliary, endocrine, and thoracic.

FINDING MORE CURES FOR CANCER FASTER

Patients will now have access to a broader portfolio of hundreds of clinical trials—including phase I trials—that both institutions offer. Together, Hackensack Meridian Health and Memorial Sloan Kettering will enhance the capabilities of each other, offering cancer patients access to more than 1,000 clinical trials that may have otherwise been unattainable. Combined, Memorial Sloan Kettering and John Theurer Cancer Center perform more than 900 bone marrow transplants, the most in the country and second most in the world.

In December, at the site of the forthcoming Seton Hall-Hackensack Meridian School of Medicine, Memorial Sloan Kettering Cancer Center and Hackensack Meridian Health announced the Memorial Sloan Kettering–Hackensack Meridian Health 10-year strategic partnership. This partnership brings together two world-class organizations with deep New Jersey roots to foster a single goal: Finding more cures for cancer faster while ensuring that patients have access to the highest-quality, most individualized cancer care.
care when and where they need it. To achieve this goal, the new Memorial Sloan Kettering Cancer Center—Hackensack Meridian Health partnership will combine both organizations’ unparalleled expertise in all areas of cancer care and research, as well as their commitment to excellence, to accelerate new discoveries and improve the lives of patients they jointly serve, while training a new generation of leaders in the field.

According to the American Cancer Society, New Jersey has a higher cancer incidence rate than the national average. The Memorial Sloan Kettering Cancer Center—Hackensack Meridian Health partnership aims to improve the state of cancer care in New Jersey and beyond by providing support to patients throughout the cancer care continuum, from diagnosis through active treatment and into survivorship. Patients will benefit from greater access to the most innovative concepts and treatments in cancer care, including precision medicine, immunotherapy, and cell-based therapies.

Each organization’s existing sites of care in New Jersey—including Hackensack Meridian Health’s cancer care locations, John Theurer Cancer Center at Hackensack University Medical Center, and Memorial Sloan Kettering’s locations in Basking Ridge, Middletown, and Montvale (opening in 2018)—will be part of the Memorial Sloan Kettering Cancer Center—Hackensack Meridian Health partnership, but each organization will independently own, operate and manage these existing sites.

Together the partnership will develop and implement standardized care management and research protocols for all cancer patients receiving care at Memorial Sloan Kettering Cancer Center and Hackensack Meridian Health partnership sites.

Physicians employed by Memorial Sloan Kettering Cancer Center and Hackensack Meridian Health—including the Hackensack Division of Regional Cancer Care Associates and physicians who participate in Hackensack Meridian Health’s clinically integrated network—will continue to care for patients at their respective sites.

**MAJOR COLLABORATION ON CANCER ANTIGENS**

John Theurer Cancer Center has announced a partnership with the Parker Institute for Cancer Immunotherapy, founded by Napster founder Sean Parker, and the Cancer Research Institute in New York, for a major collaboration focused on neoantigens, unique cancer markers that researchers believe may hold the key to developing targeted cancer immunotherapies.

In addition to John Theurer Cancer Center, initial tissue samples are expected to be provided by Memorial Sloan Kettering Cancer Center, National Cancer Centre Singapore, Roswell Park Cancer Institute, UCLA, and the University Hospital of Siena in Italy. The Tumor neoantigEn SeLection Alliance (TESLA) includes 30 of the world’s leading cancer neoantigen research groups from both academia and industry.

**Groundbreaking Studies In Blood Cancer Presented At American Society Of Hematology Meeting**

In December, 17 physicians from John Theurer Cancer Center, including Andre Goy, M.D., M.S., its chairman and director and division chief of lymphoma, presented 46 studies on some of the most cutting-edge research topics in blood cancers at the 2016 American Society of Hematology Meeting. Their data presentations included two late-breaking abstracts, 19 oral sessions and 27 poster discussions. The data presentations at American Society of Hematology bring forward advancements in three critical areas of research at John Theurer Cancer Center: Acute Myeloid Leukemia Novel Therapies, Multiple Myeloma Novel Options and Lymphoma Immunotherapy. Hackensack Meridian Health is deeply committed to accelerating the development of breakthrough therapies to
combats blood cancer and helps patients and their families manage diseases like multiple myeloma and leukemia. The groundbreaking work that the team presented this year further demonstrates the significant impact that our cancer program is having in the field of hematology.

**VALUE-BASED CARE ON THE AGENDA IN DAVOS**

Dr. Goy, chairman of The John Theurer Cancer Center, led a discussion on value-based care at the World Economic Forum (WEF) Annual Meeting in Davos, Switzerland. His discussion focused particularly on leveraging digital technology to promote behavioral changes toward patients’ engagement in health care, wellness and shared decision-making. He also contributed to a white paper that is being published by the previous Industry Agenda Council on the Future of the Health Care Sector summarizing the causes and origins of the underperformance of health systems, particularly a clear misalignment across stakeholders.

The participation of Dr. Goy in this prestigious international endeavor is a testimony to the forwardness of Hackensack Meridian Health. Physicians across the board at Hackensack Meridian Health are fully engaged in improving oncology care delivery including using big data and technology to support treatment decisions, research and innovation.

According to the American Cancer Society, New Jersey has a higher cancer incidence rate than the national average. The Memorial Sloan Kettering Cancer Center—Hackensack Meridian Health partnership aims to improve the state of cancer care in New Jersey and beyond by providing support to patients throughout the cancer care continuum, from diagnosis through active treatment and into survivorship. Patients will benefit from greater access to the most innovative concepts and treatments in cancer care, including precision medicine, immunotherapy, and cell-based therapies.
Information technology leaders from Hackensack University Medical Center were selected to participate in the White House Precision Medicine Initiative Summit on February 25, 2016. The event took place in the South Court Auditorium of the White House and featured a panel discussion with former President Barack Obama, as well as other industry experts, patients and researchers. Launched in January 2015, the Precision Medicine Initiative has made significant progress toward revolutionizing health care delivery. The Administration called on academic medical centers, researchers, foundations, privacy experts, medical ethicists, and medical product innovators to develop new approaches to patient participation and empowerment. Hackensack University Medical Center was one of a very select group of organizations that accepted and delivered on this challenge based on the medical center’s strength in health care information technology, early adoption and advancement of interoperability standards, as well as its ongoing commitment to patient experience.
Currently, Hackensack University Medical Center is utilizing NJIT resources to define the future of care delivery transition, which will involve coupling precision medicine with population health. With precision medicine, data and evidence-based medicine are brought together to drive out as much negative variation as possible. Ultimately, outcomes are improved and inefficiencies and cost are greatly reduced.

Implementation of precision medicine utilizes a multidisciplinary team, with members from the clinical, quality, finance, education, experience and research teams. Andre Gay, M.D., chairman and executive director of The John Theurer Cancer Center, and Tim Hogan, FACHE, president of Riverview Medical Center and Bayshore Medical Center, are leading the multidisciplinary team in the design process.

Precision medicine and a multidisciplinary approach put physicians in the driver’s seat for delivering patient care, transforming from a fee-for-service to valued-based care model. The five key components for how the future of care will be transformed include clinical excellence, high quality, a highly-reliable experience, value, and innovation which supports education.

Though the team is currently focused on building bundles for cancer care, the vision is to take this care product further to redefine how we deliver all care. The plan is to design the first bundle, for Breast Cancer Her 2 Neu Positive, refine the design and use that design approach to create the additional bundles for cancer care, and beyond.

By partnering with NJIT, Hackensack Meridian Health is undertaking a clinical engineering endeavor to create a model that will benefit so many patients in the future.

“Currently, Hackensack University Medical Center is utilizing NJIT resources to define the future of care delivery transition, which will involve coupling precision medicine with population health. With precision medicine, data and evidence-based medicine are brought together to drive out as much negative variation as possible. Ultimately, outcomes are improved and inefficiencies and cost are greatly reduced.”
Computational health, or computational health informatics, can be defined as a branch of computer science that deals specifically with computational techniques as they relate to healthcare. In many cases, sophisticated machine learning programs are applied to vast data sets to support healthcare professionals and policy makers in determining the best approach to multidimensional problems and the impact of different interventions. The models or algorithms created can be applied to populations and individual patients.¹

WHY IT’S IMPORTANT
With the rapid surge of healthcare data available—from the electronic health record, claims data, imaging data, wearables that monitor vital signs, activity, sleep patterns, etc., there is a need to understand how this data correlates and to what extent it can provide meaningful and actionable indications of the health status of an individual. A study by ABI Research suggests that biometric “wearables” are expected to reach $52 billion by 2019, and this will only compound the amount of unstructured data available to analyze.² The volume of healthcare data continues to mount every second, making it continuously harder to find any particular nugget of helpful information. Human knowledge and intuition alone will no longer be enough to ensure quality patient outcomes. The future of healthcare depends on the synthesis of this vast amount of data, with rapid processing and delivery at the point of care, so that each provider and patient can have a truly informed encounter.²
Hurdles: Volume of Data, Clinician Interface, Connectivity

Connectivity as it relates to healthcare information is a huge hurdle. In most instances, a patient must repeat their story multiple times, and the provider is only looking at the data that is held within a single instance of the EHR. With concerns around privacy and sharing of healthcare data, it is currently very improbable that a provider can view data from a patient’s visit to an ER while they were vacationing in a different region of the country, or around the world for that matter. Eventually, healthcare data will need to be assimilated in a platform agnostic warehouse or advanced health information exchange that can be called up wherever the patient may land.

Once patient data is truly connected with ubiquitous yet secure high reliability access, clinicians will need to make sense of it. Big Data, in this case population scale health information, can be seen as a blessing and a curse. The overwhelming quantity and variety of healthcare data presents potential noise for any clinician. Nuanced changes in vital signs, lab values etc., are rarely automatically processed to alert a provider about potential substantial shifts in a patient’s condition. Algorithms will need to be crafted to help clinicians separate the signal from the noise.

Additionally, how we receive and view a patient’s data in the current EHR systems is often problematic. Trends are not readily established for the health care provider. There is no equivalent to a “Netflix model” where your potential viewing options are based on what others who possess a similar profile are viewing. In many EHRs, decision support is static. Typically, it takes the form of alerts when certain fields are populated (or not) and built in isolation from real time treatments and population trends. If a Netflix model was applied to healthcare, clinical decision support would be dynamic with individual patient characteristics, real time responses to treatments, and comparative response for large similar populations.

Current Examples

Significant headway has been made in applying computational techniques to healthcare delivery and population health. At a large health system in western Pennsylvania, an integration of clinical variables such as race (white vs nonwhite), intensive care unit (ICU) type (medical vs surgical), sex, and age has been used in developing multivariate logistic regression models to estimate a personalized initial dose of heparin.

In one of AHP’s own institutions—Hackensack Meridian Health—one of AHP’s own institutions—Hackensack Meridian Health—oncology providers are piloting computational strategies in oncology clinical decision support for optimal cancer treatment. The program leverages Cota, a data base and classification tool for cancer patients, as well as IBM’s Watson for Oncology, to help identify and rank treatment options, while providing links to supporting evidence. This empowers oncologists and patients with unparalleled insights as they consider the right course of treatment. Cota derives abstracted and benchmark data and embeds patient classification into Watson for Oncology to analyze meaning and context from clinical notes, reports and key patient information within the context of treatment planning.

What AllSpire Will Focus On

As part of the AllSpire Innovation Program, a service bureau will be developed to serve as a central access point for accumulated clinical data, care pathways, decision matrices, digital tools and outcomes data. Called Sophia Physis, this “Wisdom of Life” service bureau will support other AllSpire innovation companies, assist with the standardized of clinical protocols and order sets for the electronic health record (EHR) and provide ongoing data search and analytics support for the members of AllSpire Health Partners. The ultimate goal is to incorporate methods and technology for integrating real time medical surveillance data into the AHP member institutions EHR, as well as providing medical alert service for rising risk patients.
CONCLUSION
With the rapid rise of powerful computational tools, new inroads are being forged to facilitate enhanced healthcare delivery. When you combine these tools with the freeform “lifestyle” data in multiple platforms, clinicians will have greater opportunity to learn more about the patient that may or may not be in front of them. They will possess the ability to process nuanced changes in the patient’s health status and act on them earlier to potentially thwart the onset of disease or delay advancing chronic conditions. Coupled with more engaged and activated patients, the practice of health care as we currently know it will shift dramatically to a more collaborative and preventive model.

Sources:
MEDICAL ROBOTICS

BY JOANNE RESNIC

The term “robot” was coined by the Czech playwright Karel Capek in 1920. The play, R.U.R. (Rossum’s Universal Robots) depicted “creatures” more like clones than the robots we think of in modern times. The word was derived from an Old Church Slavonic word, “rabota”, which means servitude or forced labor. Today robots in the medical field come in many forms and can be segmented as follows: surgical robots, rehabilitation robots, non-invasive radiosurgery robots, hospital and pharmacy robots and others, which serve the neurology, orthopedics, laparoscopy and special education areas. For AllSpire purposes, medical robotics is a field of technology across a broad spectrum beginning with simple physical process automation, through stand-alone robots to fully-human-likeness androids, all applied to either clinical or non-clinical support of the delivery of healthcare.

WHY IT’S IMPORTANT

With the aging population and projected increases in the over 65 years cohort set to grow from 46 million to 98 million by 2060, doctors and nurses will be in short supply in the not too distant future. Coupled with static, and in some cases negative, growth in health care operations in rural and remote communities, medical care will require new approaches for delivery of care and support services. Leveraging medical robots could result in extending capacity of clinicians, a cost savings by allowing robots to perform repetitive, tedious or dangerous tasks in place of human labor, and also could extend the time elderly can remain independent and in their own homes.

In today’s world, there are already substantial benefits realized from the use of robots in healthcare. There is reduced fatigue for surgeons who use robots to assist them with surgeries as well as allowing them to reach places the human hand cannot, with calculated movements and consistent precision. Robots have the ability to perform repetitive tasks over and over—for example lifting...
patients in and out of beds—without experiencing exhaustion or strain. In the future, these robots may support individuals with special needs and/or requiring rehabilitation. Pharmacy robots have become commonplace in hospital inpatient pharmacies to reduce errors and costs associated with filling medications by hand. There are few medical supply warehouses that do not yet use robots for packing, storing and shipping. Today’s major illness may become tomorrow’s minor annoyances, and robots will be an integral part of this transformation.

HURDLES: COST, SAFETY, SECURITY AND PRIVACY
Currently, surgical robots are only as skilled as the surgeons using them. The research and development costs are high, as well as the capital acquisition costs. There have been reports of injury and death associated with robotic surgery, as well as higher price tags to patients. Insurance companies often reimburse hospitals at the same rates regardless of whether a procedure is a “minimally invasive (i.e.: robodoc)” or traditional surgery. Hospitals can actually end up losing money as a result of implementing a surgical robot.

Even as surgical robots become more refined and the reimbursement and costs normalize, there are other questions surrounding the use of robots in healthcare. There are ethical issues when the autonomy levels of these robots increase. What happens when there is full autonomy? What becomes the role of the medical specialists? What about the skill sets of surgeons? Could/will these autonomous robots replace clinical staff in a detrimental way? Understanding the implications of the changing requirements and skill sets for clinicians will require ongoing multidisciplinary input from clinicians, regulatory bodies, legal experts, educational thought leaders, and consumers of healthcare. All this is necessary to determine how we should utilize medical robotics in the future.

Regulation of medical robots will be challenging, as will assessment and assignment of risk. There will be a new tension around what amount of information is necessary to allow a robot to function safely, efficiently and effectively versus what information will maximize opportunities and goals of doctors, integrated delivery networks, industry, patients and other consumers. Additionally, more people may be involved with healthcare than in the past—data scientists, programmers, and others—which could result in a reduction of privacy for the patient and rising data security threats. Migrating to this larger “care team” means ensuring the same standards of patient confidentiality apply to all participating members.

CURRENT EXAMPLES
For the general public, surgical robots like CyberKnife (robotic radiosurgery system) and the Da Vinci Surgical System are likely the most familiar (and advertised) examples of how this technology has infiltrated healthcare. Interestingly even in this category, some remarkable gains have been made. In September 2001, the first transatlantic robotic surgery took place when a team of surgeons in NY and Strasbourg France, linked fiber-optically, removed the gallbladder of a 68-year-old woman using robotic arms built by Computer Motion (later acquired by Intuitive Surgical). This has future implications in treating patients in situations where a surgeon cannot be physically present—such as bioterrorism, battlefield or extremely remote rural locations. In some hospitals, robots are used to deliver meals and medications while carrying up to 1000 pounds and traveling 12 miles a day. Imagine how this could complement our aging workforce. Robots are available to perform many of the menial tasks in operations, like pharmacy, with much more accuracy and the ability to handle very large volumes. The RP-VITA, developed by InTouch, is a mobile telemedicine robot platform that allows doctors to be virtually present, and intimately engaged in the care of their patient, when they are physically far away. It can effectively extend the doctor’s reach to administer patient care over hundreds or even thousands of miles. Over 1,000 hospitals
in the U.S. are leveraging this technology for emergency and critical care, neurological assessment, cardiology, neonatology, pediatrics and mental health.¹⁰

WHAT ALLSPIRE WILL FOCUS ON

Understanding the increasing costs and strains on healthcare workers from the continuously rising demand for care, AllSpire will seek to leverage medical robotics with expanding levels of automation to reduce labor costs per patient and enable staff to focus on the most meaningful work, including spending more time interacting face-to-face with patients and managing the robots doing unskilled repetitive tasks.

In the near future, costs for robotic support are projected to decrease to such a level that these devices will be able to be deployed in any patient’s residence to ultimately allow elderly patients with chronic conditions to remain in their own home as long as possible or indefinitely.

CONCLUSION

Medical Robotics has the potential to solve many challenges that are on the foreseeable horizon for healthcare. Autonomous and semi-autonomous robots have wide-ranging applications within surgery, consultation, ambulation for the disabled, hospital operations, neuro-muscular rehabilitation, and many non-clinical health related support functions. As the options for medical robots proliferate, multiple considerations including cost, safety, privacy and impact on workforce will need to be thoughtfully evaluated and proven for there to be acceptance as an essential mode of care delivery. Once these hurdles are sufficiently addressed, robots and robotics will be mainstreamed in every healthcare setting: hospital, skilled nursing, behavioral health, assisted living, and in the individual home.

Sources:
5. Bertalan M. 9 exciting facts about medical robots. The Medical Futurist. (blog)
The emergence of precision medicine has the capacity to detect disease at an earlier stage, when it is easier and less expensive to treat effectively, stratify patients into groups that enhance the selection of optimal therapy as well as minimizing the adverse reactions from treatments.

**WHY IT’S IMPORTANT**

Precision medicine will aid in delivering precise treatments based on a patient’s medical history, specific characteristics and family history. The emergence of precision medicine has the capacity to detect disease at an earlier stage, when it is easier and less expensive to treat effectively, stratify patients into groups that enhance the selection of optimal therapy as well as minimizing the adverse reactions from treatments.

In treatment development, precision medicine can improve the biochemical targets of drug discovery, and ultimately reduce the time, costs and failure rate of clinical trials. Eventually, precision medicine will shift the emphasis from reaction to a disease to early detection or prevention.\(^1\)
HURDLES: VOLUME OF DATA, COMPLEXITY AND COST
While the promise of precision medicine is quite high, there are several hurdles that must be addressed. Precision medicine is intertwined with computational health, and the burden of exploding amounts of data within these two paradigms will require significant adaptation by clinicians. With further refinement of disease pathways, as a result of precision medicine outputs, providers will need to learn new skills in managing the progressively burgeoning classification of diseases. Patients and frontline providers, especially PCPs, will need decision support tools that are updated in real time, along with support around optimal engagement of specialists that is likely to become vastly more complicated.

There will need to be new regulations around precision medicine, particularly around treatment developed. Constant updates to disease prevention that result from early detection will need to be mandated or strongly incentivized. Lastly, financial incentives around disease detection and drug creation will need to be evaluated and realigned, since current incentives provide much more financial reward for pharmaceutical development versus the development of new diagnostic tests and non-pharmaceutical interventions.

CURRENT EXAMPLES
At the University of California health system, precision medicine is being leveraged to quickly detect infectious disease among patients in its health system. The SUPRI project is a collaboration between the health system Quest Diagnostics, Google Genomics, DNANexus and Syapse. The project uses the work led by UCSF researcher Dr. Charles Chiu, who developed a DNA sequencing scheme that can detect any pathogen with a single test, versus the traditional means of sending a series of individual tests until you identify the correct pathogen.

This new test helped save the life of a 14-year-old boy with bacterial encephalitis. Once a patient’s genes are sequenced, technology from DNANexus integrates Chiu’s algorithm into the cloud allowing samples and sequencing from a range of sites to be analyzed and securely shared using a common platform. As the program is commercialized, Google Genomics will help with the distribution of Chiu’s software, while Syapse will integrate all of the molecular genomic data with the clinical data that comes from medical records. The goal is to provide clinical decision support to doctors, pointing them toward appropriate treatment options. Quest Diagnostics will help develop the test for UC-wide use, and ultimately serve as a main commercialization.

Another avenue for precision medicine can be seen in the breast cancer patient population. One of the earliest widespread applications of precision medicine in cancer care is helping patients and physicians decide whether chemotherapy is needed. Chemotherapy has substantial side effects and improving chemotherapy recommendations to those who truly stand to benefit would reduce complications and improve quality of life for many women. Today, breast cancer patients without lymph node involvement are offered a gene assay test that helps assess the risk of breast cancer recurrence and whether chemotherapy is likely to help lower that risk in women with early stage disease. The standard of care is to offer this test to breast cancer patients without lymph node involvement. Researchers examined over 1800 patients, and of those patients who had the test, the results aligned with the decision for or against chemotherapy. Eighty-seven (87) percent of patients with a high score had chemotherapy. For patients with the most favorable prognosis and the lowest test scores, only 3 percent received chemotherapy, compared to 13 percent of women who did not have the gene assay test but had a favorable prognosis. Patients reported high satisfaction with their treatment choice. While most examples of precision medicine involve clinical trials, the recurrence gene assay shows how precision medicine can be used in everyday clinical care.
In January of 2012, Ivacaftor, a medication used for Cystic Fibrosis (CF) patients was approved by the FDA. This is an example of a new treatment derived by precision medicine, but underscores some of the ramifications that will need to be considered as precision medicine evolves. This drug was initially shown to reduce the amount of pulmonary exacerbations, normalize sweat chloride and dramatically improve lung functions with patients that had a specific gene mutation. Sadly, this represented only 5% of the CF patient population. With a price tag of $300,000 a year it makes it very difficult for a CF patient to afford this medication. Today, 10% of all CF patients now fall into the subset of patients who find significant benefit from its use, but with no other competition, the price of the drug has not decreased.

WHAT ALLSPIRE WILL FOCUS ON
Precision medicine will soon evolve from a focus on treatment based on gene mutations to enabling the provision (or modification) of the right treatment and dose at precisely the right point of time based on a patient’s presentation, with real time data supporting these determinations. AllSpire will seek out and/or create capabilities that enable real-time, dynamic plans of care based on a patient’s evolving status and past influencers of treatment. A service bureau is envisioned within AllSpire, referred to as Sophia Physis (meaning Wisdom of Life), to provide decision support to both the patient and clinician. Another goal is to provide an enhanced ability to measure impact of treatment options and deliver the most efficient, highest outcome producing selection for an individual. The initial target populations are poly-chronic disease elderly, oncology, infectious disease, and behavioral health patients.

CONCLUSION
Given the promise of precision medicine, it is clear that the practice of medicine will undergo a sea change in how care is delivered. Decision support tools will need to be developed to help manage the rapidly proliferating options for care, and patients will need to become far more engaged in their own care as they become a much more central part of the decision process and treatment equation. Ethical questions will continue to surface as issues arise around the cost of new targeted treatments versus the benefits, particularly as the treatments become more and more personalized to potentially an “n of 1”.

Sources:
CONNECTED HEALTH

BY LEHIGH VALLEY HEALTH NETWORK

To provide creative space and support to multidisciplinary stakeholders to work collaboratively to foster the development and implementation of innovative ideas, processes and technologies that align with the goals of the Triple Aim—Better Health, Better Care, Better Costs.

LEHIGH VALLEY HEALTH NETWORK AND THE AIR PRODUCTS CENTER FOR CONNECTED CARE AND INNOVATION AT LVHN

LVHN thinks about innovation as the introduction of a new or unique product, process or service that creates value for patients, helps fulfill the LVHN mission and facilitates achieving our goals. The mission and vision of the CCCI cascades from LVHN’s overarching mission and vision. Our strategy is to develop and implement innovations that hold the promise of transforming healthcare and provide greater value to the populations we serve.

LVHN MISSION

We heal, comfort and care for the people of our community by providing advanced and compassionate health care of superior quality and value supported by education and clinical research.

CCCI MISSION

To provide creative space and support to multidisciplinary stakeholders to work collaboratively to foster the development and implementation of innovative ideas, processes and technologies that align with the goals of the Triple Aim—Better Health, Better Care, Better Costs.

The Air Products Center for Connected Care and Innovation (CCCI) at Lehigh Valley Health Network (LVHN) officially opened in November 2017 at One City Center in downtown Allentown. The CCCI partners with the departments of Population Health and Community Health to support LVHN in becoming an innovative population health leader that creates superior quality and value for the patients and the communities we serve.

With the opening of the CCCI, LVHN colleagues, industry partners, the community and institutions of higher learning now have a centralized location at LVHN to focus on thinking differently about healthcare programs, processes and
technologies that help provide better care, better health and reduce the overall cost of healthcare for the populations in our region and beyond.

Lehigh Valley Health Network (LVHN) has been on a journey of innovation since the day Leonard Pool decided to build a world-class hospital in Allentown, Pennsylvania. While that journey started in the 70’s, in the past 15 years LVHN has implemented one of the largest connected care programs in the Commonwealth of PA. LVHN created one of the first TeleIntensive Care programs in the country; was an early adopter of remote patient monitoring for patients living at home with chronic diseases; was one of the first to implement robotic surgery services and implantable devices. We are also one of the first to use analytics through its Populytics subsidiary to predict and identify those individuals that will be at the highest risk of developing health related issues so that we can begin caring for those individuals sooner rather than later, in an effort to keep them healthy at home. LVHN has even taken its programs to the street, by caring for the homeless population and working with a local high school’s sewing club to make ponchos, tents, etc., out of “blue wrap”, that would have otherwise been thrown away.

For all of our past efforts, LVHN has received many significant awards and clinical designations including, but not limited to the 2013 Magnet Prize for our Telehealth Innovations, being recognized by Hospital and Health Networks as one of the 100 Most Wired and Most Wireless hospital systems across the country, winning the Davie’s Award in 2017, being named by the Joint Commission as the third comprehensive stroke center in the nation (the first in Pennsylvania), being reclassified in 2017 by the American Academy of Pediatrics as a Level IV Neonatal Intensive Care Unit, and being named for the 22nd consecutive year by US News and World Report as one of the nation’s top hospitals.

The emphasis and push to think differently with innovative ideas was accelerated by a generous and substantial financial gift from the Air Products Foundation in December 2015. This five-year gift provided the fuel to launch the creation of the CCCI and will provide a lasting impact on the region, through the development of new programs, processes and technologies that will improve healthcare in the Lehigh Valley and beyond. Since December 2015 the CCCI team has done a lot of homework to lay the foundation for the Center’s future. This includes, but is not limited to:

- Developing an internal Executive Steering Committee for Connected Care and Innovation. This committee primarily consists of LVHN’s clinical chairs, clinical chiefs and senior level executives. The function of this group is to serve as an internal Board of Trustees for connected care (a/k/a telehealth) programs and new innovations within the networks.

- Developing an external Community Advisory Council made up of business leaders throughout the community. The Council meets several times a year to discuss the unique health care concerns of our community and generate potential innovative solutions to those challenges.

- Developing the Connected Care Council which includes LVHN’s biggest clinical champions of our Connected Care service line.

- Joining the Innovation Learning Network. This Network is comprised of healthcare systems, health foundations, safety net providers, design/innovation firms and technology companies. The overarching goal of this group: to make healthcare better through good design. It includes organizations such as Adventist Health, Carolinas HealthCare System, Cedars-Sinai Medical Center, Kaiser Permanente, MedStar Institute for Innovation, Salesforce and Partners HealthCare, just to name a few.
• Visiting and learning from innovations centers and innovation professionals at MedStar, Kaiser Permanente, the Florida Hospital Innovation Lab, Steelcase, Philips, the Cleveland Clinic and Johnson and Johnson. The major takeaway in the process was that if you have seen one innovation center, you have seen one innovation center. They are all a little different, but with one common theme/approach—design or human centered design thinking. What is design thinking? Tim Brown, a British Industrial Designer and President of a company called IDEO defines design thinking as a human centered and collaborative approach to problem solving, which uses a designed mindset to solve complex problems.

• Discussing co-creation and co-development opportunities with local, regional and international healthcare companies.

• Working with architects, designers, LVHN Facilities and Construction, Lehigh University’s Integrated Business and Engineering program and construction firms on the development of the recently opened Air Products Center for Connected Care and Innovation at One City Center. The CCCI is comprised of 25,000 square feet of space, with about 15,000 feet of open space, conference rooms, simulation rooms, new collaborative technologies, white boards and focus booths for the purpose of maintaining focus on the CCCI’s vision and mission. The remaining space is home to our CCCI, Population Health and Community Health colleagues.

• Developing a digital innovation funnel for LVHN colleagues to submit ideas that will meet specific innovation challenges, as well as ideas that will address the Triple Aim of better health, better care and lower costs. Any colleague, no matter their title, who submits an idea that is selected for further study or implementation, will be one of the team members addressing that idea.

• Increasing the geographic reach and number of connected care programs (24) that provide for more than 100,000 clinical encounters a year.

LVHN’s journey with innovation now continues with renewed energy and a new home which will welcome all LVHN colleagues, industry partners, institutions of higher learning and community members that wish to partner with us to make the Lehigh Valley region one of the healthiest communities in the United States. To do this we must stimulate, ideate, collaborate, incubate, accelerate, simulate, demonstrate and imagine the possibilities for a healthier world. We’ve only just begun...
THE VALUE OF STREET MEDICINE

BY LEHIGH VALLEY HEALTH NETWORK

“Our research showed that approximately 7% percent of Lehigh Valley Health Network’s (LVHN) patients were experiencing homelessness, over 9,000 patients a year. We also found that the homeless community have limited access to care, are distrustful of the healthcare system, and often avoid seeking medical attention.”

In many cities, homelessness may be evidenced by long lines at soup kitchens, at bus and train stations, or persons bedded in church buildings sleeping in cots on the floor. In the Lehigh Valley, the crisis is more elusive. Our homeless find refuge under bridges or in camps hidden in the surrounding forest. In 2012, Lehigh Valley Health Network took action to try to make a difference in this community by bringing care to them wherever they are, however they are. We began a street medicine program, recruited a director, and made a call to our LVHN volunteer community to help provide care and services. We also began to collect data. Our research showed that approximately 7% percent of Lehigh Valley Health Network’s (LVHN) patients were experiencing homelessness, over 9,000 patients a year. We also found that the homeless community have limited access to care, are distrustful of the healthcare system, and often avoid seeking medical attention.

Since its inception, the LVHN Street Medicine Program works on the belief that everybody matters. This belief guides a philosophy and model of care that centers on caring for patients where they feel comfortable, bringing the care to them. The LVHN Street Medicine team serves as their primary source of care, providing medications, laboratory testing and examinations free of charge. To ensure a patient-centered focus, the team not only provides primary care but also helps arrange mental health services, assists their patients in attaining identification, signing up for Medicaid, applying for Social Security benefits, and helps them navigate the complex housing process. The team found that when their patient’s daily ambition is to find shelter and a meal, accessing basic health care is no longer a priority. Understanding this harsh reality, the Street Medicine team decided to bring health care to their patients. Clinics are held at eight designated sites in soup kitchen locations and homeless shelters on a scheduled rotation throughout the Lehigh Valley. Additionally, the clinical team treats patients under bridges and in the woods where many homeless have made makeshift shelters. The Street Medicine team also provides inpatient consultation at all LVHN hospital units and in the emergency departments. Inpatient consults serve to
initiate a relationship between the patient and the Street Medicine team facilitating follow-up and ensuring continuity of care. A basic foundation of trust is established at the patient’s bedside and is often the beginning of a relationship that lasts for years—often resulting in patient referrals to care for other homeless in the valley.

Furthermore, the Street Medicine team has developed a Respite Care site. The site serves as a transitional bed for homeless individuals to recuperate after a medical procedure or surgery once they are well enough to be discharged from the hospital but not yet strong enough to return to living on the street.

The patient-centered approach of the Street Medicine team has also brought other unintended consequences. Since 2015, improved access to health care has reduced emergency department (ED) visits 75% and admissions by 66%. Street Medicine data has demonstrated the provision of exceptional care by exceeding network clinical metrics for hypertensive management. Additionally, by using laptops in the field, the team has been able to get homeless patients insured; today, 74% have coverage. Importantly, the Street Medicine Program was chosen as the 2017 site for the International Street Medicine Symposium which was attended by over 500 representatives from 20 countries worldwide and 85 cities. Geneva, Switzerland was the 2016 site and Rotterdam, Holland is the 2018 site.

The volunteerism and willingness to help has become part of the LVHN culture of innovation. When the environmental engineering department learned that the unsheltered homeless are often exposed to wet and cold elements, they decided to find an innovative way to help them. They decided to take the sterile wrap used in the operating rooms to Allentown’s Dieruff High School’s Sewing Club. The students used the wrap to sew blue wrap ponchos, tents, backpacks and other items that the homeless might need. The Street Medicine team now distributes these when they do street rounds.
POPULATION HEALTH AT LVHN

BY LEHIGH VALLEY HEALTH NETWORK

“We will build on our foundation as a premier academic community health system and become an innovative population health leader that creates superior quality and value for the patients and communities we serve.”

BACKGROUND

Becoming a population health enterprise requires intentional strategies that begin with a Vision for how to execute on achieving population health. In 2012, Lehigh Valley Health Network (LVHN) created that vision—“We will build on our foundation as a premier academic community health system and become an innovative population health leader that creates superior quality and value for the patients and communities we serve.”

To accomplish this, there are key strategies a health system must accomplish that are based on producing value to the consumer. These are; 1) build the operational analytical infrastructure to produce predictive data analytics to direct clinical resources, 2) organize and direct the clinical assets needed based on the interpretation of the analytics, and 3) engage and educate the clinical workforce so that they can embrace the vision and philosophy of value-based care. We outline the steps LVHN took to begin the transition to population health.

BUILDING OPERATIONAL ANALYTICAL INFRASTRUCTURE

The first steps LVHN took was to create a company called Populytics. It is a population health management and advanced analytics company that integrates health plan management, clinical care delivery and advanced information technology and analytics to “make healthier happen.” Populytics’ population health analytics transforms raw claims and clinical data to provide insights into the health of a population. This yields actionable information—current and future, including identification of high-risk populations via risk stratification and predictive modeling, opportunities for cost reduction and gaps in care, and provider performance in comparison to national standards of care.

Populytics’ advanced technology platform, combined with informatics and analytics experts, collects, translates, and aggregates data into customized, dynamic, drillable dashboards.
It also exposes opportunities for physician clinical intervention modifications that may drive behavior change—all while bending the cost curve.

Populytics leads the analytics for LVHN’s population as well as for self-funded employers and businesses. For LVHN, Populytics supports value-based payer contracts through actionable analytics—leading analysis of attributed populations and making recommendations to clinical teams. Populytics also supports LVHN clinical departments to develop care pathways.

ORGANIZING AND DIRECTING CARE
Using the data produced by Populytics, clinical assets were organized to care manage high clinical and financial risk patients. Community Care Teams (CCT), were created. These teams include: a registered Nurse Care Manager, social services coordinator, behavioral health specialist, and a pharmacist. The team documents their encounters within our single universal electronic medical record—EPIC.

CCT’s are deployed to work collaboratively with primary care practices with high volumes of high risk patients to offer care management and care coordination. CCTs educate, coordinate and connect patients to additional health care and community resources in order to support their health improvement goals, achieve better health outcomes, and reduce avoidable costs.

CCT members use a registry that risk stratifies patients using established algorithms into high, medium, and low risk. They work with patients based on this predetermined risk stratification. Six clinical conditions were identified as having the highest opportunities based on care and cost variations in these high-risk patients.

We currently cover 120 clinical practices, provide high-risk care management to approximately 25,000 high risk unique patients, and had 90,000 patient encounters in one year. The goals for these high-risk patients included: improve patient self-management by providing education, reduce nonessential utilization of services, provide patients with direct point of contact while providing intensive care management, and improve adherence to health care goals. We also believe that by offloading non-patient facing tasks to central infrastructures enabled by EPIC, telephone and video technology we created an environment where our patient-facing clinical teams are able to focus on personalization and streamlining of the clinical encounter. This is consistent with the next generation of Patient Centered Medical Homes (PCMH).

The population health clinical infrastructure is supported by other existing infrastructure such as remote-patient monitoring units (ambulatory ICU-Like units) that monitor patients that are high risk and recently discharged from the hospital. A nurse monitors patient blood pressures, weights, and pulse oximetry daily and calls patients to ensure that they are doing well.

To care for our medium and low risk population, we adopted other initiatives including patient centered medical homes, patient engagement and activation through the patient portal, and new consumer relationship management software that proactively communicates with patients. Additionally, we created access for our consumers by opening express care and urgent care sites that can provide easy one-stop shopping within our primary service area.

EDUCATING AND ENGAGING THE CLINICAL WORKFORCE
Part of the key to success of population health strategies is the inclusion, engagement, and education of the clinical workforce. At the end of the day, it is the clinical workforce that provides patient care. Early in the process of adopting our vision, we invited our
clinical leaders to help inform the predictive analytical tools we created. Clinical leaders worked alongside of our analytical teams to provide the clinical intuition we needed to finalize the analytical tools, dashboards, and registries.

We also created curricula to provide the educational background our clinical leaders need to understand the importance and rationale for population health management. To date, over 160 clinical and operational leaders have attended these courses. We also created an e-learning educational module on the basics of population health that has been viewed by all LVHN employees.

Educating and engaging our clinical and administrative leaders in Population Health on the value of predictive data analytics to drive interventions has proven to be key for all of our value based initiatives. We have an eager audience to discuss quality initiatives, value-based payer contracts, and shared savings or risk based arrangements. A Population Health Executive Group has been created to oversee the population health strategy of the network and to ensure all clinical initiatives related to quality care are aligned. This is a decision-making group for the network on all things regarding Population Health. It is chaired by the Chief Insurance Officer and the Chief Transformation Officer both of whom report to the CEO and President of the Health System. The group consists of multi-disciplinary clinical and operational leaders who review the strategic and operational goals for Population Health.

**SUMMARY**

Health systems are embracing population health management to demonstrate and execute on value to consumers, providers, and payers. Their ability to design and implement strategies to execute on this strategy is predicated on how well they understand the value of predictive analytics, whether they can clinically operationalize the data, and how they engage and educate clinicians to help them embrace population health. This means that health systems have to show clinicians how to move beyond the traditional in-patient and out-patient quality metrics to population level metrics and demonstrate to them the value of achieving meaningful change for the population.

As an organization’s sphere of influence widens in a value-based environment, their cost/efficiency focus will need to shift from the traditional view, involving inpatient and physician-centric entities, to a population health view with a broader scope of the care continuum. Broad strategic thinking about the care patients receive after they leave the hospital’s four walls is required of health systems to ensure the right care in the right place, at lower costs and of better quality. This is part of the transformation journey.
COMMUNITY CARE NAVIGATOR

Community Care Navigator program trained selected paramedics as patient navigators who visit patient’s in their homes following discharge. These patients are at high risk for readmission due to heart failure.

This article was developed from an interview with Dr. Charles Barbera, MD, Chair, Department of Emergency Medicine, Reading Hospital.

The Community Care Navigator program, supported by Reading Hospital Foundation, trains selected paramedics as patient navigators to visit patients in their homes following discharge. These patients are often at high risk for readmission due to Congestive Heart Failure (CHF), Chronic Obstructive Pulmonary Disease (COPD), and other chronic conditions.

The program takes a practical approach by focusing on the ten most frequent patients that present to the Emergency Department on weekly or bi-weekly basis. A specially-trained paramedic is selected as a patient “buddy” to visit the home or residence of that patient and complete an on-site assessment of the patient’s condition in their home environment.

Several examples of patient situations that would require a community care navigator include:

A Congestive Heart Failure (CHF) patient with multiple readmissions had trouble managing her medications and...
understanding dietary guidance. The Community Care Navigator paramedics taught her how to read medication bottles and food labels and helped to schedule her doctor appointments, which reduced her readmissions. This same patient required a bed repair to sleep elevated to avoid fluid retention in the lungs. The program assisted this patient with the needed repair as well as coordinated donations of two electric lift chairs to other CHF patients that allowed them to avoid fluid retention and increased mobility.

A patient with obesity, diabetes, and Chronic Obstructive Pulmonary Disease (COPD) did not have access to regular and healthy nutrition. After intervention with a nutrition program and arranged food deliveries, there was a marked improvement along with a decrease in her hospitalizations.

Paramedics have assisted these high-risk patients by connecting them with local food banks and assisting them in their grocery shopping to purchase foods that would fit within their diet restrictions.

Reading Hospital also partners with EMS and paramedics on other important hospital initiatives and programs including the Warm Handoff Program and Teleneurology.

The Teleneurology program implemented the use of iPads funded by The Friends of Reading Hospital to assess stroke victims in ambulances while still en route to the hospital. This program connects patients to doctors in the Emergency Department (ED) for earlier diagnosis and faster treatment. The program started with ten ambulances and has expanded to 38, with the hopes of expanding to 85 in Berks County.

The Warm Handoff Program is also ED driven and provides a “warm handoff” for patients suffering from addition to place them directly into treatment after their emergency care. As a result of the program, 75 percent of overdose patients have voluntarily gone into treatment. Patients are taken directly from the ED to a rehab center instead of returning to their previous environment.

Without the support of EMS and paramedics, and the partnerships Reading Hospital has formed with them, programs such as Community Care Navigators as well as Warm Handoff and Teleneurology would not be possible. They are vital contributors to the success of these programs and are a crucial part of the patient’s healthcare team.
Lehigh Valley Health Network recently opened the Air Products Connected Care and Innovation Center at its corporate headquarters in downtown Allentown, Pennsylvania at One City Center. As a result, new connected care programs and innovative ideas are being generated, created, beta-tested, implemented, and scaled across the network of 8 hospitals in the region. Some examples of the connected care services now available include: LVHN Video Visits 24/7/365, The LVHN BabyCam, Remote Home Monitoring, TeleNeurology.

LVHN VIDEO VISITS 24/7/365

The MyLVHN Video Visit service provides virtual primary care for ten low-acuity conditions to the community through any mobile device that has video camera capability. The program differs from others in that all video visits are done by a local LVHN provider with the full electronic medical record of the patient available through EPIC during the visit. New patients are added to the EPIC record and their visit note is made available to the patient immediately after their visit. Additionally, a note is sent to the patient’s primary care physician to alert them that their patient has been seen. Patients that have used the service are extremely satisfied with the convenience and easy access to healthcare with a local provider.

THE LVHN BABYCAM

BabyCam is a camera device that is set-up for babies in the Neonatal Intensive Care Unit. This provides the parents and their families visual access to their baby anytime they want. With permission from their Moms, babies can be seen 24/7/365 from anywhere in the world. Thus far, this service has been used by people in 47 states and 104 countries.

REMOTE HOME MONITORING

Remote Home Monitoring is a digital ambulatory service that is provided to high risk patients after they are discharged from the hospital to ensure that they continue to improve, to provide seamless coordination across the care setting, and to assure patients and their families that an LVHN provider is available to them during this fragile time. Bluetooth devices are set up in the home for the patient and their caregivers. Key vitals are monitored remotely by a nurse who documents these in the medical record. The nurse will call the home and send a nurse or provider if changes occur that may need more attention.
TELENEUROLOGY
TeleNeurology is a virtual consultative service being provided to other hospitals and physician offices for patients that need to see a neurologist. The TeleNeurology team consists of a dedicated physician and care team that work virtually using two-way cameras and medical equipment in concert with other healthcare team members at the primary location. The digital equipment includes a stethoscope, otoscope, and electrocardiogram capabilities that allows the Telenurologists to do a routine neurological exam remotely while instructing the patient and nurse as needed. The exam is documented in the electronic medical record, EPIC, and made available to the patient and the hospital or physician office. Follow-up examinations can be arranged to be done in person or by continued virtual exams.
ATLANTIC HEALTH ADVANCEMENTS (AHA!) PROGRAM

BY ATLANTIC HEALTH

In November of 2017, Atlantic Health System launched their innovation program—Atlantic Health Advancements or “AHa!”. The program serves as an idea incubator for Atlantic Health System’s team of over 16,000 employees and 3,700 physicians. The goal is to generate ideas that will enhance care delivery and improve clinical outcomes.

In response to the rapidly changing landscape of healthcare, the AHS senior leadership team realized they needed to engage all team members to find solutions to common care delivery problems that result in more efficient, safe care and an overall better patient experience. By supporting the ideas that are generated by staff, it allows the health system to encourage creativity, celebrate collaboration and the development of innovations that sustain best practice. The AHa! program provides not only financial support to the front-line inventors, but also access to engineering and prototyping specialists along with many other business processes needed to convert ideas into products, all in an accessible streamlined system.

Each staff idea is submitted online via the health system’s intranet and is critically assessed for alignment with the health system strategic plan, feasibility of execution, size of potential market and competitive advantage. All ideas submitted are considered by a diverse panel of experts comprised of experts from Atlantic Health System, universities, government labs, and private enterprises. The Aha! program understands that innovation does not always happen in a lab or in a center, it happens where healthcare professionals, faced with daily challenges, can feel empowered to develop real-life solutions.

THE ISSI BOX

One example of a successful idea developed by the everyday clinical team is the ISSI (pronounced “IZZY”) box. The problem it solved is the significant waste in insulin vials—small vials that can get “lost” anywhere—nurses pockets, left on a cart, or misplaced in a patient’s room. These small little vials represented over $100,000 in product waste each year, not to mention the pharmacists’ time spent on refilling the same item repeatedly when not necessary.
Enter two pharmacists, a pharmacy tech and a nurse who went on a hunt for waste that they saw every day. When they collected 186 vials over the course of three days, they knew they were on to something. In a brainstorming session, someone mentioned it would be great if all insulin vials had a block of wood attached to them so you would not misplace them, and the Aha! moment was born. The ingenious insulin box has specific placement sections for each of the different types of insulins, and then access ports so you never need to remove the vials from the box. Today, each nurse receives a new box at the start of each shift, clearly labeled, and more easily tracked by the pharmacy staff.

For nurses who use this device every day for their patients, it is a daily reminder that at the Atlantic Health System, innovation starts with everyone.
AllSpire Health Partners is a consortium of five health systems that leverages its combined strength and clinical expertise to drive clinical excellence, improve affordability and enhance economic sustainability for the member health systems. Our hospitals and medical centers have been honored with numerous awards and are recognized throughout the region for their leadership.

The following member core statistics highlight key metrics of AllSpire’s combined resources.

**SCALE + CAPACITY**

- 9,539 Licensed Acute Beds
- 427,786 Annual Patient Admissions
- 1,658,252 Annual Emergency Visits
- 35 Acute Care Hospitals
- 363 Hospital ORs
- 78 ASC ORs
- 1,231 Skilled Nursing Facility Beds

**POPULATION SERVED**

- 30 Counties Served
- 1,010,736 ACO Covered Lives & Fully Insured Lives
- 14,101,031 Total Service Area Population

**TALENT POOL**

- 13,139 Physicians on Staff
- 2,156 Employed Specialists
- 50,984 Employed Clinicians
- *Non-physician
- 1,952 Employed PCPs
- 84,724 Total Employees

**ECONOMICS ANNUAL TOTAL**

- $14.9B Enterprise Revenue
- $2.9B Supply Chain Purchasing Volume
- $7.1B Employee Salary, Wages & Benefits

**Internship Program**

- 16,000
- 14,000
- 12,000
- 10,000
- 8,000
- 6,000
- 4,000
- 2,000
- 0

2016 2017

Enterprises Revenue

Progress bars show:

- 29% increase in Enterprise Revenue

- 26% increase in Supply Chain Purchasing Volume

- 17% increase in Employee Salary, Wages & Benefits
ALLSPIRE LEADERSHIP

Paul J. Tirjan
President and CEO | AllSpire Health Partners

Paul J. Tirjan, a seasoned and accomplished health care executive and entrepreneur, is president of AllSpire Health Partners and provides strategic leadership, start-up expertise and operational project oversight.

Prior to joining AllSpire Health Partners in August 2016, Tirjan served three years as vice president of ambulatory care at Universal Health Services, Inc. (UHS), a Fortune 500 health services company located in King of Prussia, Pa. In his position at UHS, Tirjan was responsible for the overall ambulatory care strategy, development, growth and profitability for the hospital management company. UHS’ ambulatory portfolio under Tirjan’s direction included free-standing emergency departments, urgent care centers, ambulatory surgery centers, imaging centers, radiation oncology, rehabilitation, wound care, retail pharmacy, home health, and telemedicine, as well as data, technology, infrastructure and programs to support population health management.

Brian A. Gragnolati
President and CEO | Atlantic Health System

Brian A. Gragnolati is president and CEO of Atlantic Health System. Prior to joining Atlantic Health System in May 2015, Gragnolati served as Senior Vice President, Community Division of Johns Hopkins Medicine (JHM). He was operationally responsible for three owned/two affiliated hospitals, eight ambulatory and surgery center sites and community physician integration. He was successful in further developing the JHM Integrated Delivery and Financing System by expanding owned insurance product offerings, growing the geographic footprint and developing new models of clinical and financial integration. He also served as President and CEO of Suburban Hospital, a member of JHM where he was recognized by the Jackson Organization as a top performing hospital for overall employee satisfaction. He led the full asset merger in JHM securing Suburban’s continued ability to provide access to high quality, affordable health care services in a complex and evolving market. Key, long-term relationships were developed by Gragnolati with National Institutes of Health, Kaiser and Highmark.

Robert C. Garrett, FACHE
Co-CEO | Hackensack Meridian Health Network

Robert C. Garrett, a nationally-renowned healthcare leader and sought-after industry expert, is the co-CEO of Hackensack Meridian Health Network, one of the largest, most comprehensive health networks in New Jersey.

Mr. Garrett began his time with Hackensack University Medical Center in 1981 as a resident, and served as president and CEO of the Hackensack University Health Network from November 2009 through July 2016, at which time he assumed his current position as co-CEO of Hackensack Meridian Health. In the face of healthcare reform, Mr. Garrett optimally positioned HackensackUHN and HackensackUMC for success through a series of acquisitions, mergers, partnerships and affiliations.

John K. Lloyd, FACHE
Co-CEO | Hackensack Meridian Health Network

John K. Lloyd, FACHE, a nationally-recognized health care innovator, is the co-CEO of Hackensack Meridian Health Network, one of the largest, most comprehensive health networks in New Jersey.

Prior to his current position as co-CEO, John served as president and CEO of Meridian Health, a $1.8 billion, New Jersey-based, not-for-profit integrated health system, encompassing Jersey Shore University Medical Center, K. Hovnanian Children’s Hospital, Ocean Medical Center, Riverview Medical Center, Southern Ocean Medical Center, Bayshore Community Hospital, Raritan Bay Medical Center—Old Bridge, Raritan Bay Medical Center—Perth Amboy, and Meridian Partner Companies, which include home health services, skilled nursing, inpatient and outpatient rehabilitation facilities, fitness and wellness centers, ambulance services, physician practice management and support services, urgent care facilities, and ambulatory care and services located throughout central New Jersey.
Clinton Matthews
President and CEO | Tower Health

Clint Matthews is president and chief executive officer of Reading Health System. Since taking on this role in June 2010, Mr. Matthews has overseen the implementation of a system-wide electronic medical records implementation, a new system branding and advertising campaign and the oversight of a Clinically Integrated Physician Network (CIPO), as well as the approval and start of construction for $354 million in perioperative services and an inpatient bed tower.

Previously as a managing director with FTI Healthcare, Mr. Matthews was responsible for the assessment of and/or improvements for FTI Healthcare clients nationwide, with expertise in leading executive management teams, performance improvement, organizational redesign, operations management and strategic planning. With a focus on organizational and leadership development, as well as financial, operational and quality improvement, Mr. Matthews assisted health systems and hospitals with financial recovery, improvements in quality outcomes, physician alignment, and patient satisfaction.

Brian A. Nester, DO, MBA, FACOEP
President and CEO | Lehigh Valley Health Network

Brian Nester, DO, became president and CEO of Lehigh Valley Health Network (LVHN) on July 1, 2014. LVHN is a comprehensive, integrated health network that includes three full-service licensed hospitals with five campuses, a children’s hospital, an employed physician group with nearly 1,000 members, and 11 outpatient health centers. LVHN is its region’s largest employer, with more than 13,000 employees.

Dr. Nester had been the chief strategy officer (CSO) at LVHN since 2011. In that role he aligned LVHN’s business development assets with evolving population health management competencies and insurance sophistication in the creation of new partnerships and structures that will facilitate LVHN’s transformation into an accountable care organization.

Kevin H. Mosser, MD
President and Chief Executive Officer | WellSpan Health

Dr. Kevin Mosser has been associated with WellSpan Health for more than 30 years, assuming the position of president and chief executive officer in October 2013. A board-certified family physician, he has served the community as a practitioner and in leadership roles that span the entire health system, including WellSpan’s medical group, hospitals, medical education programs and preferred provider organization.

As executive vice president and chief operating officer, Dr. Mosser provided senior executive oversight to WellSpan York Hospital, WellSpan Gettysburg Hospital, the WellSpan Medical Group, WellSpan Specialty Services and system-wide clinical programs. He has focused on performance improvement and enhancing integration and care coordination across WellSpan’s continuum of care.
EXECUTIVE COMMITTEE

Brian Gragnolati
CEO, Atlantic Health System

Robert Garrett
CO-CEO, Hackensack Meridian Health

John Lloyd
CO-CEO, Hackensack Meridian Health

Brian Nester, DO
CEO, Lehigh Valley Health Network

Clint Matthews
CEO, Tower Health

Kevin Mosser, MD
CEO, WellSpan Health

DEVELOPMENT COMMITTEE

Atlantic Health System
Kevin Lenahan
VP, Finance and Chief Finance Officer

Tower Health System
Daniel Ahern
EVP, Strategy and Business Development

Joe Wilkins
SVP, Chief Transformation Officer

Gregory Sorensen, MD
EVP & Chief Medical Officer

Hackensack Meridian Health
Jim Blazar
EVP and Chief Strategy Officer

WellSpan Health
Ann Gavzy
EVP and General Counsel Health Network

Charles Chodroff, MD
Chief Clinical and Population Health Officer

Edward Dougherty
SVP and Chief Business Development Officer

Michael O’Connor
SVP and Chief Finance Officer

Debbie Salas-Lopez, MD
Chief Transformation Officer

Lehigh Valley Health Network

INNOVATION JOURNAL 2018

SHARING STRENGTHS FOR BETTER HEALTH

ALLSPIRE HEALTH PARTNERS
INTRODUCTION
Atlantic Health System is on the forefront of medicine, setting standards for quality health care in New Jersey, Pennsylvania and the New York metropolitan area. With over 14,000 employees, the system includes 6 hospitals: Morristown Medical Center in Morristown, NJ; Overlook Medical Center in Summit, NJ; Newton Medical Center in Newton, NJ; Chilton Medical Center in Pompton Plains, NJ; Hackettstown Medical Center in Hackettstown, NJ; and Goryeb Children’s Hospital in Morristown, NJ. The system also includes a rehabilitation center, home care and hospice and the Atlantic Medical Group, a network of more than 600 community-based health care providers.

Atlantic Health System, headquartered in Morristown, New Jersey and one of the leading non-profit health care systems in the state, is committed to creating a Trusted Network of Caring®. Our promise to our communities is that all who enter our system receive the highest quality care delivered at the right time, at the right place, and at the right cost.

OUR HOSPITAL
Featuring state-of-the-art equipment and comfortable, family-friendly environments, our world-class hospitals are on the forefront of medicine and continually set standards for quality health care in the New Jersey and the New York metropolitan area:

Award-Winning Care
Our programs, including pediatrics, orthopedics, cancer care, rehabilitation medicine, women’s health, cardiovascular care and neuroscience, are consistently lauded for their excellence by physicians and patients alike.

AFFILIATIONS AND PARTNERSHIPS
Atlantic Health System has medical school affiliation with the Sidney Kimmel Medical College at Thomas Jefferson University, and is the official health care partner of the New York Jets.

ATLANTIC HEALTH SYSTEM AWARDS & RECOGNITION
Atlantic Health System’s hospitals, programs and services have received prestigious recognition and certifications, including:

- “100 Best Companies to Work For®”: Fortune Magazine
- 150 Great Places to Work in Healthcare | 2017: Becker’s Healthcare
- Atlantic Accountable Care Organization (ACO)—“100 Accountable Care Organizations to Know”: Becker’s Hospital Review
- Atlantic Health System’s Stroke Centers—Gold Seal of Approval for Primary Stroke Centers: The Joint Commission
- Atlantic Home Care and Hospice—Accreditation: The Joint Commission
- Atlantic Rehabilitation—“Best Nursing Home” with five-star rating: U.S. News & World Report
- Best Workplaces in New York—Great Place to Work® and FORTUNE® magazine
- Bronze Award—March for Babies: March of Dimes
- CEO Cancer Gold Standard™ accreditation for commitment to the health of employees and their families: CEO Round Table on Cancer

www.atlantichealth.org
Ernest Amory Codman Award Finalist: The Joint Commission

Gold-Level "Well Workplace": Wellness Council of America (WELCOA)

Morristown Medical Center — Best Hospital in two specialties — cardiology & heart surgery and orthopedics: U.S. News & World Report;

Official Health Care Partner of the New York Jets

Official Health Partner of Cybex and the Cybex Research Institute

One of the 20 Best Workplaces in Health Care: Great Place to Work® and FORTUNE® magazine

Overlook Medical Center — Best Regional Hospital, high performing in four types of care — neurology & neurosurgery, colon cancer surgery, diabetes & endocrinology, and heart failure: U.S. News & World Report

Security 500: Security magazine

Super User Award: University HealthSystem Consortium

Surgery, Internal Medicine and Family Medicine Residency Programs Accreditation: Accreditation Council for Graduate Medical Education

Top Doctors: New Jersey Monthly

Top Doctors: Castle Connolly Medical Ltd.

WebAward for Outstanding Achievement in Web Development: Web Marketing Association
INTRODUCTION

Hackensack Meridian Health is a leading not-for-profit health care organization that is the most comprehensive and truly integrated health care network in New Jersey, offering a complete range of medical services, innovative research and life-enhancing care. With over 28,000 team members and more than 6,000 physicians, the system includes 13 hospitals, more than 200 ambulatory care centers, fitness and wellness centers, home health services, rehab centers, and skilled nursing centers spanning from Bergen to Atlantic counties.

HACKENSACK MERIDIAN HEALTH: USHERING IN A NEW ERA OF HEALTH CARE

Hackensack Meridian Health combines the excellence and innovation of academic medical centers with the convenience and compassion of community-based care and services. The network consists of 13 hospitals, including two academic medical centers, two children’s hospitals, nine acute care hospitals, physician practices, more than 120 ambulatory care centers, surgery centers, home health services, long-term care and assisted living communities, ambulance services, lifesaving air medical transportation, fitness and wellness centers, rehabilitation centers and urgent care and after-hours centers.

Hackensack Meridian Health also trains tomorrow’s doctors and allied health professionals and conducts significant research that results in new ways of preventing and treating disease. High on the list of milestones will be the opening of the only private school of medicine in New Jersey, in conjunction with Seton Hall University, to further punctuate Hackensack Meridian Health’s focus on academic excellence. The partnership will also include nursing and allied health sciences.

By combining and sharing resources and identifying efficiencies, Hackensack Meridian Health is providing patients the highest quality care at the most appropriate cost, meeting the needs of the larger communities it serves and enhances its ability to be innovative in the delivery of care.

EDUCATING THE NEXT GENERATION OF PHYSICIANS

A strategic mission of Hackensack Meridian Health is to develop into a major academic center. Hackensack Meridian Health and Seton Hall University are in a unique position to partner in the development of an innovative New Jersey-based health education program to address the upcoming physician shortage. This is why they are moving forward to establish a new, four-year school of medicine. Both organizations believe their academic reputations, combined with clinical expertise, will create an opportunity to form New Jersey’s first private school of medicine that will no doubt become one of the premier schools in the nation. The new school will be located on the campus of the former Hoffmann-La Roche Inc. in Nutley and Clifton, NJ. The 25-year-lease of the campus began in early October 2016.

The proposed school of medicine would be dedicated to achieving the following goals: educational excellence; cutting-edge research; highest-quality clinical care; meaningful integration; and the advancement of New Jersey medical and
health sciences educational imperatives. Seton Hall University will bring its College of Nursing and its School of Health and Medical Sciences, which includes its Physician Assistant Program, Athletic Training, Occupational Therapy, Physical Therapy, Speech and Language Pathology, Masters in Health Administration and a Ph.D. in Health Sciences (research) to this new health sciences campus. This will create an opportunity to integrate the education and training of these multiple disciplines into a single classroom setting – a truly innovative approach that will mirror how health care will be delivered in the future.

The new school of medicine will bring together the best of both worlds: a state-of-the-art, one-of-a-kind campus, coupled with Hackensack Meridian Health’s flourishing research partnership with Georgetown University. This will create a world-class network of academic, research and clinical expertise to educate the next generation of physicians. Students will be trained within New Jersey on Hackensack Meridian Health campuses, and retention programs will be developed to embed the physicians within the Network.

The development of a differentially trained and oriented physician workforce by two leading institutions will deliver a very nationally competitive health science complex to the state of New Jersey. Early last year, Bonita Stanton, M.D., a nationally recognized expert on pediatric medicine, was also welcomed as the founding dean of the Seton Hall – Hackensack Meridian School of Medicine.

Seton Hall – Hackensack Meridian School of Medicine will be governed by a Board of Trustees with equal representation by Seton Hall University and Hackensack Meridian Health in terms of the voting power and number and types of individuals appointed by, and with representation meeting the requirements of the Liaison Committee on Medical Education. The medical school Board of Trustees will be responsible for overseeing and making recommendations regarding the strategies, policies and finances of the medical school.

PAVING THE WAY FOR INNOVATION IN NEW JERSEY

In February, the New Jersey Innovation Institute (NJII), a New Jersey Institute of Technology (NJIT) corporation, announced that Hackensack University Medical Center became the only health care Charter Member of NJII and a partner in its Healthcare Delivery Systems Innovation Lab (iLab).

NJII applies the intellectual and technological resources of the state’s science and technology university to challenges identified by industry partners. Through its iLabs, NJII brings NJIT expertise to key economic sectors, including health care delivery systems, bio-pharmaceutical production, civil infrastructure, defense and homeland security and financial services.

Through this partnership, we are committed to developing novel ideas which promote open innovation and the use of tools and processes that encourage creative thinking. Through iLabs, we will be able to combine our collective resources to make meaningful advances in care.

Hackensack University Medical Center has been focused on research and innovation for many years. In 2014, the teaching hospital had more than 700 active/open studies offering more than 1,000 patients new options in care. Partnering with the New Jersey Innovation Institute is a natural fit for the two organizations.

NJII has a business unit of university executives from various departments and disciplines expressly created to familiarize our industry partners with university assets and programs. They also harness the ability to set up and run Hackensack-specific ideation platforms with their portfolio of health care cluster incubator companies to develop and pursue innovative program opportunities. NJII will mobilize NJIT’s intellectual, capital, and research resources to meet the specific R&D needs of Hackensack University Medical Center.
MISSION
We heal, comfort and care for the people of our community by providing advanced and compassionate health care of superior quality and value supported by education and clinical research.

At Lehigh Valley Health Network, we continually go the extra mile to fulfill our mission to heal, comfort and care for the people of our community. Each one of our more than 17,000 colleagues contributes to this mission and helps make the Lehigh Valley a healthier—and better—place in which to live.

INTRODUCTION
Lehigh Valley Health Network includes eight hospital campuses—three in Allentown including the region’s only facility dedicated to orthopedic surgery, one in Bethlehem, one in Hazleton, two in Pottsville, and one in East Stroudsburg. The health network also includes numerous community health centers and clinics, retail health clinics, and home health and hospice services, with a team of more than 15,000 staff members, more than 1,200 medical staff members and more than 650 employed physicians and advanced practice clinicians.

Our tagline—A Passion for Better Medicine—reflects a legacy of patient-centered care that began with 13 compassionate, civic-minded women more than a century ago. Caring deeply about the health and well-being of their community, they raised $5,300 for a plot of land at 17th and Chew streets in Allentown, PA., and in 1899, opened The Allentown Hospital. Their generous example was the first step in our health network’s journey.

In the late 1950s, with the area’s population booming, a group of Lutheran clergy purchased a 102-acre alfalfa field in Bethlehem and set out to build another hospital for the community. Muhlenberg Hospital Center opened its doors in 1961 as a 192-bed facility for the chronically ill.

The inspiration for our modern-day health network came from Leonard Parker Pool, the founder of Air Products. In addition to having a brilliant mind for business, Pool also had a passion for health care and serving his fellow man. In the late 1960s, that passion became personal.

Guided by Pool’s vision, we have since transformed into one of the nation’s most respected health networks, offering comprehensive care in 95 clinical specialties. This care is complemented by clinical research and education, including a medical school partnership with the University of South Florida Morsani College of Medicine that’s preparing the doctors of tomorrow.

In January 2014, we merged with the Greater Hazleton Health Alliance to give residents of Northeast Pennsylvania enhanced access to special...
care. Its hospital, Hazleton General Hospital, was established in 1891 to provide medical care to coal miners of the region.

We continue to add new facilities, services and programs to a regional campus that now includes:

- Three full-service hospitals: Lehigh Valley Hospital-Cedar Crest in Salisbury Township, which includes an additional clinical campus, Lehigh Valley Hospital-17th Street in Allentown; Lehigh Valley Hospital-Muhlenberg in Bethlehem; and Lehigh Valley Hospital-Hazleton in Luzerne County
- Lehigh Valley Children’s Hospital, the only Children’s Hospital in the Lehigh Valley, including inpatient and ambulatory care, a Children’s ER, more than 25 pediatric specialists and numerous child-specific services such as rehab and burn care
- Community health centers offering doctors’ offices and lab and imaging services at convenient locations in Bangor, Bath, Bethlehem Township, Emmaus, Hamburg, Hazleton, Kutztown, Macungie, Moselem Springs, Quakertown, Trexlertown and Upper Bucks (in partnership with Grand View Hospital)
- More than 1,340 primary care and specialty physicians—including more than 630 employed by the health network
- Pharmacy services at three of our hospital campuses
- Imaging services to obtain accurate diagnoses with the latest high-tech diagnostic equipment
- Home health and hospice services
- Community clinics, including 40 primary and specialty clinics to care for people who are uninsured or underinsured
- Health Network Laboratories, providing laboratory tests from the most critical medical applications to simple pre-employment drug screenings

- Valley Preferred, linking employers and individuals with quality health coverage

The care and services we provide annually receive national recognition through awards and accreditation from organizations such as U.S. News & World Report, Centers for Medicare and Medicaid, National Cancer Institute Community Cancer Centers Program (NCCCP) and many others.

Wherever our health network’s journey takes us in the years to come, you can be sure we will carry forth the passion our founders, as well as their enduring vision: to provide the people of the Lehigh Valley with the best possible health care—right in their ownw
ABOUT TOWER HEALTH

Tower Health brings together more than 11,000 dedicated team members, 2,000 nationally recognized physicians, specialists and providers across 65 convenient locations. Our collaborative clinical excellence is leading the healthcare transformation—which means our communities have expanded access to advanced, comprehensive care by renowned physicians, when and where they need it.

Here, we know that advancing the quality of care will transform the quality of life.

Tower Health is a strong, regional, integrated healthcare provider/payer system that offers leading-edge, compassionate healthcare and wellness services to a population of 2.5 million people. Tower Health includes Reading Hospital, a teaching hospital based in West Reading; Brandywine Hospital in Coatesville; Chestnut Hill Hospital, a teaching hospital in Philadelphia; Jennersville Regional Hospital in West Grove; Phoenixville Hospital in Phoenixville; and Pottstown Memorial Medical Center in Pottstown.

We also operate Reading Hospital Rehabilitation at Wyomissing and Reading Hospital School of Health Sciences, and we have a comprehensive physician network. All of our facilities participate in our partnership with the UPMC Health Plan.

Together, our six hospitals and other entities provide a full range of medical care—from prevention, screenings and education; to the latest clinical services and surgeries available; to rehabilitation. We also offer wellness programs and public health services that ensure our communities are the healthiest they can be. Our caring, highly trained physicians and staff are committed to patient safety and patient satisfaction.

Our hospitals have received national recognition for advanced care in areas such as neurosurgery and stroke, cardiac and vascular surgery, trauma, hematology and oncology. Reading HealthPlex, which opened at Reading Hospital in October 2016, combines state-of-the-art technology and world-class design to make the HealthPlex one of the most sophisticated surgical centers and inpatient facilities in the region.

Collaboration across Tower Health enables our hospitals, providers, leadership and staff to leverage best practices across the health system. Our patients benefit from access to a broad range of services—all right here in our region.

At Tower Health, we have a rich history of providing high-quality, cost-effective care in the communities we serve. As the healthcare industry continues to change, one thing remains steadfast: Tower Health’s commitment to Advancing Health, Transforming Lives.
INTRODUCTION
WellSpan Health is a non-profit health care system located throughout south central Pennsylvania and northern Maryland. The system includes six hospitals, WellSpan Ephrata Community Hospital, WellSpan Gettysburg Hospital, WellSpan Good Samaritan Hospital, WellSpan Surgery & Rehabilitation Hospital, WellSpan York Hospital and WellSpan Philhaven. WellSpan has over 15,000 team members, 35 outpatient health care locations, a regional home care organization and partnerships with Hanover Hospital, Hospice and Community Care. Additionally, the WellSpan Medical Group includes more than 1200 providers in over 130 locations.

Every day across central Pennsylvania, the people of WellSpan Health work together to support this non-profit mission of service—one patient, one community, one unique health care need at a time. We also collaborate with community leaders, area residents and other health care providers to make sure that inpatient, outpatient, home health and physician services are located where they can do the most good for our neighbors.

Focusing on the health of the community has inspired us to transform the way we work. We make it as simple as possible for individuals to develop a relationship with our health system and to become healthy and stay that way. Each patient’s information is available to providers at any WellSpan location through our sophisticated electronic health record, and their care is coordinated by teams of physicians, health coaches, social workers and other professionals. This is, we believe, the best way to improve health across our growing, diverse region.

OUR MISSION:
Working as one to improve health through exceptional care for all, lifelong wellness and healthy communities.

WELLSPAN AT A GLANCE:
• A valuable community resource that provides more than $165 million each year in charitable, uncompensated care.
• More than 15,000 employees
• Highly skilled primary care and specialty physicians and advanced practice clinicians, including more than 1,200 members of the WellSpan Medical Group
• More than 140 patient care locations that offer services such as diagnostic imaging, laboratory, rehabilitation, primary care, retail pharmacy, walk-in health care, durable medical equipment and other essential services
• A regional home care organization: WellSpan VNA Home Care
• Six respected hospitals: WellSpan Ephrata Community Hospital, WellSpan Gettysburg Hospital, WellSpan Good Samaritan Hospital, WellSpan Surgery & Rehabilitation Hospital, WellSpan York Hospital and WellSpan Philhaven.
• Regional referral services in heart and vascular care, oncology, women and children services, orthopedics and spine care, neurosciences and behavioral health

www.wellspan.org
• The region’s only accredited Level 1 Regional Resource Trauma Center and Comprehensive Stroke Center with an endovascular neurosurgery program.

• Partnerships with respected organizations, including Hanover Hospital, Summit Health and Hospice & Community Care (formerly Hospice of Lancaster County), as well as hundreds of private-practice community physicians.

AWARDS & RECOGNITIONS
At WellSpan Health, we believe that our communities deserve care that is safe, timely, efficient, equitable, effective and patient-centered. That’s why our team of more than 15,000 employees strives to deliver this caliber of care and enhance the quality of living across central Pennsylvania and northern Maryland. We are gratified that others have recognized our efforts and are sincerely humbled by many awards and accolades, including consistent recognition as one of the Top 100 Integrated Health Systems in the United States, as well as one of the nation’s “Top 25 Connected Healthcare Facilities” by Health Imaging and IT magazine.

TOP 100 INTEGRATED HEALTHCARE NETWORK
WellSpan has been named a Top 100 Integrated Healthcare Network by IMS, a health care data and consulting company, for six consecutive years. Researchers determine the rankings by compiling a system’s overall score measuring 33 attributes in eight differently weighed performance categories. Overall integration is the most heavily weighed. Other categories include integrated technology, financial stability, hospital utilization, contract capabilities, services and access, outpatient utilization and physician services.

H&HN’S HEALTH CARE’S MOST WIRED
WellSpan Health has been named one of “Health Care’s Most Wired” by Hospitals and Health Networks (H&HN) magazine, highlighting WellSpan’s commitment to enhancing patient care through the effective use of information technology. H&HN’s 18th Annual Health Care’s Most Wired list names select hospitals and health systems based on its Most Wired Survey, which is viewed as a benchmarking study and a leading industry barometer measuring information technology (IT) use and adoption among hospitals nationwide.

TOP 25 CONNECTED HEALTHCARE FACILITIES
WellSpan has been named among the Top 25 Most Connected Healthcare Facilities by Health Imaging and IT magazine on six occasions. The award recognizes true innovators in imaging and informatics. Designated facilities demonstrate their ability to leverage data to inform decisions and to drive targeted improvements in patient care, quality and efficiency.

TRAINING MAGAZINE’S TOP 125
WellSpan has a long history of being committed to education and training. Training Magazine’s Top 125 ranks organizations based on statistics such as total training budget; percentage of payroll dedicated to training; number of training hours per employee program; goals, evaluation, measurement and workplace surveys; hours of training per employee annually; and detailed formal programs.

LEADERSHIP YORK BUSINESS OF THE YEAR
Leadership York named WellSpan its 2011 Business of the Year. Leadership York cited WellSpan’s desire to create healthier communities, partnerships, educational programs and its mission to provide for those who have no insurance or are unable to pay for their health care.

VHA LEADERSHIP AWARDS
Over the years, WellSpan has earned five VHA Leadership Awards in the areas of Community Health, Operational Performance, Clinical Excellence, Dental Access and Management of Diagnostic Tests.
CERTIFIED COMPREHENSIVE STROKE CENTER
WellSpan York Hospital has been certified as a Comprehensive Stroke Center by The Joint Commission, meaning that the hospital has met standards for treating the most complex stroke cases and is ready 24/7 to deliver advance stroke care to patients. WellSpan York Hospital is the only WellSpan facility in York, Adams, Lancaster and Lebanon counties with neuroendovascular surgery capabilities and to have earned Comprehensive Stroke Center certification, making it the regional referral center for stroke care.