*re*IMAGINE
INTERNAL MEDICINE

EDITION 2 | 2020

THE UNIVERSITY OF ARIZONA
COLLEGE OF MEDICINE PHOENIX
Internal Medicine

WELCOME

Our Department of Internal Medicine community, like most others across the country, faced challenging times during 2020. A resurgent pandemic, political turmoil, dramatic personal sacrifices and economic stress altered and continue to influence much of what we do. Amazingly, these challenges have brought out the best in our family and align with our mission to reimagine Internal Medicine.

Guided by our commitment to superb innovative care, teaching excellence and clinical and translational investigation, our teams have pioneered novel ways to work and learn. Our focus on unique ways to recruit trainees, coupled with our commitment to optimizing medical education to serve the needs of our community, have taken on new importance and urgency as the magnitude of health care disparities are highlighted by COVID. Our clinical and translational research programs continue to expand targeting heart, lung and gastrointestinal disorders with a focus on team-based science. The rapid and robust transformation of our clinical research team to respond to COVID has resulted in important clinical discoveries and the opportunity for our patients to receive cutting-edge treatments. Finally, our focus on superb patient care and outcomes continues. We have developed strategies to provide post-hospital care and have strengthened our interactions with the Navajo Nation and our Latino community fueled by the challenges and disparities of COVID. In addition, we remain dedicated to evolving our age-friendly health system and providing cutting edge technologies for treatment of cardiac arrythmias. Many of these accomplishments are the result of collaboration across departments at the College and within the greater medical community.

We are proud to share some of our accomplishments from 2020 by our highly dedicated and talented teams. We look forward with enthusiasm to our continuing journey of partnering, leading and innovating together.

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WHAT'S INSIDE

MEDICAL EDUCATION

Medical education in the Department of Medicine at the UArizona College of Medicine – Phoenix was borne of innovation 10 years ago and hasn't stopped since. In fact, we've been working in overdrive in 2020 as a result of the challenges and opportunities brought on by the pandemic.

March 2020 had an immediate and lasting impact on all aspects of medicine and medical education. Clinical rotations quickly turned "remote", pushing the boundaries of technological connection with patients. New curricula emerged, focused on critical appraisal of the literature, addressing healthcare disparities and physician well-being. Schedules were disrupted and didactics reconfigured. Trainees were faced with caring for others even as many experienced personal losses from COVID-19.

Our medical community has met these challenges and many more with resolve and compassion, with an eye toward building momentum focused on the "silver linings" we have seen in actively addressing systemic racism in medicine and medical education, innovative scheduling and collaborative clinical care.

As always, our patients and learners remain the center of our Department of Medicine (DOM) community. We are pleased to share a small sampling of stories and projects featuring innovations in curricula and recruitment, along with efforts to meet important needs as trainees advance toward career goals. Our medical students, residents, fellows, and faculty have given the best of themselves during an unprecedented time in our history. Collectively, these efforts, as part of the DOM community, are creating our future.

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Director of Education, Department of Medicine
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Primary Care: Meeting and Understanding Our Community's Needs

COLLABORATORS:

Jayne Peterson, MD

Arizona ranks 42nd for total number of Primary Care Providers (PCP) at 77.9 per 100,000 population in the U.S. Our state has a current deficit of over 550 physicians and will need almost 2000 more by 2030. The University of Arizona College of Medicine — Phoenix Internal Medicine residency program has begun to address that gap by recruiting residents who identify primary care as their career choice. Although we currently recruit just 2 of our 24 annual resident class for these positions, we are seeing the additional resources and experiences of this curriculum making an impact on other residents' career choices with more traditional IM residents entering primary care.

558[1]

1,941[2]

Primary care physicians needed NOW and by 2030

The Primary Care track places more focus on ambulatory medicine through exposure to a variety of practice settings such as the VA APACT (academic patient aligned clinical team), FQHC (Federally Qualified Health Center) as well as subspecialty rotations that focus on the necessary primary clinical evaluation prior to subspecialty referral.

Primary care track internal medicine residents receive didactic and experiential education to help meet patients needs and expand our primary care work force.

—RESIDENTS' REFLECTIONS—

"Many times, I feel like we make these recommendations and expect that they will solve our patients' problems without thinking of the logistics of how they will obtain the resource... it was exhausting to travel from place to place by public transit in this heat."

"...there were many children and teenagers waiting with their parents (at DES office) which made me realize that a time-consuming process could restrict employment for people without access to easy, affordable, and safe childcare."

Residents spend the day in the shoes of a hypothetical patient seeking community and governmental resources.

This includes navigating the complex public transit system to locate the Department of Economic Security (DES), a food pantry and an inexpensive fresh food option using subsidy cards.

A hallmark of the program is an immersive experience in which new residents "walk in the shoes" of a hypothetical patient who has lost their job and requires a number of community services. Through reflection exercises they were able to identify the barriers that some of our patients might encounter when in this situation.

[1]The Health Resources and Services Administration (HRSA). [2] The Robert Graham Center

SPLIT Residency Recruitment: A Novel Approach to Residency Interviews

COLLABORATORS:

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Emily Mallin, MD

Even before COVID-19 the increasing resources necessary to interview residency applicants and effectively communicate program strengths necessitated a change from the traditional process.

Beginning with the 2018 residency match, the Internal Medicine Residency program developed a totally new interview and recruitment method to ensure a more flexible and streamlined process for faculty and students.

Through the process, we increased the number of interviews by approximately 35%, reduced the number of on-site "events" that took resident time by 70% while maintaining the excellent profile of the residents who are matched.

The project had already been presented in numerous forums over the last several years to the internal medicine community and was also accepted as a podium presentation for the 2019 AAMC meeting. Subsequently, as a result of the pandemic, the Coalition for Physician Accountability multi-stakeholder group announced their recommendation that all GME interviews and visits become virtual for the 2022 match.

This dramatically accelerated interest from other programs in this topic. A free one-hour webinar was hosted by the UArizona College of Medicine – Phoenix with over 3,000 in attendance and by late September, the recording had received 14,000 views. The team has since presented it on at least 10 occasions to virtual groups across the country. The vision, innovation, and execution demonstrated through this project has not only helped our own GME programs to swiftly adapt to virtual recruitment during the pandemic, but also highlighted these strengths nationally.

Residents on a hospital tour during a recruitment site visit in 2019

SPLIT INTERVIEW & VISIT PROCESS

Site Visit separated from interviews

Pre-interview preparation

Learn detailed program information through a dedicated website

Interviews done remotely via video & phone

Timing flexible for each component (remote interview day & site visit)

Careers in Academic Medicine: Evolution of Curriculum and the Assessment of Influence on Physician-Trainees' Career Decisions

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Physicians who care for our diverse patient population and the educators who train them are at the center of medical education reform. A substantial financial investment has been made in the development of middle school, high school and pre-med pipeline programs. However, academic career development for physician-trainees diminishes at the medical school level and beyond (Sanchez et al., 2011).

As a result, physician-scientists entering the workforce are on the decline (Kosik et al., 2014). Additionally, only 18.3% of residents across all specialties completing training from 2008-2017 had a full-time faculty appointment at a U.S. medical school (AAMC Medical School Faculty Trends Report, 2018).

Aside from specialty advising at medical schools, what career counseling options are provided to students? Why are there misconceptions about academic medicine and training paths among medical students? What can institutions do to combat such misconceptions and address the lack of awareness about career options that could increase the academic workforce? What can be done at GME level? What can we learn from recent learners transitioning from graduate medical education (GME) into the workforce?

In response to these questions, six years ago we cultivated a pathway to increasing academicians for the future by creating a course, MED850c Careers in Academic Medicine (CAM). CAM is an innovative, credit-bearing, month-long, non-clinical elective for fourth-year medical students at the UArizona College of Medicine–Phoenix.

Course objectives include: 1) defining academic medicine in the context of a faculty position; 2) informing students of academic medicine careers to understand the reality of leadership trends, common challenges, salary differences, negotiation skills and organizational cultures; and 3) presenting the perspectives of private practitioners and physician-faculty to compare private practice and academic life.

The course focuses on academic career options rather than specialty choices. We explore the overt and hidden day-to-day expectations, highlights, and challenges inherent to an academic career. Physician-scientist, master clinician, educator (e.g.,

Educational researchers often turn to the conceptual framework within the College Choice and College Access processes to understand decision-making behavior of students to inform several important actions.

core faculty, residency/clerkship director), chief resident year and physician-administrator (e.g., medical director, division chief, chair, dean) roles are explored. Six years later, the course continues annual offerings. The course has been featured on national platforms, such as the AAMCNews, a 2018 BNGAP national conference meeting, 2020 AAMC iCollaborative course resource sharing site in response to virtual course offerings and recently adopted by the University of California-Riverside School of Medicine. Furthermore, aligning with ACMGE's national strategic plan initiative #3 of harmonizing education across the continuum (2015), the course has expanded across the physician-training continuum into GME for chief residents. Through clinical affiliations and previous medical education collaborations with Drs. Mallin, Holland, O'Malley and McGreevy, both the college and Phoenix Children's agreed to provide a platform within GME as the course is expanded.

Sociological and educational research routinely examines decision making and individual agency. In fact, educational researchers often turn to the conceptual framework within the College Choice and College Access processes to understand decision-making behavior of students to inform several important actions. These include: PK-12 framework for curriculum revisions to reduce gaps in knowledge and access to workforce training programs, high school intervention programs, college bridge programs and educational public policy (Perna et al., 2006). Academic medicine has not considered the use of such conceptual framework to understand career development of our physician-trainees. Also, academic medicine has not examined career decision making outside the context of specialty choice. This is an opportune time to borrow from our education colleagues and apply a construct to explain physician-trainee's ultimate career decisions to better understand the influence of curricular offerings. As such, we apply Hurtado et al.'s (1997) three-stage choice model that breaks down a learner's decision-making process by pre-disposition, search and choice phases as a conceptual lens by which to understand alumni's career choices.

METHODS

A qualitative methodology study design is applied to explore how the course influenced the students' decisions and their respective career choices. Phenomenology best answers these questions (Lincoln & Guba, 1989). Phenomenology describes how and why people experience a particular phenomenon and why they react or make certain choices. In-person or Zoom interviews are being conducted with course alumni who have recently completed GME training in the U.S. and are now moving into the physician-workforce.

CONCLUSION

Now that course alumni are entering the physician workforce, through a multi-institutional collaboration, we seek to systematically explore how and why the course curriculum shaped the decisions and behaviors during GME training that led to their ultimate career choices. Understanding the course take-aways that informed their decisions can help the broader health professions community develop and reform curricular experiences at undergraduate and graduate levels. Furthermore, results could identify more appropriate opportunities for mentorship as they transition into physician-faculty or private practice roles.

POCUS Club: Training Residents in Bedside Ultrasound

COLLABORATORS:

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Jordan Merz, MD

Point-of-care ultrasound (POCUS) is defined as ultrasound used at the bedside by the provider to answer directed clinical questions and guide clinical care. POCUS has procedural and diagnostic utility and has been shown to improve patient safety for many bedside procedures. Diagnostic POCUS can augment the physical exam to improve diagnostic accuracy, decrease time to diagnosis, and provide additional prognostic information. Many organizations advocate for the implementation of POCUS into residency curricula including the Alliance of Academic Internal Medicine, American College of Physicians and Society of Hospital Medicine. POCUS brings the physician back to the bedside and increases patient satisfaction through shared diagnostic understanding.

Despite integration of POCUS training into medical schools and residency programs nationally, as well as significant interest in POCUS training by our residents, barriers to widespread implementation of POCUS and POCUS curricula at our institution persist. Some of these barriers have included technologic limitations, the high cost of handheld devices, and few POCUS-trained faculty.

POCUS is being integrated into medical schools training as the technology is more abundant with the rise of low-cost handheld devices. Unfortunately, there is a current gap of internal medicine residency training to utilize and incorporate POCUS.

We were able to successfully address these barriers when a critical mass of faculty educators and chief residents completed certification in POCUS. Upon completion, we developed a pilot program for didactic education and collaboration between faculty and residents, called The POCUS Club. Using available evidence, POCUS Club members created a POCUS curriculum and helped secure funding for handheld ultrasound devices, along with dedicated time in the residency curriculum for this subject. Interested residents participated in a series of hands-on POCUS workshops that served as the basis for diagnostic bedside ultrasound education. Additional training directly with patients included a dedicated procedure team rotation, which was incorporated within the emergency medicine rotation. The POCUS Club has met regularly with consistently high resident participation over the last year.

The POCUS Club has served as a vital step toward our broader goal of developing competency and confidence to trainees within our residency program in utilizing bedside ultrasound for a range of diagnostic and therapeutic applications.

POCUS club didactic session

Residents participating in POCUS training

TRANSLATIONAL RESEARCH

In this section, we highlight some of the translational research studies at UArizona College of Medicine – Phoenix and Banner – University Medical Center Phoenix. Newly awarded grants from the NIH and other support are enabling us to focus on understanding problems in the heart, lung, liver and pancreas.

We continue to recognize the burden of disease and the unfortunate delays in diagnosis and the lack of curative treatments. Since the onset of the pandemic, we were “COVID-19 ready” with research teams in place giving us a front row seat in many pivotal translational COVID-19 clinical trials (National Institutes of Health, industry, and investigator-initiated).

The projects presented herein display a broad range of specialties and many will lead to the implementation of new diagnostic and therapeutic strategies to enhance patient care.

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A "Lung on a Leaf" Model to Study Pulmonary Disease

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SUPPORTING ORGANIZATIONS:

Center for Applied NanoBioscience and Medicine
University of Arizona, Phoenix
University of Arizona, Tucson
Funded by ABRC

Our goal is to develop a novel, easy to use, in vitro model to recreate the lung alveolar-capillary microenvironment to better understand pulmonary diseases

Current model systems have limits:

- ✓ The differences between species demonstrate incompatibility of animal models and may produce inconsistent results
- ✓ Microfluidic devices cannot reproduce the oxygen gradients or close cell-cell or cell-matrix interactions
- ✓ 3D model systems lack a functional vascular network and the investigation of more than two cell types

To overcome these challenges, we propose the use of decellularized plant scaffolds to generate a living "lung-on-a-leaf" model to more accurately investigate lung disease

- ✓ Resulting scaffold is thin, yet durable to allow cells to attach, communicate and proliferate
- ✓ Amenable to co-culture of multiple cell types to recreate the disease microenvironment
- ✓ Specifically, the natural vasculature structure of a spinach leaf is available for re-population with human lung endothelial cell multi-culture
- ✓ Inherent biomechanical properties

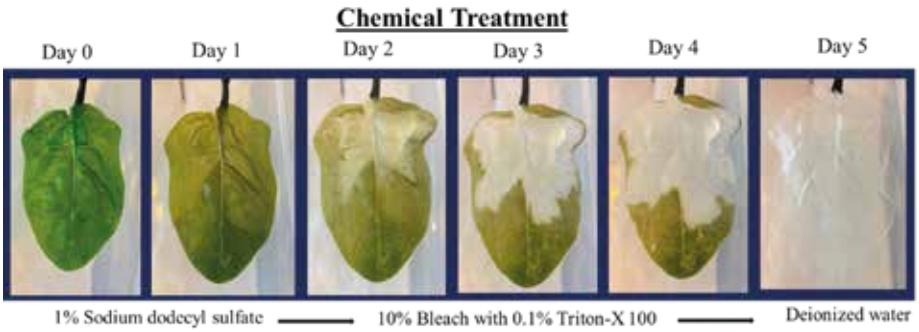
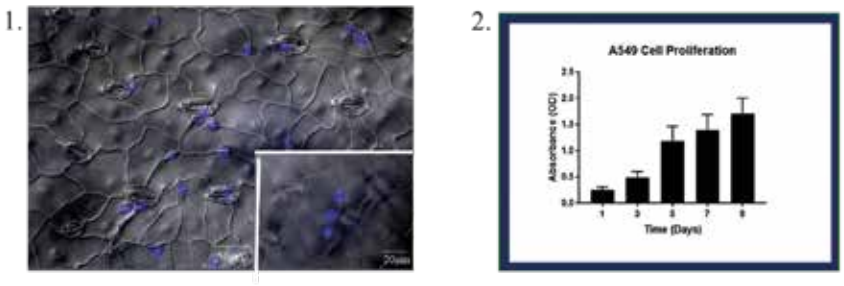
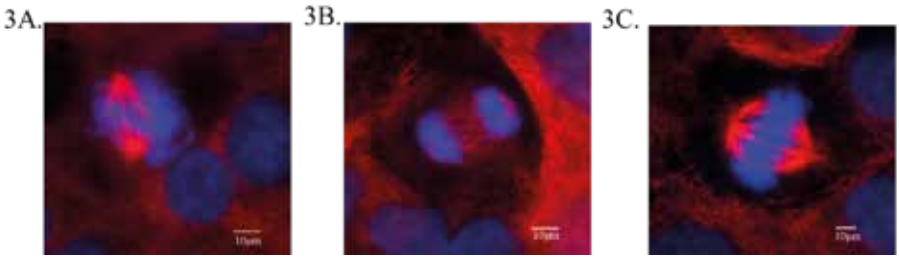


Figure: Prior to perfusion, spinach leaves were cannulated at the petiole with a 26 gauge needle and secured with heat shrink tubing. Serial washes with hexane and PBS removed the wax cuticle. DNA content of fresh and decellularized leaves was quantified using Qiagen's DNeasy Plant Mini Kit. Leaves were broken down using liquid nitrogen and samples were treated following manufacturer recommendation. Protein content of fresh and decellularized leaves was quantified using microBCA protein assay kit. Both absorbance were read by a microplate spectrophotometer. Decellularization threshold is 50ng of DNA / mg of tissue and 5mg of Protein / mg of tissue.





(1) A549 cells attached to the decellularized leaf scaffold after 24 hours. DAPI = Blue, grey = brightfield. (2) An MTT assay was used to determine the viability of cells seeded on the plant scaffold. Leaves were cut to 0.5 x 0.5cm and plated into a 96-well plate. A549 cells were seeded at 5,000 cells/well for 9 days. (3) A549 cells on the leaf were seeded 72 hours prior to imaging. (3A) prometaphase: chromosome condensation and mitotic spindle formation, (3B) metaphase: chromosomes align on the metaphase plate (3C) anaphase: chromatids pulled to opposite poles. Immunofluorescence imaging performed with an Epifluorescence Microscope. Scale bar = 10μm

CONCLUSION

Plants, such as spinach leaves, can be decellularized to create thin, durable scaffolds on which human cells can attach, survive, and proliferate.

We continue development of an intact vascular network using the plant's natural venous structure and focus on cell attachment by cellulose-ECM chemistry.

Work in progress involves a complete plant-based lung microenvironment model integrating vascular (endothelial), connective, and epithelial (fibroblasts, alveolar) cells.

The final step will be to establish the personalized, ex-vivo model from which to study granulomatous and fibrotic lung diseases. This model also holds promise for a more biologically relevant drug discovery platform.

RON Kinase Receptor as a Target in Pancreatic Cancer

COLLABORATORS:

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Prognosis for pancreatic cancer is bleak as the disease is diagnosed at an advanced stage with limited therapeutic opportunities. Molecular changes that contribute to pancreatic cancer metastasis is not yet clearly defined, and thus lack targeted therapies. Immunotherapy studies were also not successful necessitating exploration of novel molecular targets for therapeutic development. The Cancer Genome Atlas (TCGA) of pancreatic cancer cohort suggested high MST1R (RON tyrosine kinase receptor) expression correlated with poor prognosis in human pancreatic cancer. RON expression elevates from pan-in lesions through invasive carcinomas. Besides RON, another protein which was reported to play a vital role in cancer metastasis is hypoxia inducible factor -1 alpha (HIF-1α). Our research focus is to identify if RON/HIF-1α axis contributes to pancreatic disease progression and if a small molecule RON inhibitor blocks this axis and abrogates metastasis using in vivo model systems.

METHODS

We have performed immuno-histochemical analysis on 101 human pancreatic tumors to determine the significance of RON and HIF-1α expression.

Manipulated RON expression in pancreatic cancer cells to directly determine if RON regulates HIF-1α expression.

Analyzed if altered HIF-1α expression contributed to decreased pancreatic tumor growth and metastasis in mouse model.

OUTCOMES

All the 101 human pancreatic tumors analyzed exhibited RON and HIF-1α expression with 95 out of 101 tumors scored 3 on a scale of 0-3 (Fig.1).

Specific targeted knock-down of RON expression in pancreatic cancer cells blocked HIF-1α expression.

HIF-1α expression was reduced in RON knock-down tumor xenografts (Fig.2).

CONCLUSION

Our preliminary results also indicate RON/HIF-1(alpha) axis exists in triple negative breast cancers, which are also lacking in targeted therapies. Successful completion of future studies will elucidate impact of this therapeutic targetin cancer care.

FIG. 1

RON and HIF-1α Expression in Human Pancreatic Tumors

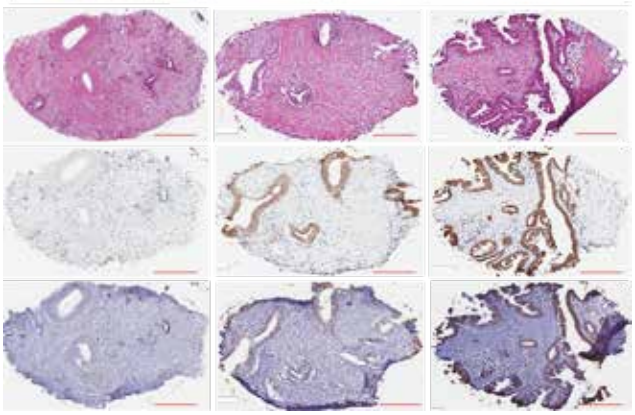
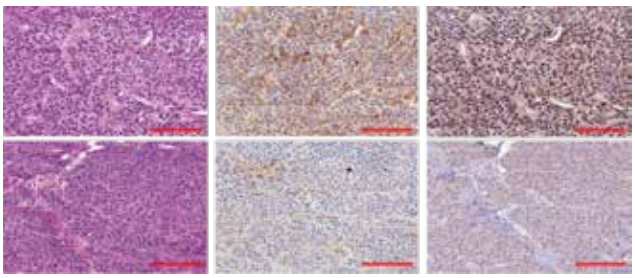


FIG. 2

HIF-1α expression is reduced in RON knock-down tumor xenografts.



eADR Algorithm for the Automated Calculation of Adenoma Detection Rate (ADR)

COLLABORATORS:

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Adenoma Detection Rate (ADR) is the percentage of screening colonoscopies in which the endoscopist discovers one or more adenomas (a type of precancerous lesion of the colon). This is one of the key reporting metrics for practicing gastroenterologists. However, the calculation of this metric is traditionally done manually at set intervals (annually, semi-annually), and thus is tedious, error-prone and labor-intensive.

A natural language processing algorithm (NLP) was developed in Python™ for the automated classification of reports and calculation of the ADR metric. The algorithm was developed using a training subset of the data and validated using a separate blinded testing set.

The algorithm was trained using a set of 246 procedures and then validated on a blinded set of 512 procedures. The algorithm was found to be a viable alternative to manual review with slightly better performance and a lower false negative rate. The greatest advantage of the algorithm is time saved with the algorithm completing 100+ man-hours worth of chart review in under 30 seconds.

TABLE 1 Performance Results of the Algorithm Compared to Manual Review

	TRAINING DATA	TESTING DATA
Total Number of Polyps	115	260
Total Number of Biopsies	171	377
Total Number of Procedure	246	512

Training Data	eADR	Manual Review	
Detection	115 (100%)	109 (95%)	Fisher's exact .0292
False Positives	0	1	
False Negatives	0	6 (5%)	

Testing Data	eADR	Manual Review	
Detection	259 (99.6%)	257 (98.8%)	Fisher's exact .02486
False Positives	0	0	
False Negatives	1*	3 (1.3%)	

*Upon review, this miss or false negative was due to a human error in data collection, wherein the data was pasted into the wrong column for that procedure alone.

CONCLUSION

This project provides evidence for the utility of NLP and automation techniques for reducing clinical and research workloads. Such algorithms can perform labor intensive tasks at frequent intervals with equal or greater accuracy than human review. The potential impact on time and cost savings, job satisfaction and patient safety are substantial. The algorithm was designed to be easily adaptable, with numerous potential clinical applications.

Diagnosis of Hepatopulmonary Syndrome in a Large Integrated Health System

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Data on the accuracy of the diagnosis of hepatopulmonary syndrome (HPS) in cirrhosis is limited. The diagnosis can be challenging and the clinical symptoms can mimic other clinical conditions (see figure below). We evaluated the clinical characteristics of patients with International Classification of Diseases (ICD) codes for hepatopulmonary syndrome (HPS) in a large multistate integrated health system.

A retrospective review of encounters was performed of all patients with ICD-9-CM and/or ICD-10-CM diagnosis of cirrhosis and HPS from 2014-2019 in our health system. Demographics and cardiopulmonary testing closest to the time of HPS diagnosis were recorded. HPS was defined using standard criteria. An ICD diagnosis of HPS was found in 0.45% of patients with cirrhosis, markedly lower than found in previous studies. Of those given the diagnosis, only 22.5% fulfilled the criteria for HPS. Confirmed HPS patients were more often diagnosed in transplant centers.

The diagnosis of HPS by ICD code is made in an extremely small subset of a sizeable cirrhotic cohort. When made, only a minority of these patients meet diagnostic criteria. Our findings highlight the need for improved education and more effective screening algorithms.

SELECT CLINICAL CONDITIONS AFFECTING LUNGS AND LIVER

Diseases that affects both liver and lungs

Cystic fibrosis
Alpha-1 antitrypsin deficiency
Hereditary hemorrhagic telangiectasia
Sarcoidosis
COVID-19

Pulmonary diseases that coexist with liver disease

Asthma
Chronic obstructive pulmonary disease
Pulmonary nodules
Interstitial lung disease

Pulmonary complications of liver disease and portal hypertension

Hepatic hydrothorax
Hepatopulmonary syndrome
Portopulmonary hypertension

Sexual Activity Delays Progression of Heart Failure in Dilated Cardiomyopathy

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Guy L Reed, MD, MS

Heart failure (HF) causes death and disability in millions of people worldwide. Patients with heart dysfunction eventually progress to HF, which is marked by fluid retention (edema) in lungs and elsewhere in the body, difficulty breathing, and ultimately affects and reduces their quality of life. For a lot of HF patients, sexual health is important. As many as 52% of men and 38% of women with HF reported that sex was important and sexual health was impacting their quality of life. However, HF patients and their partners may be reluctant to engage in sexual activity because of fear of damaging their heart. They may also be reluctant to openly discuss this activity with their physicians and physicians frequently do not consider sexual activity in their care for HF patients. More clinical and experimental studies are needed to address the safety and long-term effects of sexual activity for HF patients.

To investigate the impact of sexual activity in HF patients is challenging because of ethical factors and limited options for interventions. Therefore, to evaluate the effect of sexual activity and gain translational insights relevant to human dilated cardiomyopathy (DCM) and its transition to symptomatic heart failure (HF), we used a well-characterized pre-clinical mouse model of DCM that progresses through all A to D stages of human HF to early death. To monitor HF progression we used human clinical diagnostic modalities (echocardiography and magnetic resonance imaging), HF biomarkers assessment and microarray comparative analysis of left ventricle genetic expression.

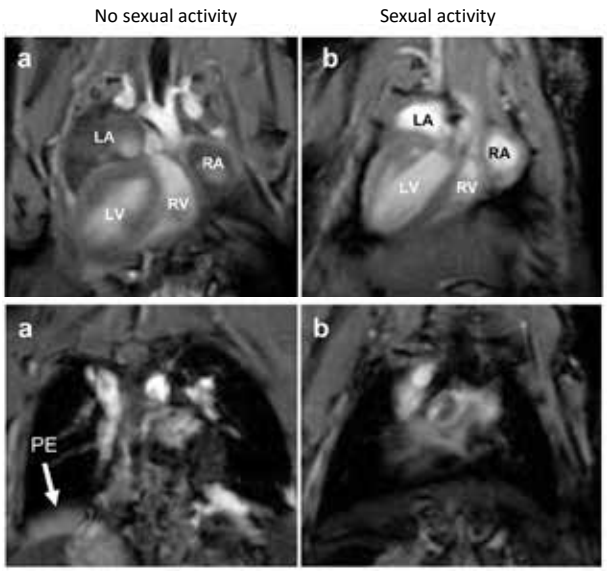

FIGURE 1:

MRI showing that sexual activity prevents heart enlargement (top row), reduces pleural effusion (bottom row) and development of heart failure in pre-clinical mouse model of DCM-HF.

The goal of the research project is to discover ways to improve the quality and length of life for HF patients. In a randomized, blinded, controlled study, we showed that sexual activity is not only safe, but beneficial in experimental HF. This study "In Experimental Dilated Cardiomyopathy Heart Failure and Survival Are Adversely Affected by a Lack of Sexual Interactions" published in the Int. J. Mol. Sci. 2020, 21(15), 5450 as a part of the Special Issue "Genetics and Molecular Pathogenesis of Non-Ischemic Cardiomyopathies" https://doi.org/10.3390/ijms21155450. We reported that deprivation from sexual activity significantly increased HF progression as definitively assessed by major physiological outcomes associated with human HF - edema, pleural effusion, systolic dysfunction (Figure 1) and reduced survival. In contrast, sexual activity improved pathophysiology of HF and altered expression of proteins that improve heart contractility to prevent and slow down the progression of heart dysfunction, delayed the onset of edema associated with symptomatic HF, and prolonged survival by almost 25% (Graphical Abstract of major findings). The bioinformatics analysis has identified dilated cardiomyopathy as the only pathology affected by sexual activity. In addition, we reported that sexual activity is associated with reduced plasma testosterone levels and that reduction of testosterone levels significantly prolonged survival.

CONCLUSION

The impact of lifestyle on HF outcomes remains poorly understood and is often overlooked since clinical management and even research have mostly focused on medical therapy. Our findings suggest a new conceptual paradigm of HF which recognizes that lifestyle and behavioral activities modify gene expression in the heart to alter the development of HF and delay its progression. This translational study supports a potential preventive role of sexual activity that delays progression of heart dysfunction to symptomatic HF. It will be important to confirm these findings in HF patients.

Assessment and Quantification of Edema in Heart Failure

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Guy L. Reed, MD, MS

BACKGROUND

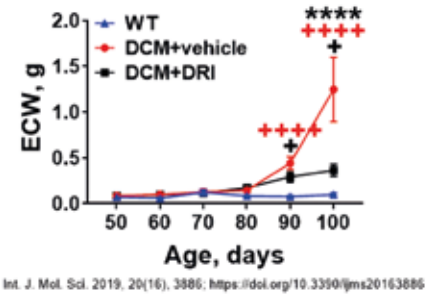
An estimated six million people have heart failure (HF) in the U.S. and the number is predicted to grow by 50% through 2035. Pathological fluid retention or edema is a major clinical sign that denotes the progression of cardiac dysfunction to symptomatic heart failure and is one of the main predictors of poor outcomes. Fluid accumulation is not always apparent during the initial transition, as substantial volumes are necessary to cause clinical signs. Fluid retention assessment throughout disease progression is challenging because pathological fluid accumulation is not initially visible in many patients. Objective detection and quantification of edema is a major challenge in HF management. Technologies to measure edema may include MRI, bioimpedance analysis/spectroscopy, or a baseline edema measuring device which utilizes water displacement. These systems require specialized training, prolonged measuring times, and are not widely available during disease identification, progression or longitudinal monitoring. Without objective, non-invasive and reproducible measurements of fluid retention, it is difficult to precisely conduct medical interventions for symptoms like shortness of breath, swelling, and lung congestion associated with clinical heart failure. Increases in extracellular water retention (or the water outside the cell) causes swelling, pleural effusion, lung and peripheral edema defining the transition from heart dysfunction to clinical heart failure. Despite having great potential as a marker of edema, extracellular water retention is not routinely measured in current clinical practice.

METHODS

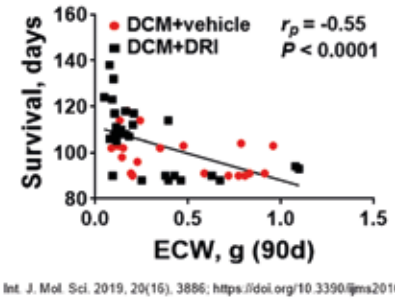
We pioneered the use of non-invasive quantitative magnetic resonance (QMR) technology in the HF setting to objectively measure and quantify extracellular water (ECW) retention and systemic edema (ascites; limb, pulmonary and pleural effusion). The same technology can also identify the onset of cachexia and/or sarcopenia which require clinical intervention to improve HF outcomes.

OUTCOMES

Our studies in translational model of heart failure (DCM) showed that longitudinal monitoring of extracellular water (ECW) retention can identify edema development, thus the transition from cardiac dysfunction to true heart failure (Figure 1). ECW levels ultimately correlated with survival (Figure 2). Tech Launch Arizona has filed a provisional patent related to this technology (Invention UA19-018) and is supported by the following publications and conference presentation: 1) Sullivan R.D., et al. Abstract 16743: Targeting Renin Activity in Heart Failure: Precision Therapy with Aliskiren Improves Systolic Function and Prolongs Survival in Female Experimental Dilated Cardiomyopathy. Oral presentation at AHA Scientific Session 2018, November 10-12, Chicago IL. 2) Sullivan R.D. et al. (2019). Normalizing Plasma Renin Activity in Experimental Dilated Cardiomyopathy: Effects on Edema, Cachexia, and Survival. Int. J. Mol. Sci. 20(16), 38. Special Issue Heart Failure: From Molecular Basis to Therapy. 3) Tripathi, R., Sullivan R.D. et al. (2020). Cardiac-Specific Overexpression of Catalytically Inactive Corin Reduces Edema, Contractile Dysfunction, and Death in Mice with Dilated Cardiomyopathy. Int. J. Mol. Sci. 21(1), 203. Special Issue Biomolecular Mediators in Cardiomyopathies. https://doi.org/10.3390/ijms21010203. 4) Sullivan R.D. et al. Corin Overexpression Reduces Myocardial Infarct Size and Modulates Cardiomyocyte Apoptotic Cell Death. Int. J. Mol. Sci. Int. J. Mol. Sci. 2020, 21(10), 3456; doi.org/10.3390/ijms21103456. PMCID: PMC7278931. Special Issue Myocardial Infarction and Myocardial Protection.



Int. J. Mol. Sci. 2019, 20(16), 3886; https://doi.org/10.3390/ijms20163886



Int. J. Mol. Sci. 2019, 20(16), 3886; https://doi.org/10.3390/ijms20163886

CONCLUSION

Our research projects and current invention strive to discover ways to improve the length and quality of life for heart failure patients. The proposed technology permits correlations between systolic dysfunction and clinical signs of heart failure with the degree of systemic edema in heart failure. The advantages of QMR over current clinical modalities are operational ease, recording speed, accuracy, reproducibility of measurements, and compatibility/safety with most metal implants (pacemaker, stents etc.).

Loss of Endothelial HIF-Prolyl hydroxylase 2 (PHD2) Induces Cardiac Hypertrophy

COLLABORATORS:

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University of Arizona College of Medicine — Phoenix

Ting Wang, PhD
University of Arizona College of Medicine — Phoenix

Youyang Zhao, PhD
Ann & Robert H. Lurie Children's Hospital of Chicago

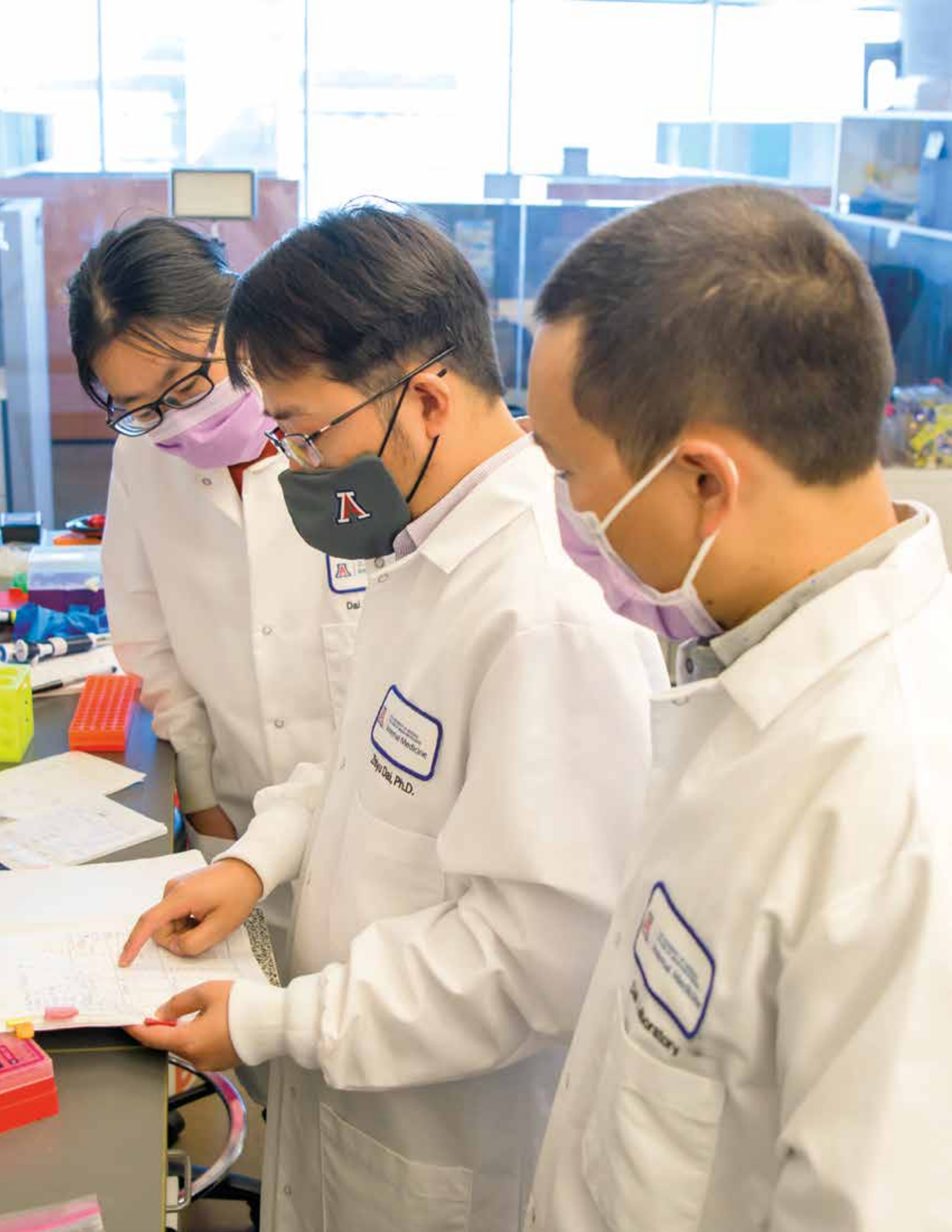
Cardiac hypertrophy can happen in physiological and pathophysiological conditions. Pathological hypertrophy induced by hypertension, myocardial infarction and cardiomyopathy results in ventricular remodeling which is associated with systolic and diastolic dysfunction and interstitial fibrosis, and finally leads to deleterious outcomes such as heart failure. Understanding the mechanistic molecular signaling in the event of physiological and pathological cardiac hypertrophy will lead to identify novel therapeutic approaches for patients with heart failure.

Mice with Tie2-Cre-mediated deletion of Egln1 (encoding PHD2) (Egln1Tie2-Cre), as well as double knockout mice with both Egln1 and Hif1a or Egln1 and Hif2a were generated. Egln1f/f bone marrow cells were transplanted to lethally irradiated Egln1Tie2-Cre mice to determine the contribution of bone marrow cells in cardiac hypertrophy. Mice carrying Egln1f/f were bred into EndoSCL-Cre-ER(T) mice containing tamoxifen-inducible Cre to generate mice with Egln1 deletion only in endothelial cells in adult mice (Egln1SCL-Cre) after tamoxifen injection. Echocardiography were measured to study cardiac size and function. Histological examination was also performed.

Egln1Tie2-Cre mice exhibited left ventricular hypertrophy evident by increased thickness of anterior and posterior wall and left ventricular mass, as well as cardiac fibrosis. Egln1 deletion in bone marrow cells did not contribute to cardiac hypertrophy. Tamoxifen induced endothelial Egln1 deletion in adult Egln1SCL-Cre mice also induced left ventricular hypertrophy and heart failure. Genetic ablation of Hif2a, but not Hif1a, in Egln1Tie2 mice normalized cardiac size and function. Additionally, we observed a marked decrease of PHD2 expression in heart tissues from patients with dilated cardiomyopathy.

CONCLUSION

These studies define for the first time an unexpected role of endothelial PHD2 deficiency in inducing cardiac hypertrophy in a HIF-2α dependent manner. Thus, targeting PHD2/HIF-2α signaling represents a novel therapeutic approach for the treatment of cardiac hypertrophy.



Comparison of Three Anti-Coccidioides Antibody Enzyme Immunoassay Kits for the Diagnosis of Coccidioidomycosis

COLLABORATORS:

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Department of Medicine, UArizona College of Medicine — Phoenix

Joshua Malo, MD
Department of Medicine UArizona College of Medicine — Tucson

Coccidioidomycosis (Valley Fever) cases are increasing in Arizona. The spectrum of disease is broad, ranging from a mild, self-limited illness to severe or disseminated disease. As clinical signs and symptoms are similar to other causes of community acquired pneumonia, the diagnosis may be difficult.

Serologic methods provide the laboratory basis for diagnosis in most cases. Commonly, initial testing is performed using antibody enzyme immunoassays (EIA). How good are these blood tests? We really don't know. For example, in immunocompromised patients, there is concern about reduced sensitivity in patients at the highest risk for severe disease. In order to determine utility of these tests in patient populations, post-marketing studies and head-to-head comparisons of available tests are needed.

To help answer this important clinical question our team evaluated two widely used commercially available EIAs, the Meridian Premier® Coccidioides EIA (Cincinnati, OH), the Immuno-Mycologics (IMMY) Omega Coccidioides EIA (Norman, OK) and a newer antibody EIA MiraVista Diagnostics (MVista).

A total of 103 unique serum samples from patients in Arizona with definite (n=27) and probable (n=76) coccidioidomycosis were included in our study. Cases were verified by chart review. Research serum collection was performed at varying times from the initial diagnosis. Controls included 88 residual serum specimens from the Houchin Blood Bank (Bakersfield, CA), 60 specimens from healthy donors and 22 clinical controls diagnosed with illness other than coccidioidomycosis at Banner – University of Arizona Medical Center. EIAs were performed according to manufacture protocol.

We found that the overall combined sensitivity for detection of IgG and/or IgM was higher for the MVista EIA (88.3%) compared to the Meridian EIA (71.8%, p=0.0004) and the IMMY EIA (59.2%, p<0.0001). Specificities for combined IgG and/or IgM testing were similar across groups: MVista EIA 87.5%, Meridian EIA 95.5%, and IMMY EIA 93.7% (p=0.055 and 0.169 comparing to Meridian and IMMY, respectively).

In contrast to what is often reported, the sensitivity of the MVista IgG EIA was not significantly influenced by the type of coccidioidomycosis (pulmonary or disseminated), the duration of illness prior to testing, underlying immune status, or antifungal therapy.

For the IMMY EIA, IgG antibody was detected more frequently in patients with disseminated disease and a longer duration of illness but was not significantly affected by immune status or prior antifungal therapy. For the Meridian EIA, IgG antibodies were detected more frequently in immunocompetent patients.

It is a common clinical practice for EIA assays to be used for initial diagnostic testing for coccidioidomycosis. Although serial serologic testing is recommended and increases sensitivity, it is unclear how commonly serial testing is performed. As such, a more sensitive test may reduce the risk of under-diagnosis of coccidioidomycosis, which remains a major concern in areas in which the disease is endemic. This study has some limitations that should be considered when interpreting our findings. All testing was performed at a single laboratory. Performance characteristics of the commercial EIA kits vary according to the performing laboratory. Given timing of the research blood draw, we were unable to assess variation in the EIA performance at very early timeframes. Further prospective comparison of these assays focusing on performance characteristics over time is warranted.

TABLE Sensitivity for IgG antibodies in predefined subgroups

Parameter	MVista	IMMY	Meridian
Pulmonary (72/103)	90.2%	37.5%	72.2%
Disseminated (31/103)	83.9%	67.7%	67.7%
< 3-month illness (54/103)	85.2%	35.2%	70.1%
> 3-month illness (49/103)	89.8%	59.2%	67.3%
Immunocompromised (30/103)	83.3%	46.7%	53.3%
Immunocompetent (73/103)	90.4%	46.5%	78.1%
Prior antifungal (78/103)	88.5%	51.3%	66.7%
No antifungal (25/103)	88.0%	33.2%	84.0%

CONCLUSION

We found that the MVista Coccidioides Antibody IgG and IgM EIA demonstrates improved sensitivity and similar specificity to two commonly used commercial EIA tests for coccidioidomycosis. The more favorable performance is preserved regardless of immune status, antifungal therapy, and duration or severity of illness. Post-marketing and head-to-head comparison of clinical tests are important studies to perform.

Converting a Diverse Clinical Research Team into COVID-19 Ready Researchers

COLLABORATORS:

Anna Valencia, MPH

The DOM Office of Research

COVID-19 magnified the relevance of clinical trials in the search for viable medical treatments. The immediate need to evaluate existing therapies created an influx of requests for clinical researchers to participate in a myriad of trials. In addition, multiple physicians sought to contribute investigator-initiated studies to increase scientific knowledge. The University of Arizona Health Sciences, Banner Research and UArizona IRB teams responded rapidly, providing processes to expedite specific requests for COVID-19-related studies. Physicians and administrators from the UArizona Colleges of Medicine – Phoenix, College of Medicine – Tucson and College of Pharmacy collaborated to form a UA/Banner COVID-19 scientific review committee. The committee screened a volume of institutional requests and implemented logistics for clinical trial participation.

The Clinical Research Support Services (CReSS) team is an established, centralized service at the College of Medicine – Phoenix to support investigators through clinical research initiatives from start-up to study closure. CReSS includes a team of versatile clinical research coordinators that support studies across several College of Medicine – Phoenix departments and divisions. This centralized model expedited mobilization of coordinators to support novel COVID-19 trials.

Banner – University Medical Center Phoenix initiated protocols to protect employee health and safety, requiring non-essential staff to work remotely. A remote solution had to be developed for clinical trials as well. New trials were hampered by logistical obstacles, such as lack of PPE accessible to clinical researchers in the early stages of the pandemic, limited resources for childcare, making rapid response to study enrollments unfeasible for many researchers, and the need to redesign in-person subject consent and study-related procedures.

CReSS had a two-year history of maintaining electronic clinical trial documentation in REDCap to support a secure and paperless environment while maintaining compliance with study-related documentation requirements. With a strong regulatory compliance and clinical data team, CReSS quickly implemented an eConsent process to enable remote enrollment of COVID-19 + patients in an inpatient setting. This remote option reduced risk of exposure for clinical research coordinators and enabled compliance with emerging university and hospital physical restrictions.

Given the complexity and fluctuation in symptom-based eligibility criteria and timing for enrollment windows dependent on confirmed COVID-19 testing, a two-team format was

For successful implementation of remote clinical trial enrollment, CReSS required strong collaborations with the Banner-University Medical Center Phoenix COVID-19-unit teams and research pharmacy.

devised for each trial. This enabled longer enrollment days to accommodate numerous steps from consent to drug administration. Protocols required daily patient assessments, so teams alternated weekend coverage to ensure subject safety monitoring.

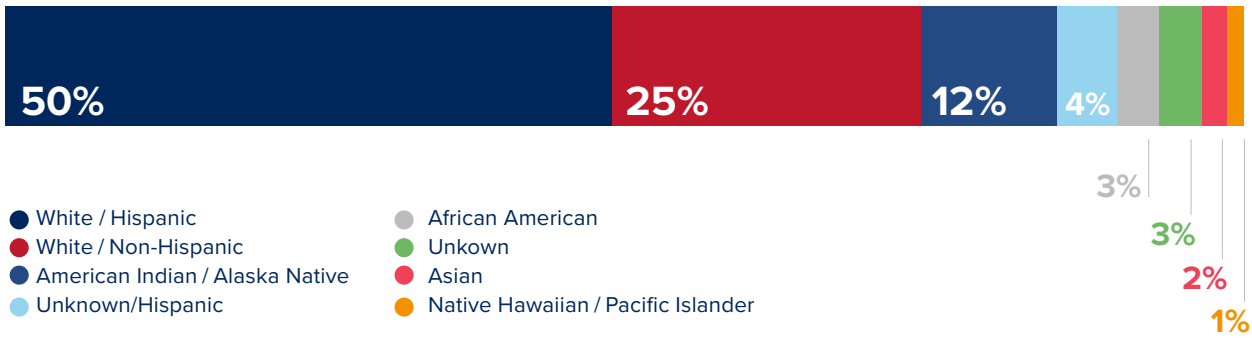
Multiple studies opened simultaneously, causing physicians and coordinators to raise concern about how to accommodate competing trials given the lack of scientific evidence to support one potential therapy over another. To ensure clinical research equipoise across overlapping trial eligibility criteria, a COVID-19 prescreening coordinator was deployed to provide initial subject review and tracking across potential studies during screening phases.

Minority populations were especially impacted by COVID-19. Conscious of the large Hispanic population in Phoenix, CReSS deemed it imperative that each clinical trial team included Spanish-speaking coordinators to best meet the needs of patients considering participation in trials.

For successful implementation of remote clinical trial enrollment, CReSS required strong collaborations with the Banner–University Medical Center Phoenix COVID-19-unit teams and research pharmacy. Physician engagement was crucial to decisions regarding patient eligibility, patient communication during the consent process as well as clinical assessments during subject monitoring.

Given the need for patient isolation, unit nurses were integral in developing research awareness, daily patient communications, study-related labs and drug administration. Research pharmacy worked tirelessly to ensure drug availability, compliance with randomization requirements and timing of drug administrations. Medical residents also participated providing study-related specimen transport from COVID units to laboratory team handoff. Successful trial implementation truly embodied a synthesis across multiple individuals and teams.

COVID Study Participants



CLINICAL EXCELLENCE

Patient care has considerably changed in recent years and will continue to do so in a rapid way. It is unequivocally shifting the way providers practice and healthcare systems are designed, managed and reimbursed.

An evident issue surrounding patient care in the United States is the inadequate and uneven variation according to region and setting. There are significant disparities in access to care by sex, age, race, ethnicity, education, and family income. These disparities exist with all levels of access to care. On the other hand, hospital systems are also now being scrutinized by large private and public organizations and commissions with the hope of ensuring clinical care and outcomes.

This evolution of healthcare has identified a need for patient-centered care, not only in the doctor's office, but also at the hospital. The University of Arizona College of Medicine – Phoenix is in a unique position since we have partnered with different institutions that include Banner – University Medical Center Phoenix, Phoenix VA Health Care System and Phoenix Children's Hospital. This symbiosis has been fruitful in training future generations of physicians and medical professionals. It has also provided ample opportunity to gain understanding in the intricacies of patient care in our diverse Phoenix community.

This invaluable exposure to different hospital systems has led to visionary work in many fields, some of which are highlighted in this publication. The efforts performed in hepatology, COVID-19, electrophysiology and programs highlighting underserved communities and minorities are some examples. I hope these initiatives make you as enthusiastic as I am about the future of patient-centered care.

Samuel Unzek, MD, FACC, FASE, FASNC
Cardiovascular Disease and Advanced Cardiac Imaging Director,
Cardiac Clinical Operations and Quality

United Against COVID-19: the Navajo Nation and UArizona College of Medicine–Phoenix

COLLABORATORS:

Lorna Rapaich, Medical Student

Cory Detlefs, MD

Michael Fallon, MD

Harvey Hsu, MD

Marilyn Glassberg, MD

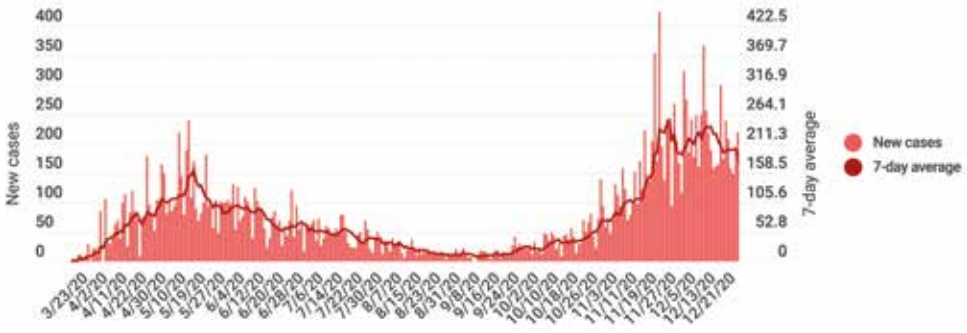
"T'áá hwó' ají t'éego"–Diné (Navajo) Teaching

(If it must be, then it is up to me.)

When the first Native American patient with COVID-19 infection arrived at Banner—University Medical Center Phoenix in mid-March 2020, no one could have anticipated what would befall the Navajo Nation in the weeks to come as the virus spread across our community. Native Americans that would arrive in the next month would come from Whiteriver, Chinle, Tuba City, Kayenta, Gila River, many other sites in Arizona and reservations in New Mexico and Utah. The hospitals nearest to these sites, depleted of their ICU beds, were transferring patients to us in alarming numbers. Families and communities of our own students and residents were devastated by COVID-19 and were in need of support beyond our medical care.

UArizona College of Medicine—Phoenix students, Lorna Rapaich and Krichelle White, utilized social media to draw attention to the crisis facing the Navajo Nation and the Phoenix community was quick to respond. Food baskets for the elderly and families with school-aged children were assembled. Monetary donations created an ongoing supply of canned food, diapers, wipes, detergent, hand soap, travel-size hand sanitizers, gloves, bleach, toilet paper, and bottled water. The students disseminated critical supplies using the local trading post as the distribution center, taking all necessary precautions to mitigate the spread of the virus.

New reported cases by day on Navajo Nation



New cases of COVID each day on the Navajo, Hopi and Zuni reservations. Data gathered from Indian Health Service

Janell Tully and Kevin Gochenour, medical students with the UArizona College of Medicine COVID-19 Student Service Corps (CSSC) Chapter, organized delivery of PPE to healthcare workers. They flew with donated services from Guardian Air to meet the Attorney General of the Navajo Nation, Doreen McPaul. They coordinated delivery of medical supplies to the Navajo Nation and Operation Pegasus was born. In the first two months of the pandemic in Arizona, Operation Pegasus took 11 flights carrying supplies to the Navajo Nation.

Partners from Arizona and across the world stepped forward to support the Navajo Nation in fighting the challenges brought about by the novel pandemic.

A fundraising competition between students and faculty yielded over 100 gallons of hand sanitizer donated by OHSO Brewery and delivered by Operation Pegasus. Working with medical residents at Banner – University Medical Center Phoenix, an additional 2,000 pounds of food, water, cleaning products, and medical equipment were delivered to Kayenta. The American Korean Association, remembering the role of the Navajo Nation as Code Talkers during the Korean War, contributed 7,800 pounds of food, water, hand sanitizer, and more N95 masks.

Support from healthcare staff in the Indian Health Service (IHS) helped to expand major outreach efforts to several reservations and facilitated delivery of hundreds of COVID test kits and medical supplies.

The UArizona College of Medicine – Phoenix heeded the Diné call to service during a particularly challenging time and will continue work toward improving the health and wellness of our communities.

SUPPORT PROVIDED BY:

American Korean Association

Guardian Air

OHSO Brewery

UArizona College of Medicine – Phoenix Internal Medicine Residency Program and BUMCP Internal Medicine Center

UArizona College of Medicine – Phoenix Faculty and Medical Students

Indian Health Service (IHS)

Countless humanitarians among communities across the state and region who donated time, money and supplies

2,000
Surgical / Cloth Masks

10,700
N95 Masks

190
Goggles

1,200
Face Shields

480
Improvised &
PPE-grade Gowns

Banner Health Collaborative Care Program

COLLABORATORS:

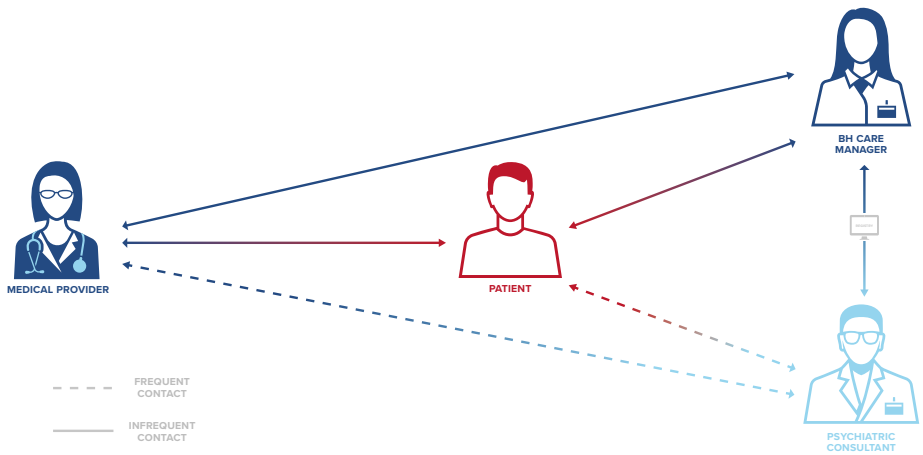
Harvey Hsu, MD
Ivorie Coleman, MD, MBA
Deborah Kestiel, RN
Alena Petty, DO
Jason Leubner, MD

BACKGROUND

Physical and mental health are deeply intertwined. Close collaboration between primary care and mental health providers will better serve patients with mental illness who choose to seek care by primary care providers (PCP). The Internal Medicine Center, Family Medicine Center, and Banner Behavioral Health Institute partnered to create the Collaborative Care Program (CCP). The CCP consists of faculty and residents from three residency programs leveraging the strengths of the system to provide team-based care, with the aims to improve patient mental health outcomes and support medical education.

METHODS

PCPs identify patients with known or suspected depression or anxiety who would benefit from augmented monitoring and treatment by behavioral health specialists. These patients are referred to a behavioral health nurse, who completes an initial assessment of depression and anxiety using two validated tools, GAD7 and PHQ9.



Weekly huddles between the psychiatry attending and nurse are completed to review active patients and provide recommendations to the PCP. Recommendations were tailored to the specific needs of each patient, with several themes identified for targeted education in internal medicine and family medicine programs.

Key reasons for referral to the Collaborative Care Program:

- non-response to current depression or anxiety treatment
- need for frequent monitoring
- mental health diagnosis is unclear

RESULTS

A total of 46 participants completed the program in its first year. There was a 62% reduction in PHQ9 scores and a 53% reduction in anxiety severity scores.

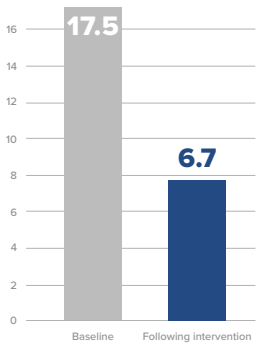
Patient experience (qualitative):

- perceived decrease in frequency of in-person visits to multiple providers
- increased satisfaction with continuity of care by trusted PCP

Themes for educational interventions:

- dosing regimens to optimize efficacy
- switching medication classes
- side effect awareness and management
- minimizing the use of addictive and sedating medications

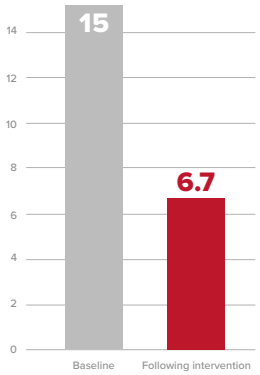
Mean PHQ9 Score



PHQ9 Scores	Depression Severity
0-4	Minimal or none
5-9	Mild
10-14	Moderate
15-19	Moderately Severe
20-27	Severe

Reduced by 62%

Mean GAD-7 Score



GAD-7 Score	Anxiety Severity
5-9	Mild
10-14	Moderate
>15	Moderate

Reduced by 55%

CONCLUSION

Banner's Collaborative Care Model improves comprehensive mental health care for patients being treated by their trusted physicians and teaches future primary care physicians best practices for depression and anxiety treatment. The CCM could be easily replicated in other multispecialty and multidisciplinary collaborations. We plan to investigate the use of this CCM to target and treat patients with hypertension and diabetes.

Standardizing Care for Acute Alcoholic Hepatitis

COLLABORATORS:

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Mohanad Al-Qaisi, MD

Domingo Maynes III, MD

C. Luke Peterson, DO

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Shivang Mehta, MD

Michael Fallon, MD

Acute alcoholic hepatitis (AH) is one of the most severe manifestations of alcoholic liver disease, occurring in patients with chronic or active heavy alcohol use. AH can range from mild to severe and life-threatening disease with one-month mortality rates as high as 30-50%. Complications related to alcoholic liver disease result in costly hospitalization. In the US, alcoholic hepatitis accounted for 325,000 hospitalizations annually in 2010 with an average cost of $46,264 and the most common diagnosis being hepatic encephalopathy.

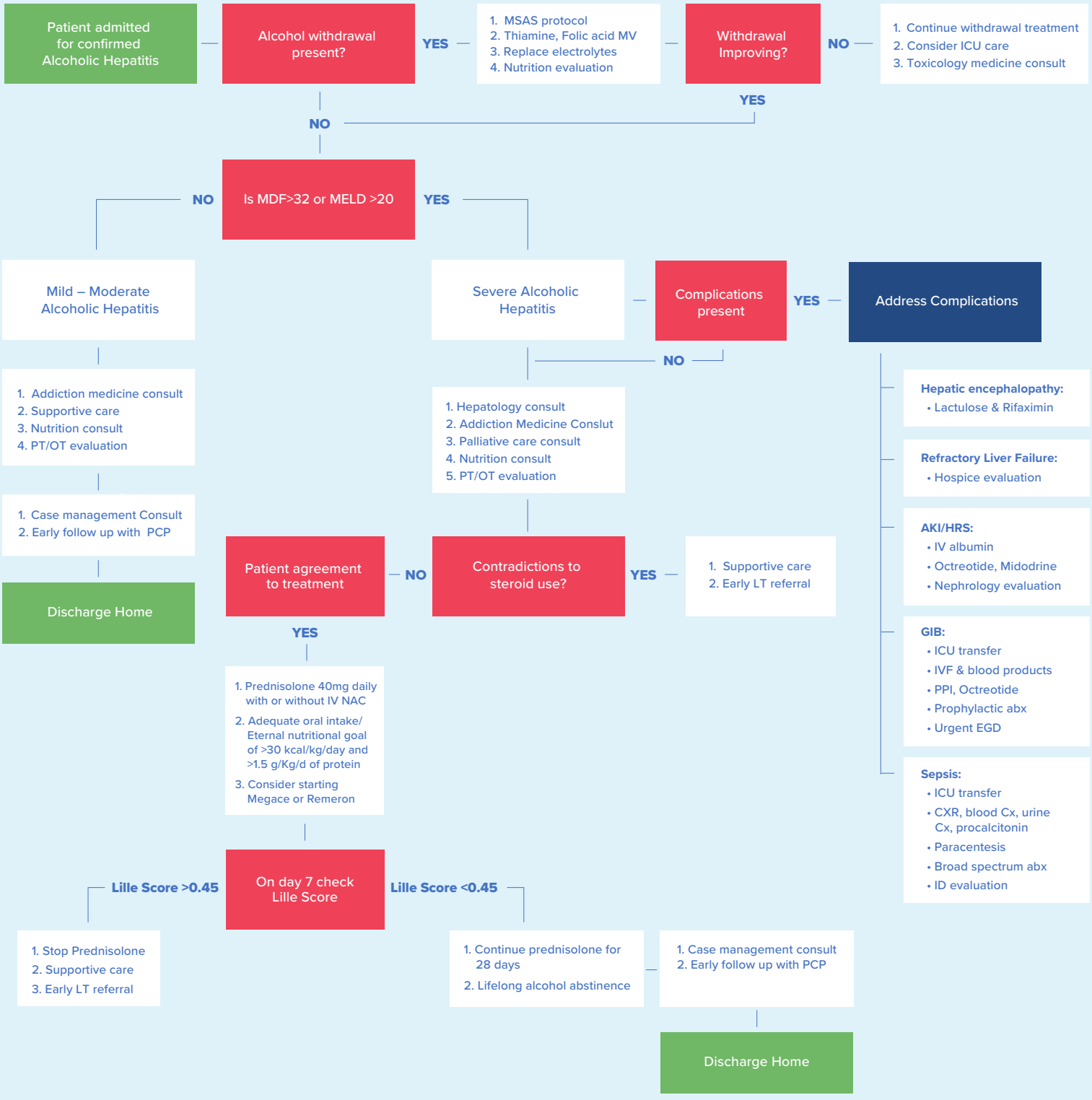
Our institution serves a large population of patients admitted from across the state and region with AH. A review of our baseline data uncovered large variation in clinical care and outcomes of these patients. A multidisciplinary team was created to identify opportunities to reduce variation in care of AH and improve patient outcomes. We developed an evaluation and treatment protocol at our institution within the electronic health record, based on clinical guidelines, that optimizes our current system of care delivery.

We plan to collect and analyze data before and after implementation to compare variables including length of stay, ICU utilization, medication use, mortality rate, disposition, and readmissions. We will also perform cost analysis of average stay before and after implementation of the protocol.

CONCLUSION

Alcoholic hepatitis carries a high risk of mortality and is costly to the system. We hypothesize that variability in care contributes to the poor outcomes of patients with this condition. Further, we hope to implement a standardized evaluation and treatment protocol that will standardize and improve care.

Acute Alcoholic Hepatitis Evaluation and Treatment Algorithm



Discharge Planning

- Improvement in bilirubin, total bilirubin < 10 mg/dL
- Stable creatinine
- Adequate nutrition
- Consider psychiatric and behavioral therapy
- Consider pharmacotherapy to prevent relapse
- AA and self-help program referral
- Addiction medicine referral
- Social worker consult
- Nurse navigator will see patient from day 1 of admission (Mon-Fri) till day of discharge
- Nutrition referral

Banner–University Medical Center Phoenix: An Age-friendly Health System

COLLABORATORS:

Nimit Agarwal, MD
Chief, Geriatric Medicine

Shane Speirs, MD
Fellow, Geriatric Medicine

As ten thousand baby boomers turn 65 everyday, making healthcare easier and simpler for our older adults has never been more important. It is known that as we age, health needs become more complex and it is. It is no surprise that older adults suffer a disproportionate amount of harm while in the care of healthcare systems.

Banner–University Medical Center Phoenix has been part of the Age-friendly Health System movement since November 2019 and has been recognized as an exemplar in the movement as a Center Committed to Care Excellence. An Age-friendly Health System is one in which every older adult's care is guided by an essential set of evidence-based practices (the 4Ms), causes no harm and is consistent with What Matters to the older adult and their families.

In providing the 4M framework of care which includes: What Matters, Mentation, Mobility and Medications; the Division of Geriatric Medicine has taken a unique interdisciplinary approach by engaging physicians, nurses, therapists, social workers and pharmacists in a model of smart rounding called virtual Acute Care of Elders where all the components of the 4Ms are reviewed using data gathered in electronic reports from the EHR and making necessary clinical interventions for the care of our older patients. This approach has led to improving mobility in our units by more than 30% as compared to before its inception, increased recognition of delirium and preventing use of unsafe medications in older adults. Most importantly every patient seen by the consult service receives comprehensive palliative and curative care which is consistent with their goals and what matters most to them.

CONCLUSION

The unprecedented shifts in the age and ethnic structures of Arizona's population will challenge the ability of healthcare providers to deliver a full spectrum of health and social services specifically to the aging population. We are proud to be leading the path in providing Age-friendly Care in Arizona.

Age-Friendly Health Systems

What Matters
Know and align care with each older adult's specific health outcome goals and care preferences including, but not limited to, end-of-life care, and across settings of care.

Medication
If medication is necessary, use Age-Friendly medication that does not interfere with What Matters to the older adult, Mobility, or Mentation across settings of care.

Mentation
Prevent, identify, treat, and manage dementia, depression, and delirium across settings of care.

Mobility
Ensure that older adults move safely every day in order to maintain function and do What Matters.

Discharge Planning and Home Pulse Oximetry for COVID-19 Patients

COLLABORATORS:

An Tran, DO

Harvey Hsu, MD

Sarah Carstens, MD

Emily Mallin, MD

Marilyn Glassberg, MD

Jeremy Goodman, MD

Internal Medicine Nurse Navigators

Early in the pandemic, we identified several barriers to safe discharge for patients with COVID-19, including safe transport, securing home oxygen and home monitoring of oxygenation. We created an interdisciplinary team including members from case management, nursing, clinic staff, hospitalists and ambulatory care physicians to create a process with seamless communication to arrange for follow up and ensure safe transport home (PPE-protected drivers). With support from institutional leadership, we purchased pulse oximeters to distribute to patients going home on oxygen who otherwise could not buy one (due to very low supply or financial barriers) to help reduce readmission and ensure a safe discharge.

We used Microsoft Teams™ for internal communication as well as to centralize communications to all stakeholders. With an emphasis on centralized and easily accessible information for all team members, everyone remained informed as the process continued to be adjusted and enhanced. Data analysis is underway to identify the number of patients under this system and their outcomes. Anecdotal reporting notes a reduction in length of stay from the time the system was engaged, as well as a low readmission rate.

CONCLUSION

We used a multidisciplinary approach to reduce barriers to discharge in a particularly challenging time in health care. This illustration in collaborative teamwork around patient care and post-discharge follow up is another testament to our commitment to our core values – superb patient care, an inclusive and innovative team approach to problem-solving, and continuous improvements across our system.

Stereotaxis-based Robotic Cardiac Electrophysiology Procedure Lab Signals New Era in Cardiac Care

COLLABORATORS:

J. Peter Weiss, MD, MSc

Wilber Su, MD

Michael Zawaneh, MD

Banner – University Medical Center Phoenix Administration

Banner CV Service line led by Kristi McShay

The foundation for automation and remote technology in cardiac procedural medicine

Electrophysiology (EP) ablation procedures are traditionally performed by hand, using stiff catheters that have changed little over many years and that are ill-suited to optimize safety and effectiveness working in the flexible, dynamic heart. The magnetic robotic system brings the opportunity to optimize safety and effectiveness as well as move forward work on automation and remote procedural medicine that will certainly drive future innovation. In September 2020, our new cutting-edge EP lab opened, featuring the Stereotaxis Genesis RMN® system. It is the second system of its kind in the world (just after Finland) and first in North America. This integrated EP lab system enables locally remote procedures with the operator outside the procedure room, in anticipation of advancing the practice of remote procedural medicine and automation. Additional information on the use of Robotics in EP and the future of telemedicine in cardiac procedures was recently published in in Current Opinions in Cardiology.

The introduction of this robotic technology to Banner – University Medical Center Phoenix and UArizona College of Medicine – Phoenix system offers the opportunity to lead the essential evolution towards reduction of human error in medical procedures through automation as well as the broadening of medical education, collaboration in research, and patient access beyond geographical limitations through the development of remote procedural medicine.

La Vida Sana Initiative Improves the Health of Our Spanish-speaking Community

COLLABORATORS:

Ricardo Correa Marquez, MD

Latino Medical Student Association
UArizona College of Medicine

Phoenix Allies for Community Health

NHMA-Phoenix Chapter

UArizona College of Medicine
—Phoenix Office of Equity, Diversity and Inclusion

The prevalence of diabetes type 2 is a major health problem in the United States, disproportionately affecting underserved communities especially in the Spanish-speaking community in border states. Our project aim is to describe the impact of the Vida Sana or Healthy Life Initiative at Phoenix Allies for Community Health clinic, serving marginalized low-income communities of working poor who have no access to primary care. Vida Sana is an eight-week course with five educational sessions followed by two social sessions and a final session. This initiative, first implemented in 2019, aims to increase the health literacy of and decrease complications of diabetes mellitus type 2 (T2D) in its participants.

The program uses Navegantes, or peer support healthcare navigators. At the first visit, Navegantes administer a health literacy survey to assess participants' knowledge of chronic conditions, such as T2D and cardiovascular disease. Navegantes record the weight, BMI, blood glucose, LDL cholesterol, waist circumference and blood pressure. In subsequent meetings, Navegantes use the Vida Sana curriculum materials to introduce the participants to topics related to health and lifestyle choices. The program also includes social events to reinforce concepts in the curriculum. An assessment of the program's impact on metabolic syndrome indicators is completed in the final session. A total of 138 clinic patients participated in the program. 47% of participants who completed the course were diabetic. Participants' weight, BMI, waist circumference, blood glucose, cholesterol and blood pressure were measured at the first and the last sessions.

RESULTS

The Vida Sana initiative at a free clinic in Phoenix, AZ improved the health literacy of the majority of its participants. At eight weeks, more than half of participants had improved scores on a health literacy test and saw maintenance or improvement of weight, BMI, waist circumference, a1c, blood sugar, total cholesterol and blood pressure.

CONCLUSION

The Vida Sana program was successful in improving health literacy and markers of cardiovascular health. We aim to expand the program to other clinics in the metro Phoenix area with the larger aim to improve health in vulnerable populations.

The Navajo Nation: Building Relationships Beyond COVID

COLLABORATORS:

Jayne Peterson, MD

Shaunak Pandya, MD

Raquel Burbank, MD

INITIAL PROJECT RESIDENT CO-LEADERS TEAM:

Arati Pandya, MD

Gabriel Ruiz, MD

Todd Peterson, MD

Kelvin Dan, MD

Naomi Newman, MD

Meenakshi Sridhar, MD

Amara Finch, MD

Andrea Polito, MD

Navajo patient with COVID-19 cared for at BUMCP recovering at home

Early in the COVID-19 pandemic the Navajo Nation was hit hard with COVID-19 cases, overwhelming their ICU capacity. Our Internal Medicine residents and faculty helped manage many patients upon transfer to the Banner–University Medical Center Phoenix ICU and continued to coordinate care upon discharge through our ambulatory post COVID-19 discharge telemedicine program. Barriers to care, such as lack of clean water, food and cleaning supplies, quickly became apparent for those who were being quarantined.

Internal Medicine Residency program team leaders reached out to local Navajo Nation Medical Center Community Program leadership at Kayenta, AZ and Tuba City, AZ to identify specific needs. They joined the University of Arizona Medical Student Service Corp; Internal Medicine Residency & community partners to collect donations. Three teams delivered these donations and met with previous patients to gain perspectives on their care.

The team conducted three major donation drives to support communities in the Navajo Nation. They delivered trailers full of critical supplies to Kayenta and Tuba City in May, June and September 2020. The ICU staff met with two patients, who were previously hospitalized with COVID-19, and learned their incredible stories of recovery. These patient experiences were recorded and shared with the providers who cared for them in the hospital. The perspectives of these patients remain with the team as we work to reduce healthcare disparities for our patients beyond the impact of COVID-19.

CONCLUSION

This project provided a direct view into the disparities that exist in Native American communities. Providing and delivering supplies to the patients we treated improved our understanding of the impact of social determinants of health on recovery and prevention of COVID-19 infections on our rural neighbors. We found that collaborating with our larger UArizona College of Medicine – Phoenix family of medical students, residents, faculty, staff as well as community partners can make a tremendous impact on communities at risk. We are working to enhance those connections for future projects with the Navajo Nation.

MEET THE HOUSESTAFF

Department of Internal Medicine

University of Arizona College of Medicine – Phoenix

@UAPhxIM | @uaphx_medpeds | @uaphxpccm | @UAPhxSportsMed | @UAZPhxGeriatric | @MedToxFellowshp

177

College of Medicine – Phoenix third- and fourth-year medical students

rotating through the Department of Medicine this year, incorporating diverse experiences in inpatient and outpatient environments, on a journey of lifelong learning

105

Residents in 3 Programs

training to become the next generation of exemplary physicians, researchers, educators, advocates, innovators, and leaders, dedicated to improving the health and wellbeing of our community

- **70** Categorical Internal Medicine
  4 Primary Care Track
- **11** Preliminary Internal Medicine
- **24** Combined Internal Medicine-Pediatrics

6

Chief Residents

- **4** Traditional Internal Medicine Chief Residents
- **2** Chief Residents in Quality and Safety

57

Fellows across 9 Fellowship Programs

receiving cutting-edge training to meet the complex needs of our patients with compassion and integrity

602

Faculty Physicians

inspiring learners at all levels, committed to our educational mission

CLINICAL SITES:

Banner – University Medical Center Phoenix
Phoenix VA Healthcare
Phoenix Children's Hospital
Banner MD Anderson

Local Banner institutions
Prescott VA Healthcare
Community practices around the Valley and state

MEET THE TEAM

Department of Internal Medicine Leadership

University of Arizona College of Medicine – Phoenix

@uazmedphx @uazmedphxchair

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Education	Emily Mallin, MD
Translational Research	Ting Wang, PhD

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Gastroenterology & Hepatology	Wahid Wassef, MD
Hospital Medicine	Nilda Franco, MD
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Geriatrics	Nimit Agarwal, MD
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Palliative Care	Domingo Maynes, MD
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Clinical Outcomes and Research Analytics	Bijun Kannadath, MBBS, MS
Hospital Medicine	Melisa Celaya, PhD
Toxicology	C. Will Heise, MD

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Strategy and Growth	Marilyn Glassberg, MD

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Combined Internal Medicine – Pediatrics	Michelle Huddleston, MD
Preliminary Internal Medicine	Brenda Shinar, MD

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Gastroenterology	Yasmin Alishahi, MD
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Interventional Cardiology and Structural Heart	Prakash Balan, MD
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Sleep Medicine	Joyce Lee Iannotti, MD
Sports Medicine	Steven Erickson, MD

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Education Scholars	Dana Archbold, MD Gregory Dodaro, MD Lise Harper, MD

THE UNIVERSITY OF ARIZONA
COLLEGE OF MEDICINE PHOENIX

Internal Medicine

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