

PARTNERS IN THE PURSUIT OF HEALTH

Health Sciences South Carolina

ANNUAL REPORT 2012



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FROM THE PRESIDENT AND CEO



What benefit is energy without direction; what can intelligence offer, without empathy? It is in concert that all great goals are accomplished, and Health Sciences South Carolina (HSSC) is proud to look back upon the past year and recount the achievements made possible through the teamwork of our members, affiliates and communities.

In our eighth year, our founding principal of collaboration has yielded impressive results: Among them, a Clinical Data Warehouse (CDW), the Research Permissions Management System (RPMS) pilot program and statewide advances in hospital perioperative practices – each project proves that population health advances are possible when cooperation replaces competition. This annual report features an in-depth view of these projects and other vital advances championed by our partners and affiliates. Our shared intelligence and passion for better health have set South Carolina on the course to become a state that does not merely react to the growing national health conversation, but a state that stands at the vanguard of proactive, practical health innovations.

HSSC is also proud to announce the appointment, after an extensive nationwide search, of the new Chief Medical Officer for our organization, Christine B. Turley, M.D., formerly of the University of Texas. Dr. Turley will provide clinical leadership to HSSC, helping to ensure that HSSC remains an innovator in the field of health research. Dr. Turley's role includes serving as a catalyst for collaboration and the advancement of new healthcare initiatives with HSSC member hospitals and universities.

While each player and accomplishment is impressive, they gain increased importance viewed in the context of our driving purpose: the "triple aim:" population health, cost reduction and patient experience. The triple aim drives the development of each piece of technology, motivates each study and is the target of our collective work to create improved population health, improved patient experience and reduced healthcare costs.

We are all acutely aware of the changing face of American healthcare. Our consistent pursuit of our strategic goals will be steadfast as we work for the good of South Carolina's residents. Thank you for your commitment and partnership in that pursuit.

Jay Moskowitz, Ph.D.

President and CEO, Health Sciences South Carolina

FROM THE CHAIRMAN OF THE BOARD



It has been my honor to serve the members and affiliates of Health Sciences South Carolina as Chair of the Board of Directors and to see the progress made this year as we worked together in the spirit of collaboration to improve health for the people of South Carolina. With continued support and passion from our board of directors, affiliates and stakeholders, HSSC has been able to thrive this year—reaching

major milestones and accomplishing positive results.

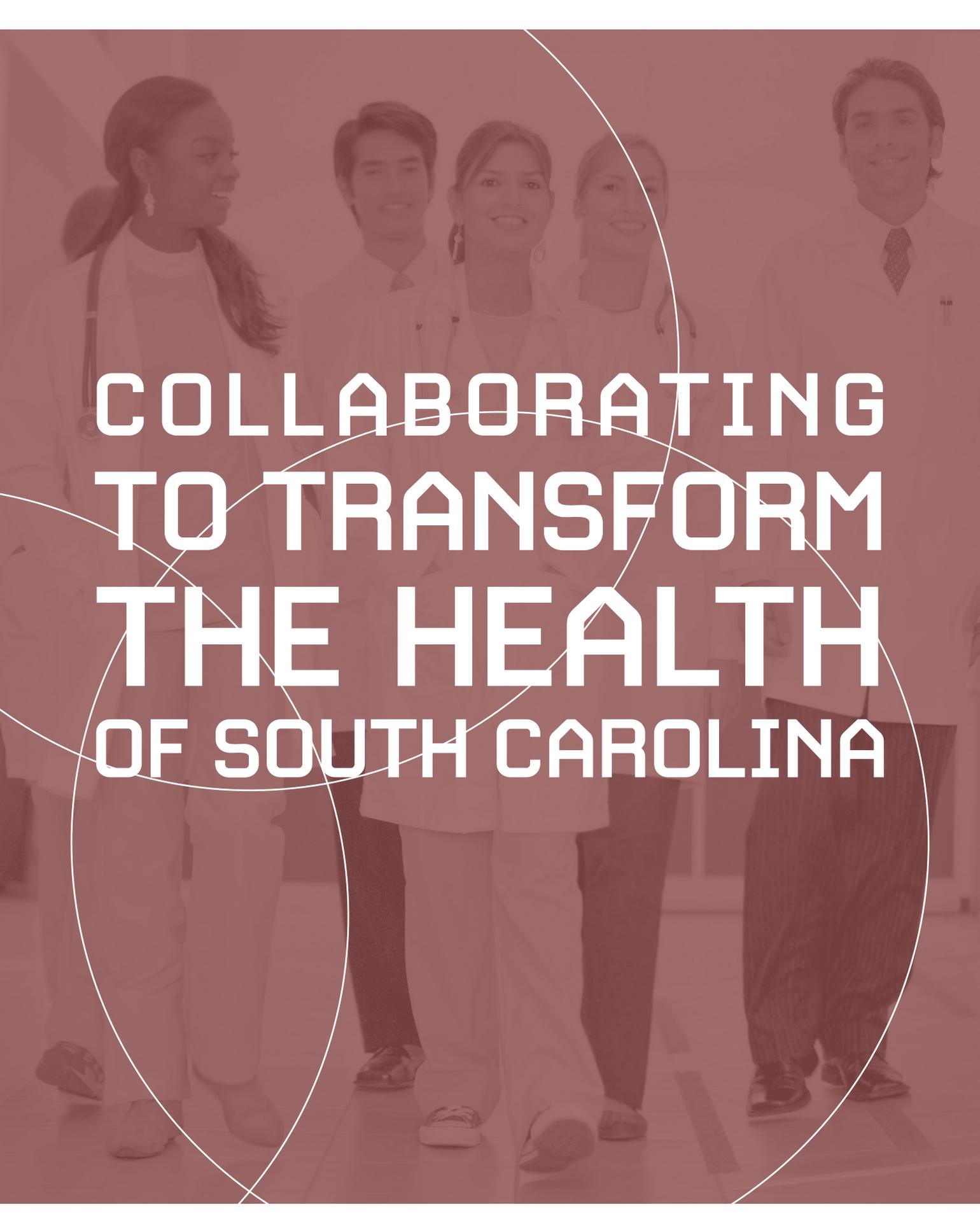
HSSC has the unique position of convening the leading hospital systems and research universities of South Carolina to foster collaboration and pursue value-added solutions. A prime example of this teamwork is the Clinical Data Warehouse. At the beginning of this initiative, HSSC members each brought their individual technical expertise to the table and joined together to leverage assets with the common goal of improving information sharing and redefining medical research in South Carolina. As a result, HSSC is on the cusp of launching this groundbreaking system, which will increase access to research and will ultimately influence positive health outcomes across the state.

Other achievements that HSSC's Board has contributed to this year include implementing a new strategic plan for HSSC, focused on the needs of our supporting organizations and affiliates as the nation's health enterprise undergoes major healthcare transitions and economic demonstrations. In addition, we are proud to have Dr. Turley, HSSC's new Chief Medical Officer, on board working closely with HSSC's member hospitals and universities to increase collaboration and advance new healthcare initiatives.

I feel confident that with the ongoing collaboration and support of HSSC's Board of Directors, affiliates and stakeholders, HSSC will continue to pursue the innovative research needed to dramatically improve healthcare and the health of all South Carolinians.

Charles D. Beaman, Jr.

CEO, Palmetto Health
Chair, Health Sciences South Carolina Board of Directors



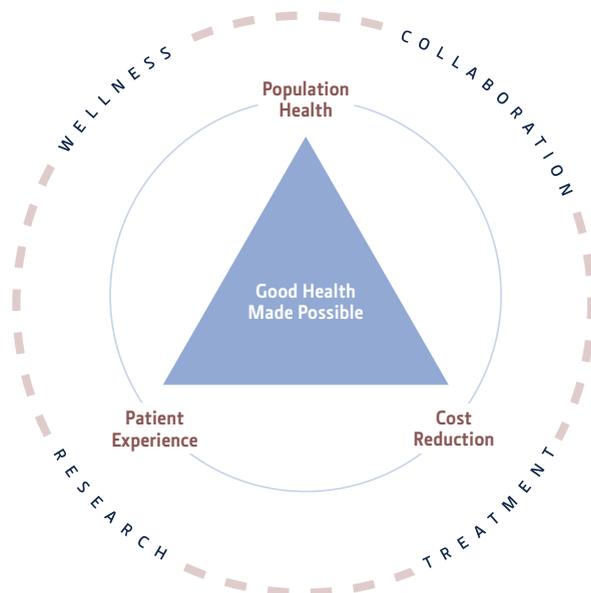
**COLLABORATING
TO TRANSFORM
THE HEALTH
OF SOUTH CAROLINA**

HEALTH SCIENCES SOUTH CAROLINA: GOOD HEALTH MADE POSSIBLE™

Our members and affiliates work to transform the health of our state.

Health Sciences South Carolina (HSSC) is a statewide biomedical research collaborative of three principal research-intensive universities and four major teaching-hospital health systems: Clemson University, Greenville Hospital System University Medical Center, the Medical University Hospital Authority, the Medical University of South Carolina (MUSC), Palmetto Health, Spartanburg Regional Healthcare System and the University of South Carolina (USC).

The triple aim is the backbone behind our motto “Good Health Made Possible™.” While the triple aim works to reduce costs, improve population health and improve patient experience, HSSC also focuses on collaboration, research, treatment and wellness. As we guide you through our successes of 2012, you’ll find that we’ve teamed with our members and affiliates to produce better research, share results and collaborate to make South Carolina a healthier place to live and work.



MEMBERS & AFFILIATES: A SNAPSHOT

AnMed Health

AnMed Health experienced a major accomplishment this year being approved to become the first study site in South Carolina for the ALERTS Pivotal US trial for the AngelMed Guardian implantable cardiac monitor and alert system that is designed to reduce the time it takes high-risk, heart-diseased patients to get to the emergency room during an impending heart attack. With this initiative, AnMed is working to shift the paradigm to prevention with early treatment at the onset of potentially life-threatening heart conditions.

Clemson University

Clemson University partners with Baptist Easley Hospital to put prevention first for patients (see page 18), and leverages the power of the SmartState Center in Health Facilities Design and Testing to improve hospital rooms, facility instrumentation and conditions in cardiac operating rooms (see page 14).

Greenville Hospital System University Medical Center

During 2012, Greenville Hospital System harnessed the power of its Simulation Center, which uses simulation education to train health professionals and prepare them for interaction with real patients, to help shape the curriculum of the newly opened University of South Carolina School of Medicine-Greenville. "The Greenville Healthcare Simulation Center allows these students to learn in an environment that's safe," said Hurschell Matthews, Jr., MHA, EMT-P, Administrative Director of the Greenville Healthcare Simulation Center. "Here it's okay for students who are trying something for the first time to ask a question, to stop and get help." The technology allows University of South Carolina School of Medicine-Greenville students to embrace a new school of thought—learning how to leverage technology in the rapidly changing world of healthcare.

McLeod Health

At the beginning of 2012, McLeod Health announced its partnership with Loris Healthcare System in an effort to collaborate and better serve the immediate community. As a result, the newly named McLeod affiliates, McLeod Loris and McLeod Seacoast, will be able to better serve patients in the growing region with a network of physicians and specialists as well as leading-edge medical technology. With a shared philosophy of quality patient care, McLeod Health and Loris Healthcare System have had a successful year improving services and ensuring the delivery of high-quality care for local communities.

Medical University of South Carolina

Thanks to a federally-funded program involving the Medical University of South Carolina and select hospitals in the Lowcountry and Pee Dee regions, hospital staff and patients in rural areas have access to experts at large medical centers through telemedicine (see page 13).

Palmetto Health

Through its Office of Community Health, Palmetto Health collaborates with community partners to provide more than 20 health maintenance programs and direct healthcare services; one of the most successful is the provision of dental care. Without insurance, many families rely on emergency rooms for ailments large and small, including dental pain. ER dental visits incur up to \$500 in additional costs compared to visits in a private dental practice. After South Carolina's Medicaid program ended coverage for all adult dental care in 2011, Palmetto Health developed an emergency oral health program in 2012 to help uninsured patients avoid unwarranted ER visits. Palmetto Health's Dental Initiative enlisted private dentists to provide emergency dental services for five to ten uninsured, low-income patients per month.



Palmetto Health covers costs at the previous Medicaid rate. The program provides a benefit for all involved: patients gain access to otherwise unavailable services, dentists are reimbursed for their time and expertise, and the hospital avoids the higher costs of providing care through its emergency rooms.

Self Regional Healthcare System

Self Regional Healthcare System recently announced a partnership between its Healthcare Cancer Center and the Hollings Cancer Center at the Medical University of South Carolina. Self Regional became the newest member of the Hollings Clinical Trials Network. This network is a statewide partnership of quality cancer centers dedicated to the promotion of cancer research by establishing a collaborative infrastructure of physicians and clinical trials offices that can reach out to a large and diverse patient population by sharing resources with member organizations. The partnership will provide cancer patients in the seven-county Lakelands region that Self Regional serves access to new and innovative cancer treatments, many of which are not yet available to the general public. The Self Regional Healthcare Cancer Center opened in 2011 and offers advanced cancer care including medical, radiation and surgical oncology, and with the new partnership Self Regional is able to advance its mission of providing advanced care close to home.

Spartanburg Regional Healthcare System

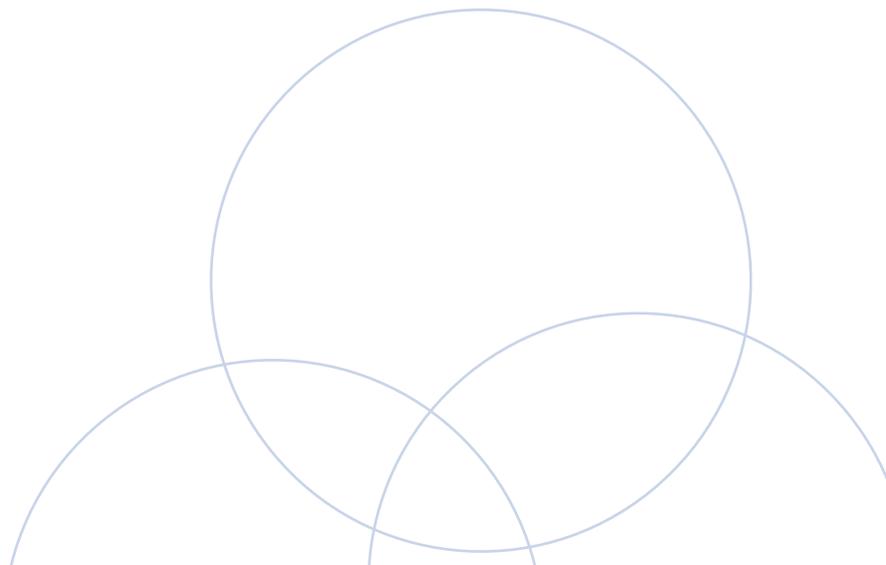
The Gibbs Cancer Center at Spartanburg Regional was selected in 2012 to continue its participation in the National Cancer Institute Community Cancer Centers Program (NCCCP), a network of community cancer centers focused on expanding research while improving access to quality care for underserved populations. The renewed funding awarded the center close to one million dollars to continue participating in the program for the next two years. Gibbs Cancer Center was one of the original pilot sites selected for the program in 2007. "If we are going to provide the most personalized care and stop the spread of cancer, we must work together to learn each other's best practices while also sharing our victories," said James D. Bearden, M.D., Vice President of Research for Spartanburg Regional

Healthcare System and Managing Physician of Gibbs Cancer Center. With a major focus on reducing cancer healthcare disparities, the 21 NCCCP community hospitals will continue efforts to enhance patient access to the latest, evidence-based cancer care, improve the overall quality of care and expand research opportunities across the cancer continuum.

University of South Carolina

Serving South Carolina is a priority at the University of South Carolina. This year the USC Schools of Medicine have placed a major emphasis on collaboration to achieve results. By spearheading the Statewide Telepsychiatry Initiative, USC works with hospitals throughout the state and the SC Department of Mental Health to help solve an increasing problem in South Carolina—mentally ill patients presenting at emergency departments not equipped to address their unique needs. The telepsychiatry program is already improving patient care and reducing admissions, and has demonstrated an average saving of \$1,800 per patient within 90 days.

At the local level, the USC School of Medicine-Greenville's inaugural class is making an impact in the community by undergoing required Emergency Medical Technician (EMT) training to gain certification and real-world experience in supporting the local community.





AT THE HEART OF
OUR MISSION
IS RESEARCH



MEDICAL RESEARCH: THE CLINICAL DATA WAREHOUSE

Health Sciences South Carolina (HSSC) has been working for the past three years to establish a statewide Clinical Data Warehouse (CDW) system as part of its mission to improve the health of all South Carolinians.

The creation of the CDW and a data management platform support the goal of significant growth in clinical trials and medical research by collaborating across HSSC member organizations including:

- » AnMed Health
- » Clemson University
- » Greenville Hospital System University Medical Center
- » McLeod Health
- » Medical University of South Carolina
- » Palmetto Health
- » Self Regional Healthcare System
- » Spartanburg Regional Healthcare System
- » University of South Carolina

The CDW solution consists of the following six components:

- 1 DATA SHARING AGREEMENT** is in place and governance framework has been established
- 2 MASTER PATIENT INDEX (MPI)** allows for the matching of clinical records from across disparate information systems for a single patient

- 3 INTERFACE ENGINE** allows for the real time and/or batch input and transformation of clinical data from the members' Electronic Health Record (EHR) systems and converts the data into standardized formats
- 4 OPERATIONAL DATA STORE** is a database designed to integrate data from multiple sources for additional operations on the data. It is an important staging area for the data within the data warehouse architecture and provides the ability to organize data across sources
- 5 DATA TRUST** is the central database in the CDW architecture where aggregated data is stored and managed
- 6 i2b2 (INFORMATICS FOR INTEGRATING BIOLOGY AND THE BEDSIDE)** is an open source application which allows researchers access to clinical data

Currently, the CDW has data for 1.15 million patients from member institutions.



The data being loaded currently includes demographics, diagnosis, procedures, labs and medications. Based on current plans, Health Sciences South Carolina (HSSC) will have data loaded from present hospital members by the end of 2014. Although the Clinical Data Warehouse (CDW) has been deployed for research purposes, the architecture supports secondary uses for the aggregated or non-aggregated data including clinical data marts that individual members could deploy for their unique purposes. Clinical data marts are an example of optional services that HSSC can provide, which leverage the information infrastructure. The architecture is designed to protect the security and the privacy of all patient data.

Collaboration among the partner institutions will provide the following value:

- » Honest broker services
- » Master Patient Identification (MPI) services
- » De-identification of data
- » Cohort selection for new trials and studies
- » Data to assist in obtaining new grants
- » Addition of new data fields
- » Addition of data from members' other delivery organizations (i.e., physician practices, clinics, etc.)
- » Data cleansing and validation
- » Support for the development of optional data services (registries, clinical services and clinical data marts)



MAKING LIFE BETTER WITH THE COORDINATION OF INFORMATION: THE RESEARCH PERMISSIONS MANAGEMENT SYSTEM

The Research Permissions Management System (RPMS) project was undertaken in South Carolina with Grand Opportunity grant funding from the National Library of Medicine.

The RPMS collaboration included an Ethical, Legal and Social Issues (ELSI) committee led by Duke University. Project execution followed a multidisciplinary approach and included team members with informatics, systems engineering, software engineering, project

management, ethics and regulatory expertise. Following the specific aims of the grant and instituted software development practices, the team employed the following iterative software development lifecycle throughout the project:



Clemson University led the initial phase involving substantial analysis focused on two key areas: **1** systematic analysis of existing business practices, registration processes and consent collection workflows at each of the HSSC member healthcare facilities and **2** investigative analysis of best practices for presenting information to users via tablet technology and capturing permissions and consent data electronically.

The analysis of the existing hospital processes for obtaining, from the patient, permission to treat revealed specific areas in which electronic forms would most effectively replace paper-based forms. This analysis influenced the design for the detailed workflow embedded into the RPMS application. The general workflow included presentation of the information to a patient or participant, collection of information from checkbox options and signatures, registrant review of the information and witness signatures. Institutional business requirements included the ability to select appropriate forms applicable for each patient or patient visit and the need to accommodate multiple languages.

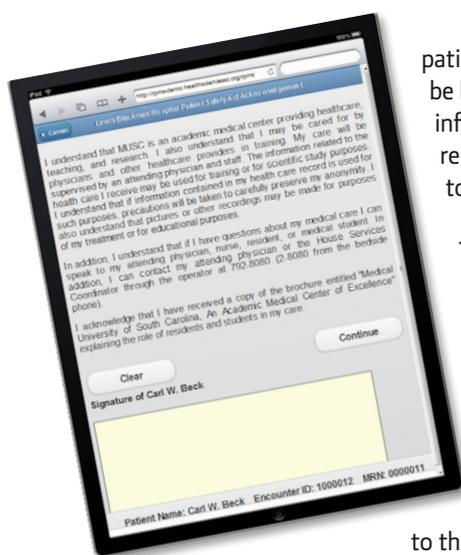
Best practices for presenting and collecting information electronically were investigated using participants at Palmetto Health. For example, the use of long forms with scrolling pages vs. the presentation of the information one page at a time with the use of navigation buttons. Also, the use of a tablet-based device (Apple iPad®) vs. a fixed touch screen. Results showed a preference by both registration clerks and patients for a portable device (the iPad in this case). In addition, the paginated interface was preferred over the scrolling interface with less handling errors. These results influenced the design of the RPMS user interface. The design was also informed by the results

of a Video Assisted Consent (VAC) study conducted at the Medical University of South Carolina in collaboration with regulatory knowledge experts using a mock-up of RPMS code.

A customized implementation of the RPMS software was piloted in select patient registration clinics at MUSC starting in November 2011. The implementation was designed specifically for the statewide infrastructure that is being established by HSSC. The stand-alone RPMS software was extended to communicate with the Enterprise Master Patient Index (EMPI) to optimize patient lookups and to store collected data in the CDW. As a result, the final extended RPMS system was inherently distributed with data transmitted from source registration areas at the member institution to the centralized HSSC CDW. For this pilot implementation, information from several paper-based forms typically used for consenting during patient registration were converted into electronic format and displayed on an iPad via the RPMS user interface.

As of August 2012, over 2,300 patients were registered using the RPMS pilot at MUSC.

In addition to permission to treat, the intention is to replace the current, paper-based informed consent process used in clinical studies with an electronic system with minimal disruption to the research workflow. The introduction of this new medium to the consenting process has several potential benefits. Patients are often presented with increasingly complicated informed consent forms during enrollment in clinical studies. The forms are often verbose and difficult to comprehend. The electronic format opens new avenues for richer content in consent forms, such as audio or video that can enhance the information presented and improve comprehension of the complex concepts and/or procedures being researched. RPMS enables study coordinators to embed rich media into consent forms. The results of the VAC study suggest that using videos to convey details about study procedures may increase participant understanding. Finally, consents collected electronically can be presented back for patient or research participant review via a patient research portal allowing them to review the list of research protocols and research authorizations to which they have consented. The information presented in this manner empowers



patients by allowing them to be better informed, to make informed decisions about research and to provide access to the research team.

Thus, Health Sciences South Carolina (HSSC) has developed an electronic system designed to simplify the collection and management of research authorizations and informed consents.

The captured data is fed to the Clinical Data Warehouse (CDW) with associated clinical data. The result is a system that can facilitate the versioning and tracking of informed consents, enhance the consent process and facilitate research participant recruitment as well as the coordination and management of a statewide

clinical trials network. Future plans include the development of best practices for the presentation of multimedia in consents; the incorporation of Institutional Review Board (IRB) workflow; a detailed analysis of the impact of RPMS on the consent process and research recruitment; and the addition of other components to RPMS such as a patient portal to empower patients and research participants about their decisions on consents and authorizations that accrue during their interactions with the research enterprise.

The final version of RPMS, which offers new features such as the support for the workflow of the informed consent to participate in research and consent form design tools, has been completed and released under an open source license at www.healthsciencessc.org/rpms. The platform is extensible and configurable with the ability to be used in multiple consenting environments such as patient registration for routine care or informed consenting for clinical trials.



CHIEF MEDICAL OFFICER

A HISTORY OF COLLABORATION TO IMPROVE HEALTHCARE:

CHRISTINE B. TURLEY, M.D.

Q: *How does your position with HSSC leverage your experience in the field of health?* I have practiced medicine in varied settings during my career. I have cared for patients in public health settings, in rural settings where I was the only pediatrician serving a large part of a state and in one of the poorest practice types in the United States, an academic pediatric training location. I have also held a number of leadership roles in academic healthcare which has given me personal knowledge of the increasing pressure on healthcare to make meaningful

improvements. Finally, my clinical research program centered on vaccines, and I had the opportunity to develop knowledge and expertise regarding all aspects of clinical research in all populations and at all stages of vaccine development. I believe that my diverse areas of expertise all come together in my role at HSSC. I draw upon my knowledge of the practical realities of practicing medicine, as well as my personal understanding of the business and financial issues confronting health systems. I also have the opportunity to use my experience in both the human subject components of clinical research and

the complexities of the regulatory aspects of clinical research. The ability to consider a research question alongside a pressing clinical need is a strength that I possess, and my role at HSSC affords me the unique opportunity to combine this knowledge to improve the health of all South Carolinians.

Q: *Since you have joined the HSSC team toward the end of 2012, what are some of the goals that you are looking toward with the organization in the next few years?* We have a three-pronged primary agenda. First, we will be focused on maximizing the use of our data warehouse. This unique data repository is a valuable asset for members and the state that aids in development of new knowledge and health system improvement. We are developing strategies to expand our membership to incorporate even more comprehensive data, leveraging our unique collaboration for the most benefit.

Our next goal will be to develop our data platform to be a highly functioning tool in the rapidly changing area of personalized medicine. We will work closely with our members to pull the technical data that exists in various repositories around the state into our central data warehouse to create a powerful tool that affords researchers improved understanding of the complex interplay of genetics and environment. This will become a means for physicians to deliver medical care to patients that is most meaningful to their specific risks and strengths.

Our third area is developing clinical research projects to make use of the talents of the faculty at our member institutions to maximize the potential of the current data warehouse to improve the health status of South Carolinians. We would like to make optimal use of the tools that HSSC has been developing to advance the knowledge and understanding of health and healthcare here in South Carolina, as a model for the country.

Q: *Are there particular healthcare initiatives that you have identified to implement in SC?* We are developing two areas of research to begin in the near future. We are working with members and partners to understand factors associated with readmission. We will be working to reengineer the transitions in care to improve outcomes for patients during this vulnerable period. We are also interested in decreasing health disparities with a novel demonstration project involving prevention of hypertension.

Q: *How do you propose increasing collaboration among SC's hospitals and universities?* My first task is to work with our member organizations to develop a vision that is consistent with their interests and goals over the coming years. My initial efforts are being spent in listening and reflective dialogue with leaders at our organizations across much of the state. Each healthcare organization is focused on excellence and improving patient care.

Establishing a dialogue about these topics will aid in developing the common platforms for working together. Each entity is committed to improving the health of all South Carolinians, and that is a fundamental unifying aim.

With the history of collaboration among HSSC members as a foundation for the future, there is tremendous groundwork for working together in even more meaningful, collaborative ways.

Q: *In addition to your work with HSSC, you will also serve as professor of clinical pediatrics in the Department of Pediatrics at the University of South Carolina School of Medicine-Columbia and serve as Office of the Dean advisor for USC School of Medicine-Columbia Clinical Affairs. What are you looking forward to with these positions and how will your work in those capacities complement your work with HSSC?* My activities at the School of Medicine (SOM) are complementary to my role with HSSC. Specifically, I am looking at ways to bring faculty from the SOM into research opportunities developing within HSSC. I have begun to work with department chairs to aid in this venture. Additionally, I will be advancing research activities in ways that dovetail with the initiatives we are working on across the state. My work in the pediatric department will focus on patient care and education of pediatric residents in the clinical setting, which allows me to combine these two professional areas. Continuing clinical practice is essential to helping me stay in touch with the realities of the changing environment of medicine. Working with learners is an important connection to a critical mission of academic health centers, educating the next generation of physicians. And finally, these two areas are just fun!

A smiling female healthcare professional in a white lab coat is seated at a desk. She is looking towards the camera. On the desk in front of her is a tablet computer, some papers, and a pen. The background is a blurred office or clinical setting. The entire image has a light blue overlay. Two thin white circles are centered on the image, one slightly larger than the other, framing the text.

PRACTICAL RESULTS FOR PRACTICING MEDICINE

UNDERSTANDING TELEMEDICINE: TECHNOLOGY IS ON CALL

Faculty at both the University of South Carolina and the Medical University of South Carolina (MUSC) are working to transform access to specialists and reduce health disparities through the use of telemedicine. Rural communities throughout South Carolina and the United States can present special challenges for patient care, often centered around limitations in access to specialized care in Emergency Department settings. This can lead to significant health disparities which contribute to poor outcomes.

A federally funded program involving the Medical University of South Carolina and select hospitals in the Lowcountry and Pee Dee Regions was established under the acronym CREST (Critical Care Excellence in Sepsis and Trauma) by Dee Ford, M.D. and Samir Fakhry, M.D.

Using telemedicine, MUSC staff and staff members from participating hospitals have an audiovisual connection, enabling them to see and hear each other, as well as the patient, resulting in a more thorough evaluation and documentation. “Roughly half of the 40,000 annual traffic fatalities occur at the scene,” says Dr. Fakhry, professor of surgery and chief of the Division of General Surgery. “But if you survive that, your best chance for survival occurs within the first hour or two, what we call the ‘Golden Hour.’ The focus in trauma care has always been to get the patient to the appropriate level of care in the shortest possible time.”

South Carolina leads the nation in the percentage of rural highway fatalities, according to a 2011 study, and, as Dr. Fakhry points out, the state’s trauma centers are in urban areas, where they are most needed. To counter that hurdle, Dr. Ford and Dr. Fakhry, armed with a grant from the National Institutes of Health, approached several rural hospitals in 2009 with a proposal to establish a telemedicine network linking MUSC, an urban hospital, to their emergency departments.

You couldn’t put an expert trauma surgeon and an expert critical care doctor in every emergency department,” Dr. Fakhry says, “But with telemedicine, we could make that expertise available and make it affordable in these remote locations.” Six MUSC trauma surgeons and four pulmonary/critical care physicians were available to consult with the rural hospitals 24 hours a day, 365 days a year.

Likewise identifying unmet need across the state, Meera Narasimhan, M.D., Vice Dean for Innovative Health Care Technologies and Professor and Chair of the Department of Neuropsychiatry and Behavioral Science at the University of South Carolina School of Medicine, has led a statewide telepsychiatry initiative providing emergency psychiatric care access 24 hours a day, 7 days a week. A psychiatrist provides assessment and recommendations for initial treatment and works closely with the emergency room physicians to identify resources in the community to help the patient with follow-up care. Patients who receive quality follow-up care are less likely to need re-hospitalization and often enjoy an improved quality of life.

In recognition of its innovative and collaborative nature, the statewide telepsychiatry initiative received the American Psychiatric Association’s Silver Achievement Award for 2011.

Recently Dr. Narasimhan was awarded a \$2.7 million grant from the National Institutes of Health (NIH) to study telepsychiatry in emergency rooms. The NIH-funded study is a partnership between the University of South Carolina, South Carolina Department of Mental Health, SC Office of Research and Statistics and Emory University. The study will evaluate the healthcare utilization, quality, sustainability and economic impact of an existing statewide telehealth initiative that is providing care in emergency departments throughout South Carolina. In addition, the study will determine whether the organizational model should be provided nationally.

DEVELOPING RESEARCH TO HELP OUR AGING POPULATION: THE SMARTSTATE CENTER IN HEALTH FACILITIES DESIGN AND TESTING

The healthcare sector is among the fastest growing sectors of the national economy. Hospitals will continue to be the core of the healthcare industry with more than 6,500 hospitals in the US and \$575 billion in annual revenues. Including ancillary activities with doctor's offices, emergency care facilities and nursing homes, the numbers increase to 820,000 facilities and more than \$1 trillion in revenues.

The healthcare sector will continue to grow due to aging demographics and the expansion of treatment options including the continued introduction of medical technology. Hospitals and related facilities will continue to offer opportunities in terms of design, technology and instrumentation. The SmartState Center in Health Facilities Design and Testing offers the potential to be on the cutting edge of this area serving state, national and international healthcare systems. Three main areas of research activity with economic development implications have been undertaken to date: **1** inpatient hospital room prototyping and evaluation, **2** development and implementation of a Post Occupancy Evaluation Instrument (POE) for healthcare facilities and **3** development of a human factors research initiative examining clinical practices and environmental conditions in cardiac operating rooms.

1 PATIENT ROOM PROTOTYPING This work formed and tested the conceptual framework for the original Center proposal and began prior to the approval of the Center. Ongoing design-research-refinement iterations have been conducted since Center approval in 2007 funded both through the sponsored subcontracts through NXT (a technology-research and development company in South Carolina) with the Department of Defense (DoD) Military Health System and the Robert Mills Endowed Professorship at Clemson. This work has also drawn significant in-kind material and collaboration support from SC-based and national healthcare equipment manufacturers such as Trumpf headquartered in Charleston, South Carolina, Hill-Rom, Herman Miller Healthcare, Sky Factory, Kohler and DuPont. The latest rounds of prototyping are engaging Trumpf in the development of a new patient room headwall prototype.

Discussions are underway to collaborate with Herman Miller Healthcare to bring to market footwall elements of the prototype room and with Sky Factory on new applications of virtual imagery. An initiative by NXT is engaging DuPont in the development of a futuristic “Patient Ribbon” based on the award-winning 2020 Patient Room.

2 POST OCCUPANCY EVALUATION (POE) Funding from the DoD Military Health System has allowed researchers at Clemson to develop a rigorous POE tool that evaluates performance of built healthcare facilities across multiple measures against original design objectives. Versions of the instrument have been used to validate the instrument and evaluate four inpatient nursing units at upstate SC hospitals and now multiple departments in two DoD hospitals over the last two funding cycles. It is expected that additional POEs will be conducted for the DoD in the future, and the ultimate goal is to develop a cross study database that can examine trends in areas of success and failure in the design of hospitals.

3 HUMAN FACTORS RESEARCH IN THE CARDIAC OPERATING ROOM Cardiac surgery is a high-risk procedure performed by a multidisciplinary team using complex tools and technologies. Efforts to improve patient safety and reduce human error for cardiac surgical patients have been ongoing for more than a decade, yet the literature provides little guidance regarding best practices for hazard identification and interventions to effectively reduce risk. Likewise, little research is available to inform the design of operating rooms, leading to reliance on past practices and anecdotal evidence.

Jake Abernathy, M.D., Associate Professor; Scott T. Reeves, M.D., John E. Mahaffey, Endowed Professor and Chairman in the Department of Anesthesia and Perioperative Medicine; and Scott Shappell, Ph.D., Professor, Department of Industrial Engineering, Clemson University serve leadership roles at the national planning level for a ground-breaking research project called FOCUS.

The FOCUS initiative is a multi-year, multi-center initiative designed to examine the physical and cultural environment of the cardiac surgery operating rooms and to define processes by which the cardiovascular operative teams can reduce the occurrence of human error. Although every individual involved in

cardiovascular operative patient care is dedicated to patient safety, the processes and communication patterns that exist frequently are inadequate to achieve the goal of absolute patient safety.

Lead by Dr. Abernathy, the Medical University of South Carolina (MUSC) was one of five hospitals nationwide that participated in an in-depth observation of the physical, interpersonal and cultural environment in cardiovascular operating rooms.

The results of that research helped inform the design of a new Agency for Healthcare Research and Quality funded grant. The Agency for Healthcare Research and Quality (AHRQ) recently awarded a three-year research grant of \$4 million to Dr. Peter Pronovost and the FOCUS initiative to improve teamwork to prevent infections in cardiac operations. This research is a joint collaboration of the Society of Cardiovascular Anesthesiologists Foundation and the Quality and Safety Research Group at the Johns Hopkins School of Medicine. MUSC is a sub-award recipient of this grant with Dr. Abernathy as Principal Investigator.

Seeking to capitalize on the state’s expertise in the areas of human factors engineering, healthcare architecture and cardiac surgery, MUSC’s Department of Anesthesia and Perioperative Medicine is creating an alliance with the Center involving Clemson University’s Graduate Program in Architecture and Health. The goal is to scientifically identify problems associated with operating room design, understand how those design flaws impact patient safety and use that knowledge to design a safer, more efficient operating room. Specifics include:

- » Engage expertise of a healthcare architecture team directed by David Allison, FAIA, ACHA and Dr. Shappell’s team in human factors engineering.
- » Engage companies in the Charleston area that focus on medical equipment and device manufacturing as partners in creating the operating room of tomorrow.
- » Establish South Carolina, specifically the Clemson–MUSC partnership, as experts in the field of operating room error reduction, patient safety and design.



**PUTTING
HEALTH IN THE
HANDS OF OUR
PEOPLE**

COLLABORATING TO ACHIEVE THE TRIPLE AIM: INTRODUCING THE SC PARTNERSHIP FOR HEALTH

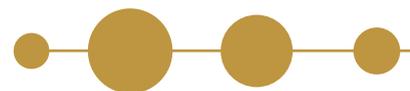
South Carolina Partnership for Health (SC PfH) is a newly founded organization that combines the efforts of BlueCross BlueShield of South Carolina, Health Sciences South Carolina and the South Carolina Hospital Association. The primary goal is to develop a collaborative within the state focused on specific advancements that embody the Institute for Healthcare Improvement's "Triple Aim."

The Triple Aim refers to three goals: improve population health, enhance patient experience and control the cost of care.

For its first initiative, the Partnership has chosen to focus on care transitions. The SC PfH and The Carolinas Center for Medical Excellence (CCME) have joined to reduce avoidable hospital readmissions by 20 percent by 2014. This means there will be 1,700 fewer hospital readmissions in our state each year, and many South Carolinians will be able to enjoy evenings in their homes, instead of hospital beds, resulting in an estimated cost savings to South Carolina of more than \$500 million. The Partnership will accomplish this by giving hospitals, healthcare organizations and communities the tools and

resources they need to improve transitions of care. Reducing avoidable readmissions is complex and requires multidisciplinary approaches. The initiative is titled PART (Preventing Avoidable Readmissions Together).

On September 20, 2012, over 265 stakeholders participated in the PART kick-off meeting in Columbia. The attendees represented a variety of institutions including hospitals, home health, long-term care, governmental organizations and primary care practices. The event was an opportunity for organizations to discuss how they can best improve patient care. The PART collaborative will continue to host biannual statewide meetings and biannual regional meetings. Webinar and coaching calls are offered each month with a focus on a specific care transitions topic and offering an opportunity for communities to share their success stories and learn from each other. The collaborative will be offering national resources to all South Carolina hospitals to help promote best practices within each institution.



After initial review, the leadership team (made up of hospitals throughout the state) narrowed the focus to a few identifiable process measures that all agreed were in need of improvement. The processes chosen were:

- 1 DISCHARGE INSTRUCTIONS AND PATIENT EDUCATION** This will be measured through utilization of the Three Item Care Transition Measure (CTM-3) which will show the extent to which patients are being prepared to participate in post-hospital self-care. The Partnership will also review charts each month to record how many patients are receiving the information that has been recommended by best practices.
- 2 DISCHARGE SUMMARY** This refers to the record of care that is sent on to the next provider. The program will be measuring the timeliness and effectiveness of these records.

- 3 FOLLOW UP APPOINTMENTS AND PHONE CALLS** The initiative will measure the effectiveness of follow up phone calls, how many patients are receiving them and how many patients are receiving a specific date and time for their follow up appointment.

Throughout this collaborative the Partnership will continuously work to improve communication and collaboration across all disciplines and settings.

The collaborative will ensure that the patients and families remain the central focus of this program. Outcome measures to follow include 7-day and 30-day readmissions, length of stay and 30-day ER visits/observation visits after a hospitalization.

Planned small pilot research and evaluation studies will help stakeholders better understand the needs of South Carolina patients and families at discharge.

HEALTHCARE SELF- MANAGEMENT TO IMPROVE OUTCOMES: HEALTH STUDIES

The purpose of this project is to better understand user needs for personal health information management (PHIM) by examining how existing software for PHIM can supplement the employee wellness program in a local hospital.

In order to do so, two researchers from the Industrial Engineering Department at Clemson University, Ashley Kay Childers, Ph.D. and David M. Neyens, Ph.D., MPH, have partnered with Healarium, a health

information technology company, and Baptist Easley Hospital (BEH) where hospital employees have been working together toward healthier lifestyles via their *BE Healthy* initiative.

The literature suggests that proper management of personal health information can empower patients to take a more active role in their own healthcare, thus leading to improved health outcomes.

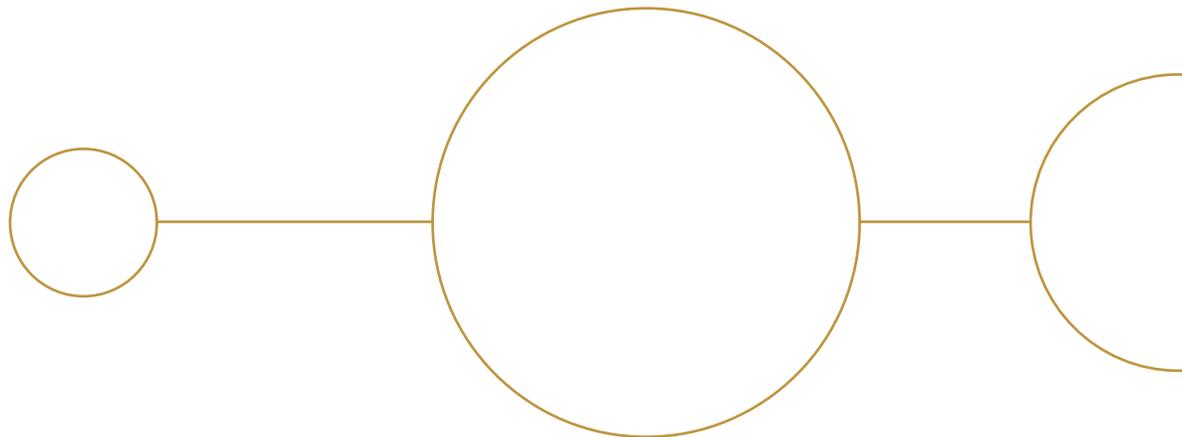
Another strategy for improving health outcomes is participation in employee wellness programs. Independently, these two strategies have been shown to have a positive impact on health outcomes. The study will investigate how the two approaches together can support improved health for participants.

The Healarium system uses enabling technology to allow health promotion programs, such as worksite wellness programs, accountable care organizations, health plans and patient centered medical homes, to deliver personalized, patient-centered health management services. The open-architecture framework allows service providers to integrate their own expertise, guidelines and protocols. This information is then tailored specifically to individual users and shared with them via web- and smartphone-based applications. The Healarium software promotes successful care-coordination relationships by integrating personal health information, incentives, interventions, daily actionable tasks and social networks.

Since 2011, BEH has been successfully implementing its program by establishing policies and programs to promote physical activity and nutrition, encourage

tobacco cessation and manage chronic conditions such as asthma, hypertension, high cholesterol and diabetes. Approximately one third of the employee population has participated in some aspect of the program, and the hospital has received a number of recognitions for these programs. It was named a Center of Excellence and a Gold Star Standard Hospital in the North Carolina Prevention Partners and South Carolina Hospital Association's Working Well Campaign. For the last two years, the American Heart Association (AHA) has recognized BEH as a Fit-Friendly Company, and this year, BEH received the Worksite Innovation Award from the AHA.

Next steps are to integrate the Healarium system into the worksite wellness program at BEH. The team from Healarium will work with the health coaches at BEH to translate its current care plans and protocols into the Healarium system. Kiosks will be set up in the hospital to send participants' biometric data to the system within real time. During this time, Dr. Childers and Dr. Neyens, Department of Industrial Engineering, will be conducting user needs assessments in order to better understand how hospital employees manage their personal health information and developing user-based design requirements and recommendations for health IT systems. The hope is this will facilitate more efficient and successful use of PHIM by consumers. In addition, the team aims to gain specific insights on understanding healthcare workers and settings to identify the features that facilitate activation and engagement in personal health information management.



HEALTH SCIENCES SOUTH CAROLINA: LEADERSHIP AND STAFF



NEW DUKE ENDOWMENT LEADERSHIP Greenville Native to Lead The Duke Endowment

Trustees of The Duke Endowment have elected Minor Mickel Shaw to serve as chair of the Board. Shaw succeeds the late L. Neil Williams Jr., who headed the Endowment Board from January 2011 through August 2012.

Shaw, a graduate of UNC-Chapel Hill, lives in Greenville, South Carolina. She is president of Micco LLC, a private investment company. Her board memberships include the Greenville-Spartanburg Airport Commission, the SC Governor's School for the Arts and Humanities Foundation, South Carolina ETV Communications and BlueCross BlueShield of South Carolina.

Shaw joined the Duke Endowment's Board in 1999. She has chaired the Committees on Educational Institutions, Governance and Child Care.



IN MEMORIAM L. Neil Williams Jr., 1936-2012

We mourn the loss of the Duke Endowment Board Chairman L. Neil Williams Jr., who died in Winston-Salem on August 26, 2012. Mr. Williams joined the Endowment's Board in 1997, providing outstanding service as former chairman of our committees on Investments, Trustees and Governance and Educational Institutions. He led the Board since January 2011.

Mr. Williams grew up in Charlotte, North Carolina, and attended Charlotte public schools. He went on to earn an undergraduate degree from Duke University and a law degree from Duke School of Law. He spent his professional career at Alston & Bird in Atlanta, where he was named a partner in 1965 and served as a managing partner from 1984 to 1996.

Duke University honored him with a Distinguished Alumni Award in 1990 to celebrate his dedication to his field, to Duke and to humanity, and Duke School of Law presented him with the Charles S. Rhyne Award in 1996 to recognize his professionalism, integrity and commitment to education and community service.

THE VISION OF HEALTH SCIENCES
SOUTH CAROLINA IS TO CONDUCT
COLLABORATIVE HEALTH SCIENCES
RESEARCH TO IMPROVE THE HEALTH
STATUS, EDUCATION, WORKFORCE
DEVELOPMENT AND ECONOMIC WELL-
BEING OF ALL SOUTH CAROLINIANS.

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