*re*imagine Internal Medicine

THE UNIVERSITY OF ARIZONA
COLLEGE OF MEDICINE PHOENIX
Internal Medicine

1ST EDITION | 2019

WELCOME

What Defines Us

We are excited to celebrate our third year as the Department of Internal Medicine in the University of Arizona College of Medicine – Phoenix. Our journey to integrate and evolve a young and innovative medical school deeply rooted in our medical community with the rich graduate medical education tradition at Banner – University Medical Center Phoenix is just beginning yet has made enormous progress.

Our goal is to consolidate the unique strengths of our amazing local partner institutions, our stellar community providers and our talented Banner – University Medical Center Phoenix and UA College of Medicine – Phoenix faculty to drive and lead the best and most efficien care for patients. Through a patient-centered approach, our teams are innovating clinical research and transforming medical education to develop the future leaders in health care. Ours is a team-based strategy, and our successes derive from the spirited and committed residents, physicians and community- and employed- faculty that are the soul of Internal Medicine.

This is reimagining academic Internal Medicine.

We created and implemented the first of its kind geriatric emergency department which enables providers to lead trauma-related care for older adults using a multidisciplinary approach. Notable areas of focus are non-surgical treatments for complex cardiovascular disease and cutting-edge therapy for pancreas and bile duct diseases. We are building on the educational strengths of our school, providing opportunities for residents to gain insight about the social determinants of health on patient care through modern-day house calls. We are designing a comprehensive research infrastructure which allows us to offer state of the art clinical trials and new technologies for advancing disease treatment.

We invite you to see some examples of what our dedicated and talented teams are accomplishing in this first edition of Reimagine Internal Medicine. We look forward to continuing our journey of partnering, leading and innovating together.

Michael B. Fallon, MD
Chair, Internal Medicine Professor, Internal Medicine
@uazmedphxchair

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Patient Care

Rare Care for Elders: First Geriatric Emergency Department in Arizona

By: Nimit Agarwal, MD

Falls in older adults are one of the most common reasons for presenting to Emergency Departments all over the country. Preventing a future fall by understanding the multitude of reasons related to a fall can improve quality of life of older adults and lower health care costs.

Staff at Banne – University Medical Center Phoenix Emergency Department see more than 1,000 patients per month who are 65 years or older. Arizona has a population of over 7.2 million people and is expected to grow between .9% — 1.9% annually over the next 30 years, according to the State of Arizona Office of Economic Opportuni . Steady growth has made Phoenix the fifth la gest city in the United States and has elevated Arizona to the 14th largest state by population size.

Maricopa County contains over 60 percent of the state's population and encompasses nine of the state's ten largest cities, including Phoenix. The 65 and older population makes up 12 percent of Maricopa County. By 2020, the number of older adults in Maricopa County is expected to increase by 50 percent to reach 700,000 people.

To improve the care of older adults presenting with falls, we developed a Geriatric Emergency Department Strategy. Under this program, any older adult (>65) presenting to the ED with a fall is identified and a multidisciplinary app oach is implemented. Using physical therapy, pharmacy, nursing and medical teams, care is undertaken to not only treat the current fall related issue, but also to plan and prevent a future fall. A post ED discharge survey is undertaken to get feedback of care provided.

The Geriatric Emergency Department Surgery will enable providers to lead trauma-related care for older adults in Arizona and provide value to our senior community. Currently, there is no program offering such ca e available anywhere in the state. The project is in the implementation phase.

"All of the ED physicians get continuous education about geriatric care from me and the Geriatrics Division."

Nimit Agarwal, MD
Division Chief, Geriatric Medicine Medical Director, Center for Healthy Aging

New Opioid Assistance and Referral Hotline Helps Physicians

Opioid misuse and abuse have significantly avaged Arizona and the nation. In response, a new 24-hour hotline for physicians treating patients addicted to opioids has been established by the Center for Toxicology and Pharmacology Education and Research at the University of Arizona College of Medicine – Phoenix and the Arizona Department of Health Services.

By: Ayrn O'Connor, MD, Tomi St. Mars, MSN, RN, and Daniel Brooks, MD

The free Opioid Assistance and Referral (OAR) Line, 1-888-688-4222, is meant to improve safety and treatment for patients addicted to opioids.

Services for Providers

Ayrn O'Connor, MD, an associate professor of Emergency Medicine and program director of the College's medical toxicology fellowship, said deaths from opioid overdoses make up more than 50 percent of all overdose deaths, and doctors need help in building a treatment plan for their patients.

The line provides 24-hour, seven-days-a-week direction to providers. Physicians can obtain real-time access to health care professionals, including pharmacists, nurses and physicians with expertise in medical toxicology, pharmacology and substance use disorders.

The experts offer consultations about

- prescribing opioids
- treating individuals suffering f om acute and chronic pain
- managing high-risk patients
- reconciling medication interactions
- reducing opioid dosing and
- treating patients with acute opioid complications or opioid withdrawal

They also provide referrals for patient support and outpatient opioid and treatment services as well as referrals for patients seeking behavioral health treatment.

Services for Patients

Though there is a heavy focus on better educating providers, the OAR Line also offers Arizona citizen and caregivers suggestions for resources and referrals for those seeking treatment for opioid use disorder, chronic pain or opioid withdrawal; transfers to behavioral health services or substance abuse/ medication assisted treatment services, as well as routine patient follow-up calls to confirm well-being

Daniel Brooks, medical director of the Banner Poison and Drug Information Center and co-director of the UA's toxicology center, said "the OAR Line will be a great asset to Arizona's long-term plans to correct the opioid crisis."

"It is not like treating high blood pressure, we cannot prescribe a daily pill and just expect someone to get better. Addiction comes with a high risk of relapse and societal consequences, too."

Data from the Arizona Department of Health Services show that the opioid epidemic continues to grow.

** From June 15, 2017, to May 10, 2018,*

7,730 opioid overdoses were reported

+74% over the previous four years.

Better Health/Healthy Weight Program

By: R. Todd Hurst, MD, Mike Fallon, MD, Melisa Celaya, PhD and Martha Gulati, MD

The greatest need, and most effectiv treatment, for patients with chronic, predominately lifestyle related diseases is weight loss, increased physical activity and improved nutrition. Providing an effective and evidenc -based solution for the health problems that affect 60 percent of adults in the US is one of the most important opportunities in health care.

The Better Health/Healthy Weight Program will comprise a research study to assess the outcomes of behavior change using a digital health program. The program will provide an evidence-based lifestyle modification solution for the patients of Banner – University Medical Center Phoenix. The protocol is being developed by Dr. Melisa Celaya.

The program has actively enrolled beta testers since January 2019. Client feedback has been positive, although no outcome data has been collected to date. The plan is to enroll the first subjects for a outcome study in January 2020. We are grateful for support from the Banner Foundation, which has committed to funding this research study.

Triage-based Medical Weight Management to Treat Serious Weight-Dependent Disorders: The Legerity Program®

By: Michael Bryer-Ash, MD, Ester Little, MD, Michael Fallon, MD, Rong Guo, MD, PhD, Aditi Kumar, MD, Harvey Hsu, MD, Janette Buhl, FNP, Jacki Hagarty, Pharm D and Jody Runge, MS, RN

There are approximately 25 million persons with diabetes in the US, and the great majority of these have type 2 diabetes. More than 85 percent of these cases is primarily due to overweight and obesity. The rise in diabetes prevalence in the past three to four decades has closely paralleled the increasing weight of our population. Despite obesity being the main potentially reversible cause of diabetes, it remains poorly treated. Similarly, non-alcoholic fatty liver disease (NAFLD) is strongly weight-dependent and is a rapidly increasing cause of liver cirrhosis and liver cancer, leading to several thousand liver transplants annually.

Health systems and health care providers continue to preferentially treat these and other serious comorbid diseases with a costly array of medications with sometimes serious side effects. Cur ent interventions to treat obesity are primarily focused on behavioral interventions, which have proven to be unsustainably expensive and unsuccessful over anything other than the short term. Bariatric surgery is an important and successful intervention, but it cannot be applied to such a large population.

The Legerity Program® is a novel triage-based program developed through collaboration between the University of Arizona College of Medicine – Phoenix and Banner – University Medical Center Phoenix. The program focuses on achievement of prompt but sustained medical weight loss. The program is specifically designed to imp ove the serious weight-related comorbidities of diabetes and non-alcoholic fatty liver disease, at a stage before irreversible complications have occurred. Medical weight management is accomplished through the use of carefully managed medication protocols derived from consensus body recommendations, using FDA-approved weight management agents or their generic component drugs, and approved by the BUMCP Pharmacy and Therapeutics Committee, designed to achieve >5.0% weight loss and >0.5% reduction in A1c or reduction in liver fib osis or steatosis score of 1 or more within a six-month period.

The program is nearing completion of its pilot phase and has reached target patient enrollment of 30 patients (57% diabetes, 43% NAFLD). Preliminary results show mean 3.2 kg (2.9%) and 5.7 kg (5.1%) weight loss at one- and three-month follow up, respectively. A single patient has had interim A1c reduction at three months of 0.6%, while weight, A1c and liver fib oscan scores are pending at the six-month visit.

While preliminary, these data are very encouraging and indicate the feasibility of the focused triage-based medical weight management approach. Given the weight-dependency of type 2 diabetes and NAFLD, it is highly likely that the primary objectives of reductions in A1c and liver fat/fib osis scores will be achieved. An ancillary benefit is eplacement of the sense of failure and burden of responsibility perceived by many such patients with the renewed motivation that often accompanies successful weight loss. Ultimately, it is hoped that this will lead to a greater focus on medical weight management earlier in the course of these, and other, serious weight-dependent diseases.

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Translational Research

Driving Discovery of Disease Treatments

We have made it our mission to support innovation in academic clinical research by providing exceptional service and valuable resources to our scientific collabo ators and industry partners. In just three years, we have built an infrastructure, Clinical Research Support Services (CReSS), to ensure clinical research support through all phases of clinical research initiatives. Our clinical research team is comprised of highly experienced individuals who facilitate and conduct clinical trials.

COMP CLINICAL RESEARCH SUPPORT SERVICES

Clinical Research Executive Director
Clinical Research Operations — Senior Director / Manager
Compliance — Manager
Regulatory Compliance Specialist
Program Coordinator / Reg. Support

Clinical Data — Manager / Sr. Database Specialist
Grant Writer
Clincial Trial Accountant

Department of Internal Medicine

Cardiovascular Institute
Assoc. Director
Manager
2 Clinical Research Nurses
2 Senior Clinical Research Coordinators
4 Research Specialist

Hospital Medicine
Research Director

Infectious Diseases
Senior Clinical Research Coordinator

Hepatology & Transplant Institute
Clinical Research Nurse (Live/Kidney)
2 Clinical Research Coordinators
Data MGMT Specialist

Pulmonary Institute
Senior Clinical Research Coordinator
Research Specialist

Dept. of Neurology
Clinical Research Coordinator

Dept. of Radiology
Clinical Research Coordinator

Dept. of OB/GYM
Clinical Research Nurse
Clinical Research Coordinator
Research Specialist

Dept. of Surgery
Director
Clinical Research Coordinator
Research Specialist
Banner Data Manager

We offer ope ational support for clinical trial development and coordination as well as compliance monitoring. We also provide assistance with REDCap database development, inpatient and outpatient specimen and data collection, as well as guidance to other resources for population outcomes, trial design and grant writing, data access and biostatistical services.

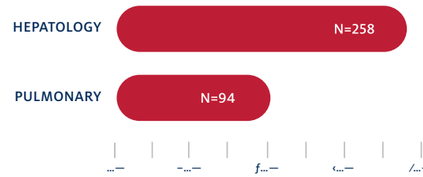
The University of Arizona College of Medicine – Phoenix and Banner – University Medical Center Phoenix partnered to create a clinical suite dedicated to clinical research activities and the All of Us Program. The UA Clinical Research Suite offers clinical esources such as:

- 4 private exam rooms
- Bariatric exam room
- Specimen processing room
- Clinical trial supply storage
- -80° freezer
- Ambient and refrigerated centrifuges
- 24-hour continuous temperature monitoring of study drug
- IV infusion room
- 2 consult rooms
- 2 vitals/phlebotomy stations
- Specimen refrigerator
- Height and weight scales
- Automated blood pressure machines

Investigators from multiple departments are actively engaged in multi-center, national and international Phase 2 – 4 clinical research trials as well as investigator initiated studies across many indications to provide patient access to new therapies and treatments.

Our biorepository comprises specimens from over 350 patients. Since January 2018, we have collected blood specimens from 258 patients from our hepatology clinic as well as 94 patients from our advanced lung disease clinic. We have also begun to collect bronchoalveolar lavage samples and will expand collection effort according to investigator needs. These samples will be integral in future translational research to help advanced disease patient populations.

DOIM BIOREPOSITORY STATISTICS

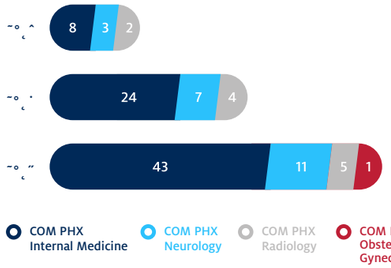


Gender: Male | 51%
Ethnicity: Non-hispanic | 74%
Hispanic | 25%

Race: White | 87%
AI/NA | 6%
Black or AA | 4%
Asian | 1%

Initiation: Jan. 2018
July 15, 2019: 352 enrolled 900 2ml vials (Serum, Plasma, DNA RNA or PBMC) and 25 samples of BAL

COMP SPONSORED CLINICAL TRIALS TREND



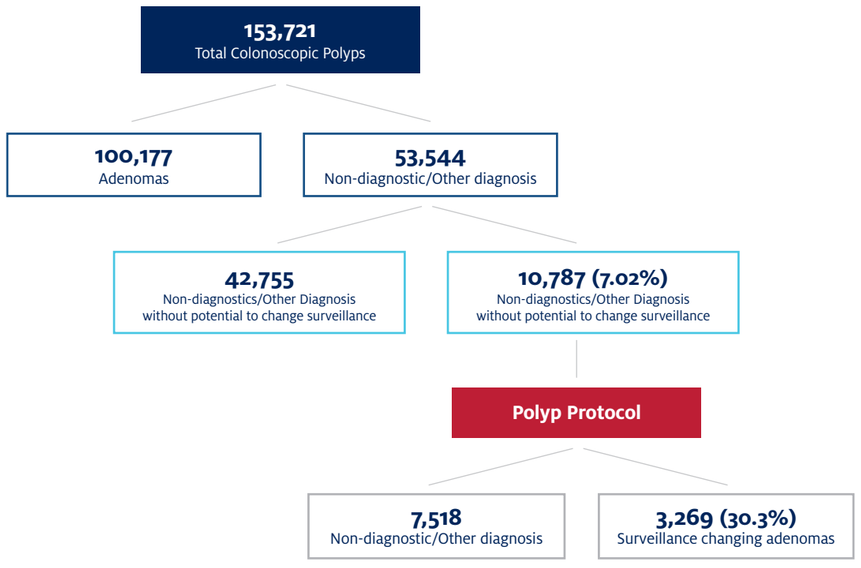
Novel Laboratory Protocol Increases Detection of Surveillance-Shortening Adenomas

By: Lauren Cole, MD, Michael Mills, MD, Michael Fallon, MD and Daniel Jondle, MD

General laboratory tissue processing protocols for biopsy specimens advise review of representative sections from approximately half of a given tissue block. In many labs, it is not routine practice for pathologists to reflexively perform additional leveling o the remaining second half of an endoscopically apparent colon polyp, even if a specimen is initially determined to be non-diagnostic.

Prior studies demonstrate an increase in adenoma detection among non-diagnostic colonoscopic polyps following additional leveling of the remaining specimen. We aim to determine if a significant pe centage of patients receive shortened surveillance intervals when pathologists examine representative levels from the entire tissue block of initially non-diagnostic colonoscopic polyps. None of the prior studies went as far as to examine representative levels through the entire tissue block.

Retrospective review of pathology performed by three fellowship-trained GI pathologists from Arizona Digestive Health over a fiv -year period of time after implementing a novel "Polyp Protocol" entailing analysis of representative sections through the entire remaining tissue block (i.e. exhaustive leveling) of colonoscopic polyps initially determined to be histologically non-diagnostic. This was performed specifically in situations whe e anadenoma diagnosis would change the surveillance interval.



A total of 153,721 polyps were removed during colonoscopic examination during the study period. Of these, 10,787 (7.02%) were non-diagnostic and either the first and only potential adenoma in the patient, or the third potential adenoma.

After these colonoscopic polyps underwent exhaustive leveling, 3,269 or 30.30% revealed a conversion from initially non-diagnostic to adenoma. Comparing the adenoma detection rate with and without the exhaustive leveling protocol showed a statistically significan increase from baseline of 2.13% (p <0.0001). These results confer with a shortened colorectal cancer surveillance interval for the respective patients.

Consistent with prior studies, we found that histologically non-diagnostic colonoscopic polyps are common, occurring in greater than 7% of potentially surveillance-changing colonoscopic polyp specimens. Our data shows that exhaustive leveling of these specimens significantl increases the detection of surveillance-changing adenomas, ultimately resulting in a significan percentage of patients receiving shorter colorectal cancer screening surveillance intervals. These results emphasize the need for further studies assessing pathology specimen processing and analysis, and its impact on adenoma detection and screening interval for the patient.

"Our data shows that exhaustive leveling of these specimens significantly increases the detection of surveillance-changing adenomas, ultimately resulting in a significant pe centage of patients receiving shorter colorectal cancer screening surveillance intervals."

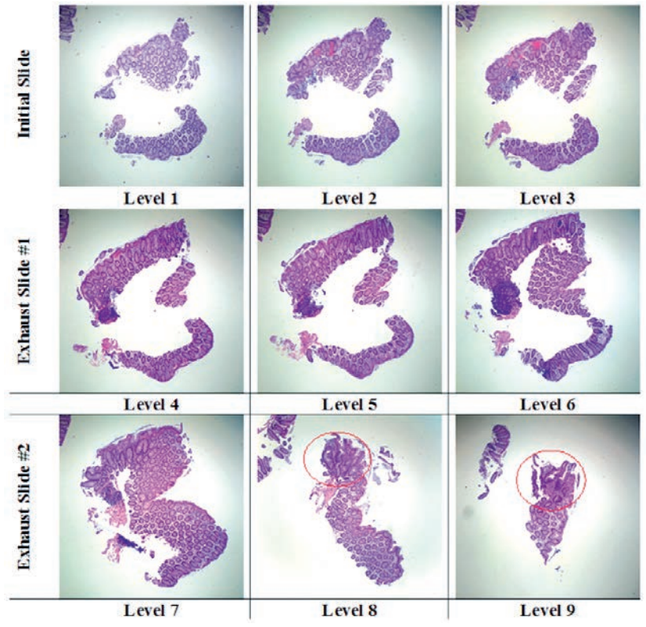


Figure 2:

This figu e shows photomicrographs from three slides of a single polyp. The top row shows the tissue seen on the initial slide reviewed by the pathologist. The middle and bottom rows show images of the polyp tissue obtained and reviewed when the pathologist ordered "levels exhaust" with the deepest levels (8 and 9) demonstrating low-grade adenomatous dysplasia as circled in red.

The Novel Role and Underlying Mechanism of Corin in Modulating Cardiomyocyte Survival After Ischemic Injury in the Heart

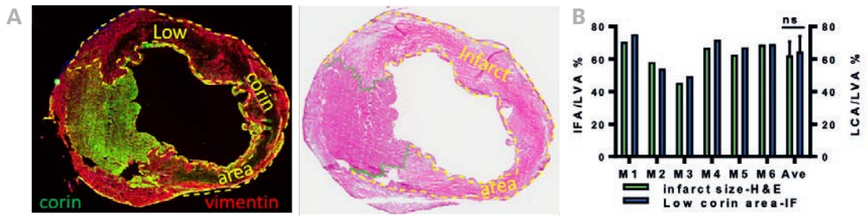
By: Dong Wang, MD, PhD
Gregory Turner, MD and
Guy Reed, MD, MS

Heart attack or acute myocardial infarction (AMI) remains a major public health problem in the US because of high prevalence and significant mortalit . Despite considerable progress in treating AMI in current clinical practice, incidence of HF among AMI patients ranges from 14% to 36%. Continuous heart muscle cell loss and ventricular remodeling are considered as the major contributor to the outcomes.

Corin is an enzyme primarily in the heart which can generate mature ANP and subsequently regulate the salt-water balance in our body. In clinical studies, associations of the corin blood levels of patients with outcomes are well established. We also found the linkage between corin level and cardiomyocyte death (infarction size) in our preliminary studies. However, there is a knowledge gap in understanding the fundamental role of corin in the process of cardiomyocytes death and cardiac remodeling post MI.

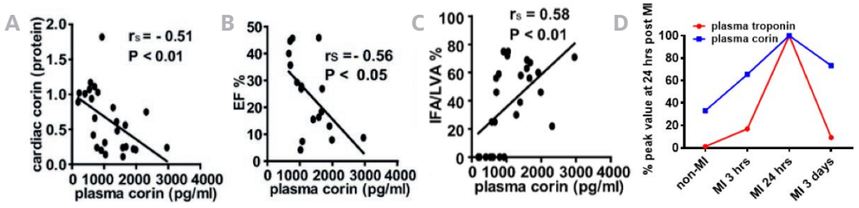
Due to limitations in the clinical setting, these unanswered questions can only be addressed in an experimental animal model that have translational relevance to human disease. We use various genetically modified mouse odels and combine multiple methods, including cardiac MRI/PET, ELISA, Real time PCR and histology to assess heart function, cardiac structural character, myocardial metabolism, viability, infarct size, cardiac fib osis, as well as soluble and cardiac corin levels, to define the functional ole of corin in ischemic heart disease.

"Our results highlight the association of corin and myocardial damage, heart dysfunction, which suggested that plasma corin may serve as an informative marker for AMI diagnosis and prediction of outcomes."



Corin level was decreased in infarct area. (A) Representative images of two serial heart sections of a WT-MI heart from 24 h post-MI group, showing corin IF staining (left) and H&E staining (right) respectively. The lower corin expression area (LCA, or the area of decreased green fluo escence, left panel) in the heart was identical to the infarct area (IFA, eosinophilic staining area, right panel). The dotted line delineates the border of infarct area and non-infarct area in both images. (B) Relationship between the area of lower corin expression and the area of infarction in mice heart of 24 h post-MI. The LCA, IFA and total left ventricular area (LVA, including septum) were measured in cardiac sections by assessing corin immunofluo escence and H&E staining from hearts (n = 6) using Image-Pro Plus software. For each heart, the loss or lower corin level area were measured and the LCA/LVA % were calculated. On H&E stained sections, infarct area (eosinophilic staining area), total left ventricular myocardium area were measured and infarct size, IFA/LVA %, were calculated.

We have found that AMI induces rapid increases in plasma corin levels and decreases in cardiac corin levels. There is a significant negative cor elation between plasma corin level and cardiac corin level as well as infarct size. In the early phase of AMI, plasma corin levels are inversely correlated with heart function. In addition, plasma corin level changes in a similar pattern to troponin T but with an early arising.



Plasma corin level reflects ca diac corin level, cardiomyocyte death (infarct size) and heart function post-acute myocardial infarction. Plasma corin levels were negatively correlated with cardiac corin levels (A), ejection fraction (EF) (B), but positively correlated with infarct size (C). (D) The percentage of each time point measurement to peak value (24 hrs post MI) of plasma troponin T and plasma corin were calculated. Data represent means ± SE of n = 7-9 mice per group.

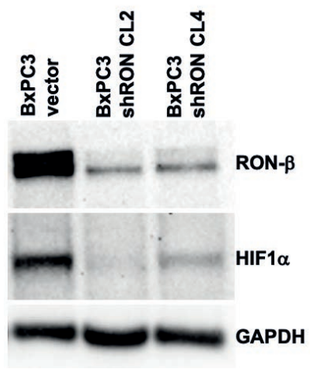
Our results highlight the association of corin and myocardial damage, heart dysfunction, which suggested that plasma corin may serve as an informative marker for AMI diagnosis and prediction of outcomes. This project will further explore the functional role of corin on myocardial metabolism and cardiomyocyte death post AMI. This project will not only expand our knowledge about the role of corin and natriuretic peptide system in AMI but also may translate to clinical diagnostic/prognostic tools for patients with heart attack.

Therapeutic Targets in Pancreatic Ductal Adenocarcinoma

By: Akihisa Kato, MD, PhD,
Sushovan Guha, MD, PhD,
Sudhakar Ammanamanchi, PhD,
Haiyong Han, PhD and
Wendi Zhou, MD, PhD

Pancreatic ductal adenocarcinoma (PDAC) has the worst prognosis with a fiv -year survival rate of 5 percent. The disease is generally diagnosed at an advanced stage with limited opportunities for surgical intervention and chemotherapy is standard care with adverse side effects and high mortalit . The molecular markers that are involved in the PDAC invasive and metastatic process is not yet clearly defined and hence lack ta geted therapies. We are investigating if axis between oncogenic RON tyrosine kinase receptor and hypoxia inducible factor-1 alpha (HIF-1) is a contributor for PDAC metastasis and if a small molecule RON kinase inhibitor either alone or in combination with Gemcitabine abrogates RON/HIF-1 mediated PDAC progression.

Immuno-histochemical analysis for RON and HIF-1 expression was analyzed in 101 PDAC tumors and RON, HIF-1 expression was analyzed in RON expressing and RON knock-down PDAC cells to determine if these 2 proteins are co-expressed in clinical specimens and if RON kinase receptor regulates HIF-1 expression in PDAC cells.



RON Kinase Receptor Knock-down Blocks HIF-1a Expression in PDAC Cells

All 101 tumors scored positive for RON and HIF-1 with a predominant score of 3 for 95 tumors. (Fig.1). Previous reports indicated normal pancreatic ducts express no/minimal RON/HIF-1 expression. Specific knoc -down of RON kinase receptor in BXPC3 PDAC cells blocked HIF-1 expression suggesting RON kinase receptor pathway involvement in the regulation of HIF-1 expression (Fig.2).

Our preliminary data indicates RON kinase receptor and HIF-1, which drives the expression of many genes involved in PDAC metastasis are co-expressed in PDAC tumors and significantly ON kinase receptor is one of the drivers of HIF-1 expression in PDAC. We are using in vitro and in vivo model systems to carry out pre-clinical studies with a small molecule RON kinase inhibitor for potential therapeutic development.

Single-cell Transcriptomes Identify Abnormal Endothelial Subpopulation in Pulmonary Arterial Hypertension

By: Zhiyu Dai, PhD and
You-Yang Zhao, PhD

Pulmonary arterial hypertension (PAH) is a devastating disease characterized by obliterative pulmonary vascular remodeling and progressive increase of pulmonary vascular resistance, leading to right heart failure and premature death. Understanding the cellular and molecular mechanisms of obliterative vascular remodeling will help develop novel therapeutic approaches for PAH patients including idiopathic PAH (IPAH) patients. Given the heterogeneity of ECs, we hypothesize that a distinct EC subpopulation is critical for obliterative vascular remodeling in the pathogenesis of PAH.

We applied single-cell RNA sequencing (ScRNA-seq) to profile the pulmonary cells in a severe mouse model (Egln1Tie2Cre mice) of PAH.

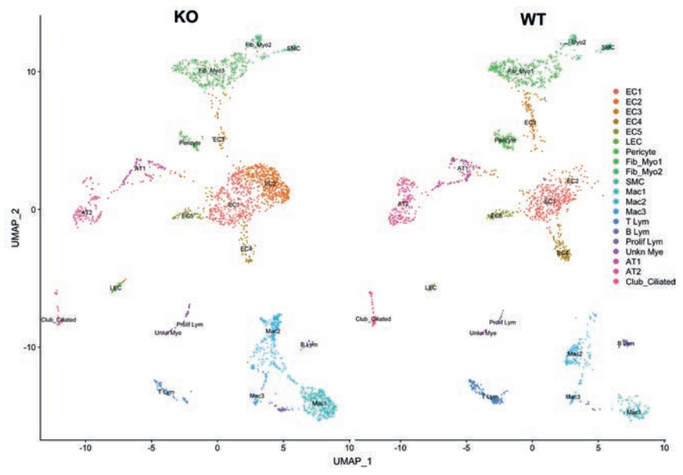
ScRNA-seq revealed 20 discrete cell populations from pooled mouse lung from WT and Egln1Tie2Cre mice. We identified five distinct endothelial cel (EC) subpopulations in both WT and Egln1Tie2Cre mice, which expressed classical EC markers Emcn, Pecam1 and Cdh5. Unexpectedly, there were markedly increased in the most abundant EC Cluster (EC2) in Egln1Tie2Cre lung. EC2 cluster (mainly from Egln1Tie2Cre lung) was characterized by little expression of Cldn5, Tmem100, Tspan7, Calcrl and Foxf1.

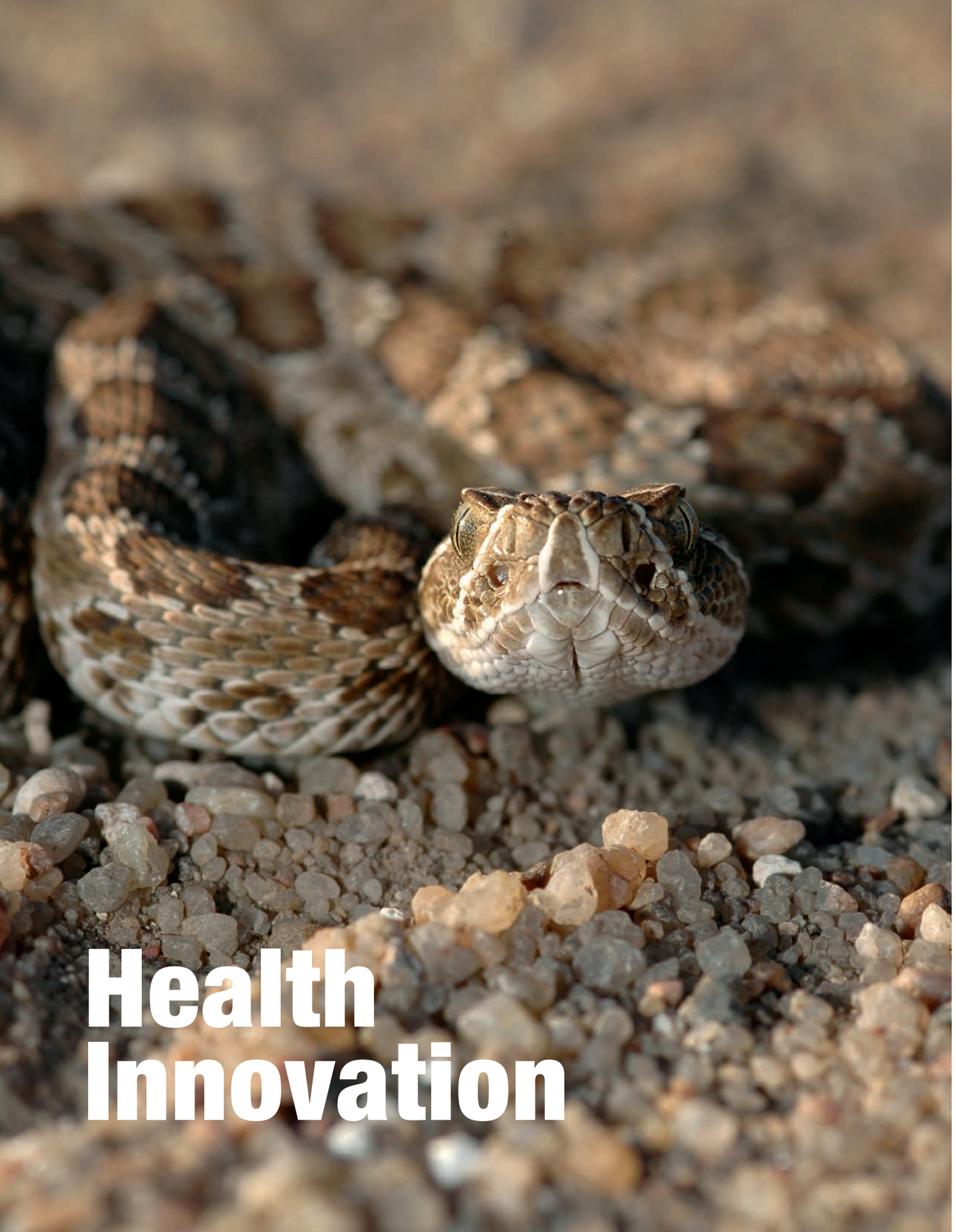
Analysis of genes related to PH showed that angiocrine factor genes Pdgfb, Cxcl12, Mif and Edn1 were significantly inc eased in all EC subpopulations from Egln1Tie2Cre mice. We also found that some of these genes (Sox17 and Atp13a3) which are mutated in human PAH patients were upregulated in most of EC subpopulations. Some of these genes were selectively downregulated or upregulated in specific EC subpopulation s) [down: Bmpr2, Acvrl1, Aqp1, Ptgis, Cav1; Up: Eif2ak4 and Smad1] in Egln1Tie2Cre mice.

The ScRNA-seq analysis we completed identifies a unique endothelial populatio only highly enriched in the lung of severe PAH mice.

"Using single-cell RNA-sequencing analysis, we were able to identify abnormality of endothelial cell heterogeneity in the development of pulmonary arterial hypertension. We also found several novel pathogenic genes such as Tmem100 and Foxf1 in pulmonary arterial hypertension. Our studies will lead to discovery of novel therapeutic approaches for patients with pulmonary arterial hypertension."

—Zhiyu Dai, PhD





North American Snakebite Registry

By: Anne-Michelle Ruha, MD, the Toxic Snakebite Study Group and medical toxicologists from numerous academic medical centers across the country

Snakebite affects thousands of people in the United tates each year and is responsible for significant morbidity and even mortality in some victims. Despite t e large impact snakebite has on affected individuals, it is a elatively uncommon diagnosis, and many physicians have never treated a patient with snakebite. Medical toxicologists are unique among physician specialists in that they receive specialized training in the management of snakebite.

Current understanding of the pathophysiology of snake venom, factors that may influence morbidity and mortality after snakebite, and ideal managem nt of patients suffering f om snake envenomation is incomplete. Much of what is known derives from retrospective case series describing cohorts of patients with envenomation as well as case reports of unusual presentations following snakebite. Published clinical trials of rattlesnake antivenom have provided some prospective information regarding clinical effects of venom and esponse to treatment with antivenom, but also highlight current limitations in our ability to effectively t eat patients and predict outcomes following snake envenomation.

The purpose of the American College of Medical Toxicology's North American Snakebite Registry (NASBR) is to gather de-identified, detailed p ospective information regarding snakebite, clinical effects of envenomation, and esponse to treatment for patients who receive bedside care from medical toxicologists across the United States. The ultimate goal is to use the information gathered in the Registry to decrease morbidity and mortality resulting from snakebite through enhanced understanding of factors that affect both clinical esponse to snake envenomation and response to various treatment modalities.

The Registry began in July 2013 and now has more than 1,000 cases, including patient characteristics, clinical effects of envenomation, esponse to treatment and outcomes. Case information in the NASBR is provided by medical toxicologists across the United States who are directly involved in the bedside care of the patient, assuring a high degree of accuracy of the toxicological data entered.

The North American Snakebite Registry is the first and only registry database in the United States that gathers detailed information regarding all aspects of snake envenomation. With the highest number of patients with snake envenomation per capita, Arizona is especially impacted by this uncommon and difficu -to-study diagnosis.

Text Mining to Automate Research

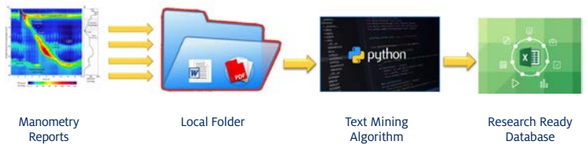
By: Sushovan Guha, PhD, Michael Fallon, MD, Bijun Sai Kannadath, MBBS, MS, Michael Mills, MD and Shiva Ratuapli, MD

Abstraction of data from reports is very labor-intensive, tedious and prone to error. Natural language processing and text mining are emerging tools that can help researchers abstract relevant data from large number of patients.

A text miner was designed in Python to abstract relevant data points and information from patient procedure reports to create a research ready database.

The Miner abstracted data from 1323 procedures and was able to remove duplicates as well as diffe entiate between diffe ent types of procedures, such as BRAVO-pH and pH-Z. The database created was analyzed and the results are included below.

This is the first esearch project utilizing text mining for the creation of a large clinical data set in the Department of Internal Medicine. The lessons and experience gained from this project will be used to expand research efforts and inc ease the quality and strength of studies by promoting accuracy and size and reducing the time and effort associated wit clinical outcomes research.



Prevention of Drug Induced Arrhythmia and Sudden Death

By: Raymond Woosley, MD, C. Will Heise, MD, Steve Curry, MD, Tyler Gallo, PharmD, Randolph Clark, MD, Cornelius Antonescu, MD, Will Holland, MD, Hamed Abbaszadegan, MD, Banner Health and Phoenix VA Health Care System

Up to six percent of cardiac arrests in intensive care units, and many in hospitals, may be caused by drugs known to cause Torsades de Pointes arrhythmia. Clinical decision support in the past has only impacted 10-15% of those patients identified at ris .

We are using unique, high impact clinical decision support tools to prevent drug induced cardiac arrests. This provides a simple tool to avoid harmful medication effects

To date we have seen a 45% rate of successful intervention at Banner – University Medical Center Phoenix. We are expanding the process to impact all Banner Health and Phoenix VA Health Care System patients. In addition, we are offering widesp ead education about this problem. There is a trend toward decreased length of stay in the hospital in these patients.

We can save lives and reduce costs for our clinical partners, through the use of clinical decision support, with potential impact beyond drug induced arrhythmia.

Data Analytics in Health Care Symposium

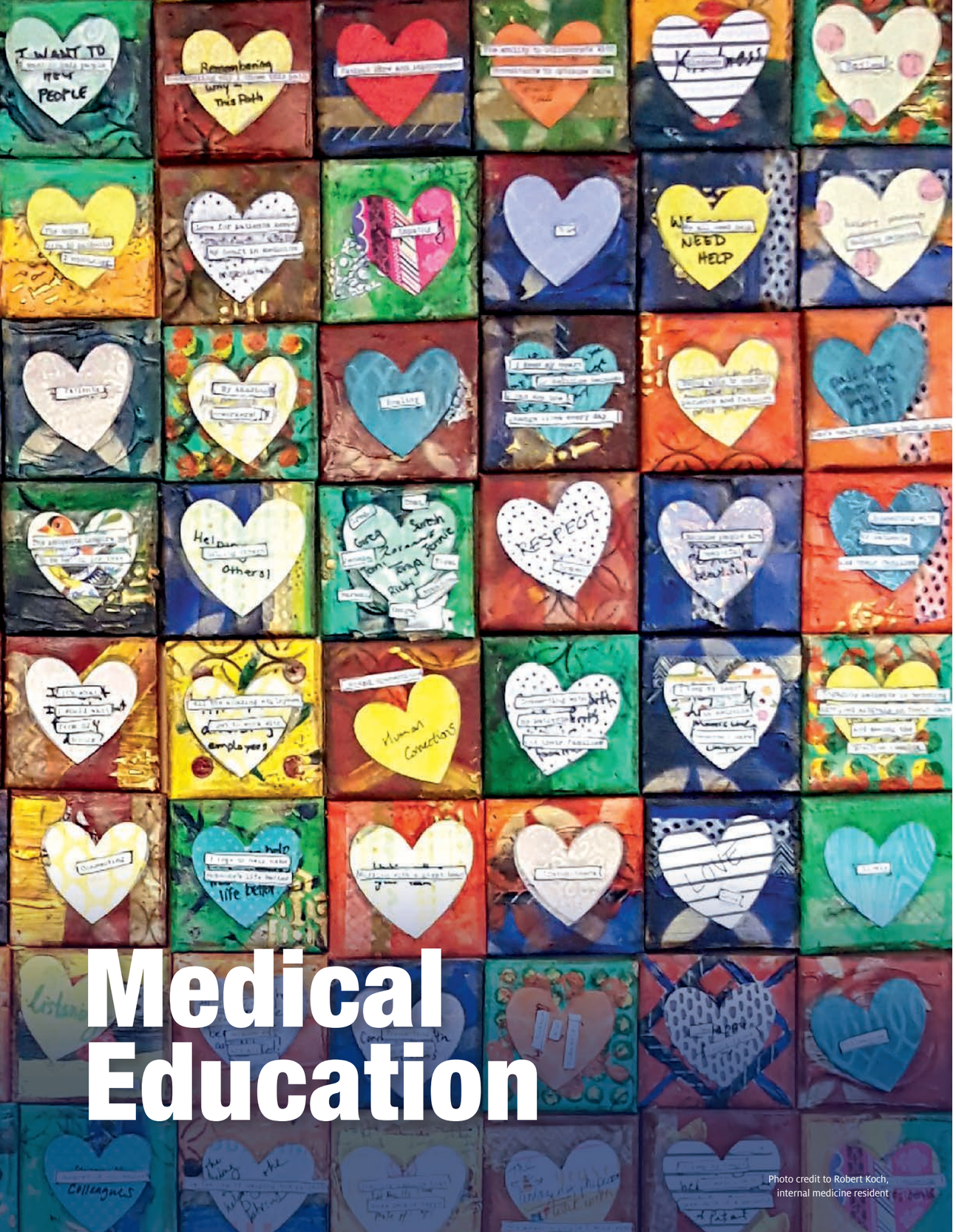
By: Richard Gerkin, MD, MS, Melisa Celaya, PhD, Mike Malek-Ahmadi, PhD and Pamela Garcia-Filion, PhD

We recognized the need to link investigators from across the state in utilizing innovative ways to help improve health care. We addressed this need by creating a symposium on data analytics with the following goals:

- Showcase the cutting-edge statistical and informatics work being done across Arizona.
- Provide a venue for biostatisticians, data analysts, informaticists, and other data professionals to share and gain applied, practical knowledge in their fields
- Create opportunities for students and early-career data professionals to present their work.
- Develop and foster a network of statistics and informatics collaborators across Arizona.

Over seventy people attended the inaugural event held at the University of Arizona College of Medicine – Phoenix. Keynote speaker, Jeff ey Wilson, PhD, presented valuable insight on “Career-development for data analysts, statisticians and informaticists.” Ten abstracts were chosen for oral presentation on topics including bioinformatics, predictive analytics, public health data and surveillance, data algorithms as well as disease registries. Follow-up surveys were sent out with virtually all responses positive.

Details about the second annual symposium to be held in spring 2020 will be made available at **phoenixmed.arizona.edu**



Medical Education

Photo credit to Robert Koch, internal medicine resident

University of Arizona College of Medicine – Phoenix Internal Medicine Residency Heart of Medicine Award

By Emily Mallin, MD

HeARTS in Medicine

When the National Academy of Medicine (NAM) put out a call for artwork that captures expressions of clinician well being, Cheryl O'Malley, MD and Robert Koch, MD, a College of Medicine – Phoenix internal medicine resident, created a way to help members of the College's Graduate Medical Education programs express how they keep their hearts in their work.

First, Dr. O'Malley invited University of Arizona College of Medicine – Phoenix faculty, residents, fellows and staff to write on a smal paper heart a sentiment that describes what keeps their hearts in medicine. The hearts were added to small painted canvases, which were then combined and finished into one la ge, framed art piece by Dr. O'Malley. Nearly all of the expressions spoke of clinicians' connections with patients and how they are able to help them through difficult time

Out of 350 entries, "HeARTS in Medicine" was among 30 chosen to be part of a pop-up exhibit during a meeting of NAM's Action Collaborative on Clinician Well-Being and Resilience in Washington D.C. The piece also will be part of a traveling exhibit of artwork from Expressions of Clinician Well-Being.

"We keep our hearts in medicine by being mindful of our needs, breaking down barriers to seeking help, increasing awareness of our needs and resources, nurturing our passions and staying connected with our purpose," Dr. O'Malley said.

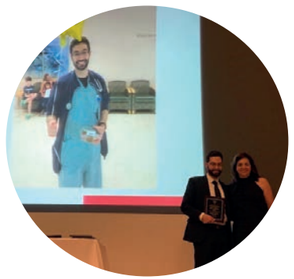
Heart of Medicine Award

Each year the UA College Medicine – Phoenix and Banner – University Medical Center Phoenix give the Heart of Medicine Award to a resident who has made significant contributions t patient care and outcomes. The awardee demonstrates a strong commitment to promoting and protecting the health of patients, exhibiting competency as an effective leader and advocate

That Special Blend

Candidates for the Heart of Medicine Award have a special blend of skill, humanity, leadership and compassion that impacts patients as well as colleagues. They inspire everyone to give more and be better.

The Heart of Medicine award was named for Dr. Stacy Achdjian, a brave resident who exemplified humanity and compassion in medicine through her dedication to patients and impact on other physicians in training – even as she was a patient. Stacy lost her battle with cancer in 2018, yet her legacy lives on through this award.



The Heart of Medicine Award recipient for 2019 is Waseem Albasha, a second-year resident.

From his first day of internshi , Dr. Waseem Albasha demonstrated the highest levels of empathy and compassion for his patients. He is a favorite of nurses and clinic staff for his cal demeanor in stressful situations, kindness and team player attitude. Dr. Albasha is soft-spoken and humble, actively listening to those around him. He is vulnerable yet incredibly strong, which earns the trust of patients and colleagues alike. Not unlike Dr. Achdjian before him, his presence and manner with patients communicate his heart in medicine, making him a most deserving recipient of the prestigious Heart of Medicine award.

Internal Medicine Residents Make Modern-Day House Calls

By: Jayne Peterson, MD

The UA College of Medicine – Phoenix Internal Medicine Residency Program reimagined an old practice to solve new problems in health care. The modern-day house call is being used as a method for exploration of social determinants of health (SDoH) in our patients.

During the post-graduate year two ambulatory rotation, residents are asked to choose one of their continuity patients for a home visit. The goal is for the residents to look at their patients through the lens of SDoH. The home visit team includes one or two learners, a faculty member from the ambulatory clinic and a social worker. After the visit and review of the patient's home, transportation, financial, education safety, and food security, residents reflect on the experience through a written narrative in which they answer questions related to the SDoH.

As of June 2019, thirty-eight residents and several medical students have participated in a home visit with their own patient or as part of a team. Common themes noted from the visits include the lack of proper nutritious foods, barriers and cost of transportation, medication reconciliation and adherence issues, patient safety concerns, health literacy, family support and previously undiagnosed depression.

Our internal medicine resident's training on social determinants of health (SDOH) has been in the form of an on-line module and scattered lectures. It's direct connection to patient care has been inconsistent. This innovation was developed to provide a practical approach to understanding SDOH within the residents' own practice and their patients.

As of June 2019, thirty-eight residents have participated in a home visit with their own patient or as part of the team. Common themes noted after the visit included the lack of proper nutritious foods, barriers and cost of transportation, medication reconciliation and adherence issues, patient safety concerns, health literacy, family support for the patient, and previously undiagnosed depression.

Home visits provide invaluable direct experience in understanding how SDoH impact patients outside of physicians' line of sight during a clinic visit. Residents learn to work collaboratively with social workers to identify and address challenges in transportation, patient home safety, housing, food insecurity, nutritional food choices and financial barriers t care. They also witness firsthand how challengin it can be to navigate community resources. One important example of the impact of the program is the high number of errors and potential safety events uncovered through medication reconciliation at home by examining all pill bottles and sources of medications. Another is the significant inc ease in completion of advance directives during home visits compared to clinic visits.

The Home Visit Program is rated highly by patients and residents alike. Based on feedback, we will continue to refine and expand services p ovided during home visits as we continue to focus on addressing all aspects of our patients' health.

Residents learn to work collaboratively with social workers to identify and address challenges in transportation, patient home safety, housing, food insecurity, nutritional food choices and financial barriers to ca e.

IM Residency Academic Half Day Curriculum

By: Brenda Shinar, MD, Lise Harper, MD, Dana Archbold, MD, Gregory Dodaro, MD and Cheryl O'Malley, MD

The didactic schedule and curriculum for Internal Medicine residents underwent significant change in 2011 f om a traditional morning report and noon conference to an academic half day (AHD) on Tuesday mornings. The residents are given a three-hour block of protected time to focus on active learning, during which time all responsibility for patient care is assumed by attending faculty.

AHD curriculum is a comprehensive longitudinal board review developed by our Internal Medicine Residency Faculty Education Scholars, a small group of faculty selected to design and study the impact of this program. Scholars create learning objectives and curate pre-reading content and corresponding MKSAP questions for pre- and post-testing. Content is organized by topic each month focused on board review with clinically important details relevant to our clinical learning environments. Speakers are selected based on quality of speaking and expertise of the material. At the fina session of each month, scholars create and deliver a high-yield comprehensive topic review based on the content from previous lectures. All didactic sessions are recorded and archived for viewing by those unable to attend or for later review.

Results from the curriculum to date show a significant imp ovement in overall and content-specific in training exam scores. Further enhancements to the program have resulted in 100% board pass rates for the past two years.

The AHD curriculum is a valuable resource for students and residents as well as for faculty in our community. Residents specifically cite AHD as one of the st ongest components of our residency program. It is a strong attraction for applicants to the program. Several scholarly projects are in varying stages of analysis and publication as a result of this educational innovation.

The SPLIT Method: Innovations in Residency Recruitment

By: Christina Bergin, MD and Cheryl O'Malley, MD

"Application inflation" for esidency applicants in the Match® has been a well-documented phenomenon since at least 2010. Fourth-year medical students are applying to and interviewing at increasing numbers of residency programs, resulting in significant financi and energy expenditure, as well as educational opportunity costs related to their time away from clinical rotations. Simultaneously, programs must interview and rank more candidates in order to fill their positions. The increased number of applicants per residency position and the need to have more ranked applicants per position has further taxed the financia and time resources on programs, faculty and residents.

To reduce the burden on students and the residency program, while still preserving the meaningful components of the traditional interview process, we instituted comprehensive changes to our recruitment and interview processes, which we describe as SPLIT Residency Recruitment. We separated site visits from the interview through the use of live video interviews with the residency program director and associate program directors. We created a unique website dedicated to applicants invited to interview. Candidates may spend time remotely learning about the program in a detailed fashion and return to it over time as needed. These modifications allowed vide interview and applicant site visits to be scheduled during times that worked best for each individual applicant and faculty member.

Through the implementation of the SPLIT recruitment process, we were able to interview 37% more applicants in 2017-2018 and 60% more applicants in 2018-2019, when compared with the traditional method of interviewing in 2016-2017. The flexibl scheduling allowed all applicants to be interviewed by the program director and an associate program director. The applicant visit day was optional, resulting in a decrease in the time required by applicants to interview. Interview time was reduced to a range of 1.5-5 hours in the SPLIT format from a range of 6-15 hours with our traditional format. This was the equivalent of a 65-90% reduction in time expenditure for the interview +/- the visit for each applicant. Feedback from applicants indicated 96% felt that other programs should add a similarly detailed website.

"Our innovative method of residency recruitment has allowed us to interview more candidates while decreasing the financial and time burden on applicants, the residency program and faculty/residents."

SPLIT Recruitment preserves meaningful components of the traditional interview process while also augmenting our ability to perform a holistic review of interviewed applicants, as every candidate is now interviewed by both the program director and an associate program director.

Furthermore, the addition of a dedicated informational website as an enduring and user-friendly source of program-specific information th oughout the season increases applicants' ability to make a well-informed determination about their "fi " with our residency program. SPLIT recruitment promotes the wellness of applicants to our UA College of Medicine – Phoenix Internal Medicine Residency Program by making it possible for them to learn about the program, interview and be ranked despite being geographically distant and/or financially unable to attend an in-perso visit day. It also promotes the wellness of UA College of Medicine – Phoenix residents, faculty and residency program leadership by alleviating some of the strain felt by faculty and residents in trying to balance their patient care and educational duties with participating in recruitment events.

SPOTLIGHT ON THE DEPARTMENT

University of Arizona College of Medicine–Phoenix
DEPARTMENT OF INTERNAL MEDICINE
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Vice Chairs
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Education — Emily Mallin, MD
Translational Research — Ting Wang, PhD

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Endocrinology — Michael Bryer-Ash, MD
Gastroenterology & Hepatology — Michael Mills, MD (interim)
Hospital Medicine — Nilda Franco, MD
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General Internal Medicine — Harvey Hsu, MD
Geriatrics — Nimit Agarwal, MD
Infectious Disease — Edwin Yu, MD
Palliative Care — Domingo Maynes, MD
Rheumatology — Trent Smith, MD
Sports Medicine & Concussion — Steven Erickson, MD

Directors of Research
Bioinformatics — Sriram Iyengar, PhD
Biorepository — Mrinalini Kala, PhD
Clinical Informatics — Bidur Dhakal, MD
Clinical Outcomes and Research Analytics — Bijun Kannadath, MBBS, MS
Hospital Medicine — Melisa Celaya, PhD
Toxicology — C. Will Heise, MD

Director, Residency Program, Internal Medicine
Donna Holland, MD

Director, Combined Internal Medicine — Pediatrics Residency Program
Michelle Huddleston, MD

Directors, Fellowship Program, Internal Medicine
Cardiovascular Disease — Martha Gulati, MD
Clinical Informatics — Hamed Abbaszadegan, MD
Endocrinology, Diabetes and Metabolism — Ricardo Correa Marquez, MD
Gastroenterology — Stacie Vela, MD
Geriatric Medicine — Paul Stander, MD
Hospice and Palliative Care — Masood Kisana, MD
Interventional Cardiology and Structural Heart — Ashish Pershad, MD
Medical Toxicology — Ayrn O'Connor, MD
Pulmonary Medicine & Critical Care — Raed Alalawi, MD
Sports Medicine — Steven Erickson, MD

Director, Education Scholars — Brenda Shinar, MD

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

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Internal Medicine

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