Inova Fairfax Medical Campus

DEPARTMENT OF MEDICINE

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Subspecialty Services
Endocrinology
Stephen Clement, MD, Medical Director
Shi Lin, MD

Geriatrics
Denise Mohess, MD, Medical Director
Sangeetha Shan-Bala, MD

MCCS
Albert Hall, MD, Medical Director
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Palliative Care
Alva Roche-Green, MD, Medical Director
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Domingo Freest, MD

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Annual Report
2018

Fairfax Hospital
Heart and Vascular Institute
Acknowledgements:

We would like to thank the following Beatty Liver & Obesity Research Program team members for their valuable contributions and excellent work in developing this annual report:

Puneetinder Kaur Mann
MESSAGE FROM THE DEPARTMENTAL LEADERSHIP

Zobair Younossi, MD, MPH
Chair of the Department of Medicine

We are proud to report that the Department of Medicine (DOM) has continued its productive journey to provide excellent high quality patient-centered clinical care in an academic environment. In this context, DOM’s programs and divisions have shown tremendous growth and productivity. Furthermore, DOM takes pride in championing and promoting patient-centered care, a culture of justice, and trust with highly engaged and productive teams, both necessary for a highly reliable organization.

For quality and general medicine, 2018 was a banner year for the DOM. As you will see in upcoming sections of the Annual Report, we implemented some major enhancements related to our Hospitalist Team. Their reach has expanded as evidenced by the integration of the CNS Hospitalist Team into the DOM Hospitalist family. The hospitalists have continued to elevate their practice, as evidenced by their internal governance committee called the Hospitalist Executive Committee. Furthermore, the group has taken major strides in terms of quality where you will see the volume of incident reports reviewed by our DOM Quality Team and the key involvement of DOM personnel in system-wide just culture training.

Madeline Erario, MD, FACP
Vice Chair of Academics and Medical Subspecialties
DIO / Director for Graduate Medical Education for Inova Health System

For the medical subspecialties, we continued to experience growth in 2018 with a focus on meeting the healthcare needs of the community and ensuring the highest quality care. While each of our medical directors will provide details about their own areas, we would like to briefly summarize some of the accomplishments. We welcomed several new physicians to the DOM Team in 2018. Sahana Hundal, MD was hired as an outpatient endocrinologist in the Reston office, Samantha Diamond, MD was hired as an inpatient endocrinologist, Michael Keith, MD was hired as a rheumatology medical director, and Ashima Malik, MD was hired as an outpatient rheumatologist. Additionally, the DOM was asked to serve as the leader for palliative care for the health system. All of our subspecialty services experienced 5%-20% growth in patient volume. Our leaders participated in several system-wide clinical effectiveness initiatives to improve the quality of care around hypoglycemia, heart failure, and high health care utilization. In addition, we put together several working groups to lead strategic planning and care coordination for gastroenterology, endocrinology, and geriatrics across the system.

Chapy Venkatesan, MD
Vice Chair of Quality and General Medicine

Gregory Trimble, MD
Vice Chair of Medical Subspecialties
Assistant Dean for Student Affairs for VCU School of Medicine Inova Campus

Department of Medicine 2018 Annual Report
Our medical critical care services (MCCS) program continues to grow and develop. The program cares for adult patients across the campus in the MSICU, NSICU, CICU and CVICU. We have had tremendous success in adding additional members to our team with unique skills in ECMO and neuro-critical care and we continue to recruit for increased staffing as we partner with our Neurosciences Department to develop a Comprehensive Stroke Center here at Inova Fairfax Medical Campus (IFMC).

In 2018, we welcomed Shashank Sinha, MD as our Medical Director for CICU. Since his arrival, Dr. Sinha has been working in collaboration with our MCCS Team to provide high quality care in the CICU and a superb learning environment for our residents and cardiology fellows. We look forward to another successful year working with this talented group of physicians and advanced practice providers (APPs) as we strive to deliver the highest quality of care to our patients.

Academically, our internal medicine residency continues to thrive under the leadership of Alita Mishra, MD. We proudly graduated our second class of senior residents in June 2018. We continue to place our residents into highly competitive fellowship programs, as well as, hospitalist and primary care positions, and we have been extremely fortunate to see a number of them join Inova Medical Group (IMG) upon graduation. In 2018, we welcomed our first class of cardiology fellows and under Drs. DeFilippi and Tran, the program has had a superb first year with two outstanding fellows and a recent successful match for our next class. The fellowship is the first one for the internal medicine program and planning continues for the development of additional fellowships. With regards to undergraduate medical education (UME), the Department of Medicine continues to host a number of medical students from our Virginia Commonwealth University (VCU) / Inova campus, as well as, those from our affiliates across the region. The students continue to enjoy the robust teaching services and we are thankful for our talented teaching faculty from IMG and our private practice colleagues that make this all possible.

The Department of Medicine continues to provide superb patient-centered clinical services, both for general medicine and subspecialty medicine. Our teaching programs are exemplary and our research programs continue to be one of the strongest for the institution. We look forward to continued growth and success as we all work to improve the lives of our patients and educate the next generation of physicians.
MESSAGE FROM THE DEPARTMENTAL LEADERSHIP

DEPARTMENT OF MEDICINE ADMINISTRATIVE SUPPORT TEAM
Trevor Gogoll, MHA
Director, Department of Medicine

2018 was another productive and rewarding year for the Department of Medicine (DOM) Administrative Support Team. Our team collaborated with DOM physician leadership on many program development initiatives, data analytics, and quality improvement projects. For example, the team developed service line portfolio reports that consolidate key performance metrics and trends on a monthly basis. These reports will go-live in 2019 and will provide critical summary information to our physician leadership in key categories, such as human resources, compliance, financial, quality, and research. The team also made tremendous strides in improving front office operating efficiencies to be able to better serve our providers and visitors. Lastly, the team worked tirelessly to ensure that the over 900+ physicians and Advanced Practice Providers (APPs) credentialed in DOM met the variety of annual training and credentialing requirements.

This year, we were fortunate to have the additions of Michael Barkema (Project Manager), Jeannie Fauntleroy (Senior Administrative Coordinator), and Charlotte Oliphant (Program Manager) on our team. Our physician leadership continued to support our professional growth as shown by members of our team earning professional certifications and attending continuing education conferences, such as the Medical Group Management Association (MGMA) Annual Conference, the National Alliance of Medical Auditing Specialists (NAMAS) Annual Auditing & Compliance Conference, and the Accreditation Council for Graduate Medical Education (ACGME) Annual Educational Conference. It continues to be an honor for our team to provide administrative and programmatic support for our physician leadership and clinical providers in the Department of Medicine and we look forward to another successful year in 2019.

ADULT SERVICES
Erin Hodson, MSN
Vice President and Administrator, Adult Services

2018 was a year of continued success for the Department of Medicine. Overall, the Medicine Service Line observed to expected length of stay was reduced by 12% from January 2018 to December 2018. We also reduced harm for CAUTI, CLABSI, falls with injury, and pressure ulcers by 50% overall. In addition, an Adult Inpatient Services Patient and Family Advisory Committee (PFAC) was created to meet monthly and provide guidance on how to improve the patient and family experience.

Organizationally, we standardized Medicine A and Medicine B Units with high functioning MDRs, closed the Original 5 Unit, opened the Comprehensive Medicine Unit, re-defined our Short Stay Unit as the Medical Surgical Unit, and reduced clinical variation on the Observation Unit, which is now under the Department of Medicine. Our leadership team also expanded as we added Darcy Allen, Chief Nursing Officer (CNO) for the Adult Hospital, and Jennifer Bautista, Director of Growth and Operations for Adult Services.
MEDICINE HOSPITALISTS
Ashiq Mannan, MD
Medical Director of the Medicine Hospitalist Program

The Medicine Hospitalist Team has had a very productive 2018. We have continued to grow in size, patient coverage volume, and our involvement in important hospital leadership roles. To adjust to such rapid continued growth over the past few years, we had a full day team retreat in March 2018, which was critical in establishing our growing group’s mission and vision for the future. We have made large strides in improving retention and are fortunate to have had some wonderful additions to the hospitalist group over the year, including: Amanda Morgan, Denny Song, Larry Istrail, Ali Shams, and Ioana Jucan. We have also integrated further with the Neuro Hospitalist Team so as to make better use of our collective size while preserving a core rounding team that works closely with our Neuroscience Department colleagues. Additionally, under the leadership of Mary Reyes, MD, Director of the Hospitalist Advanced Practice Providers (APP) Program, and Yaa Serwaah, our Chief APP, we have done a comprehensive overhaul and restructure of our Hospitalist APP Program. Notably during 2018, Dr. Reyes, a longtime hospitalist who has served in several leadership roles, also joined Sam Elgawly, MD as Associate Medical Director of the Medicine Hospitalist Program and both have been critical to our growth and success. Both Drs. Elgawly and Reyes also have devoted significant time and effort into developing a dedicated hospital consult and co-management service in working with our access team to streamline transfer of patients from outside facilities to our team.

To provide some further highlights of 2018, we have continued to work closely with hospital administration to create hospitalist unit director roles throughout the hospital. We began with Wali Azizi, MD on Tower 10 Med A / B Units, then added Kate Gibson, MD to APU, followed by Saquib Chaudhri, MD to PCCU, Krupal Shah, MD to CTUN, Shabnam Lankarani, MD to CTUS, Brigid Gray, MD to Neurosciences Unit, and Amal Chaudhry, MD to Stroke Unit. These hospitalist unit directors collaborate with existing unit leaders, including primarily the unit nursing directors to create dyads that have proved to be a very effective model to optimize unit function, improve metric performance, and efficiently deal with any safety and quality issues that may arise on the unit level. We hope to keep building on this model and refining roles to continue to maximize benefits. These hospitalist leaders have also been the primary drivers to ensure the key elements in our hospitalist workflow trio rounding (patient, hospitalist, and nurse) and multidisciplinary rounds are functioning at the highest levels.

I am fortunate to be able to work with such dedicated and passionate associate medical directors and unit directors who are all very devoted to making our group as successful as possible and helping us meet the needs of our community and hospital. We look forward to meeting the challenges of 2019 and continuing to grow and improve. Please reach out anytime via mohammed.mannan@inova.org or 703-776-3582 with any thoughts or suggestions.
New for 2018, meet our Co-Medical Directors on the Inova Heart and Vascular Institute (IHVI) Cardiac Hospitalist Team!

Kate Gibson, MD is the Co-Medical Director of the Acute Pulmonary Unit, alongside Eric Libre, MD (pulmonologist) since April 2018. Dr. Gibson completed her internal medicine residency at the University of Maryland, where she was the first Chief Resident of Quality Improvement and Patient Safety and has been a hospitalist at Inova Fairfax Medical Campus (IFMC) since July 2013. She has worked to improve multidisciplinary rounds with case management, as well as, focus on trio rounding with the nursing staff. Dr. Gibson developed a strong working relationship with the pulmonologists and together they have been working on chronic obstructive pulmonary disease (COPD) readmissions. Dr. Gibson co-chairs the APU leader monthly quality improvement meeting with nursing, Dr. Libre, quality, and respiratory therapy. Lastly, Dr. Gibson was selected for Cohort 3 Inova Physician Leadership Development Program.

Krupal Shah, MD completed medical school at Duke University, residency in internal medicine and pediatrics at the University of Michigan, and a Master of Public Policy at the University of Chicago. Dr. Shah has been at Inova since November 2016. He has an enduring interest in improving outcomes, reducing readmissions, and improving patient care for the chronically ill through close collaboration with the Geriatrics, Palliative Care, and Psychiatry Teams. Dr. Shah was appointed Co-Medical Director of CTUN in partnership with Chris May, MD from the Advanced Heart Failure Team in June 2018. He helped initiate a weekly pilot program in October 2018 with the Psychiatry Team during multidisciplinary rounds, which led to early identification of patients at risk of an acute decline in mental health and early psychiatry intervention. He has also been a part of two system wide quality improvement sprint initiatives to improve care and reduce preventable readmissions for heart failure and advanced heart failure patients.

Shabnam Lankarani, MD is the Co-Medical Director of CTUS, alongside Richard Neville, MD (vascular surgeon) since July 2018. Dr. Lankarani completed her internal medicine residency at William Beaumont Hospital – Farmington Hills in Michigan. She has been a hospitalist with IFMC since June 2016. Previously, she worked as a hospitalist at Park Nicollet Hospital in Minneapolis, MN for six years. While there, she worked in Readmission Initiatives for Heart Failure. At IFMC, she has worked with Dr. Summers and Dr. Shah on an Affordable Care Act (ACA) quality improvement project for heart failure readmissions and developed keen insight into safe discharge processes, improved patient education, and understanding of the many barriers in our vulnerable elderly patients. Through her current position, she has been working on improving patient experience through collaboration with the Vascular Surgery Team and improving communication between the two teams.

Saquib Chaudhri, MD completed his residency training in internal medicine at Hofstra University North Shore-LIJ, and also obtained his MBA in Healthcare Management. In June 2018, he became the Co-Medical Director of the Progressive Coronary Care Unit with Joseph Kiernan, MD (interventional cardiologist). Dr. Chaudhri has been a hospitalist since September 2016. He became a member of the Hospitalist Executive Committee to help improve the standards and functionality of the hospitalist group internally and externally. As Co-Medical Director of the PCCU, Dr. Chaudhri has focused on improving physician-patient-nursing communication by utilizing effective trio rounding and incorporating pharmacists to review high risk medications during rounds in this high acuity patient population. Improved geographical rounding and management of the majority of the patients in the PCCU has created continuity and visibility which translate to improved patient quality of care and nursing communication. Recently, the PCCU has expanded its clinical breadth by providing more critical care infusions, partly due to leadership partnerships with medical directors and nursing directors between CICU and PCCU. Lastly, Dr. Chaudhri was selected for Cohort 3 Inova Physician Leadership Development Program.
CNS HOSPITALISTS
Brigid Gray, MD
Medical Director of the CNS Hospitalist Program

The CNS (central nervous system) Hospitalist or Neuro Hospitalist Program at Inova Fairfax Medical Campus (IFMC) was created in 2010. The team provides specialized care for neurology and neurosurgery patients 24 hours a day, 7 days a week. The CNS team triages and accepts neuroscience transfer patients from outside hospitals providing care that patients are not able to obtain at outside facilities. In combination with radiation oncology, neurosurgery, and other neurologic specialists, the team brings together many best practices on both the neuroscience and stroke units.

The CNS Hospitalists conduct daily discharge rounds with nursing and case management leadership to ensure that transition of care is satisfactorily accomplished. The CNS Team now includes two advanced practice providers (APPs).

Fulfilling the goal of further integrating into the Department of Medicine (DOM), Brigid Gray, MD was named the Medical Director of the Neuroscience Unit. She had previously served as the CNS Hospitalist Director. She is joined by Amal Chaudhry, MD, who is the new Medical Director of the Stroke Unit. Drs. Gray and Chaudhry continue to work closely with nursing leadership on several initiatives, including HCAHPS and patient throughput process improvement. Under their leadership, the CNS Team hopes to continue improving and provide excellent care for all neuroscience patients.
A key area to successfully building Inova as a leading healthcare system is a strong critical care team at Inova Fairfax Medical Campus (IFMC). The Medical Critical Care Services (MCCS) Program is a highly specialized team of critical care / intensivist physicians and advanced practice providers (APPs) working collaboratively to care for the acutely ill or decompensating patients at IFMC. Our team cares for patients in the Neurosciences ICU (NSICU), the Medical-Surgical ICU (MSICU), the Cardiovascular ICU (CVICU), and the Coronary Care Unit (CCU).

Our current 24/7 support enables:
- Northern Virginia’s highest level of critical care
- Advanced respiratory care
- Extracorporeal membrane oxygenation (ECMO) program development
- Cardiogenic shock program with mechanical circulatory support
- Mechanical thrombectomy stroke care
- Septic shock
- Advanced renal therapies – plasmapheresis
- Advanced heart and lung failure therapies and evaluation for transplant

Some highlights of 2018 quality improvements:
- **ICU Liberation** – Pain and sedation protocols designed to reduce intensive care unit (ICU) length of stay (LOS) and neurocognitive sequelae from ICU care.
- **ECMO Program Support** – Provided additional leadership with Mehul Desai, MD as associate medical director and Erik Osborn, MD who has 10+ years of international ECMO experience.
- **Cardiogenic Shock Program** – Foundation 24/7 support to facilitate advanced therapies, including mechanical circulatory support.
- **Comprehensive Stroke Center (CSC)** – Supported strategic development and recruitment to enable IFMC to become CSC.
- **MCCS & Respiratory Therapy Steering Group** – Formed in the end of 2018 to lead development of evidence-based initiatives such as new acute respiratory distress syndrome (ARDS) protocol for mechanical ventilation.
- **Education** – Provide education to medical students, residents, and fellows in the MSICU, NSICU, CVICU & CICU.
- **System-Wide Educational Opportunities** – Offered by the IFMC team in Fundamental Critical Care Support (FCCS), ECMO, and Emergency Neurological Life Support (ENLS).
- **Process Upgrades** – Establishment of robust case review, peer review, and M&M processes.
- **Sepsis Care** – Sepsis care process improvement adopted system-wide using RRT / APP.

A few 2019 initiatives:
- Support development of Comprehensive Stroke Center, including providing leadership to stroke and neuro-critical care research.
- Creation of MSICU2 extended ICU and step down unit from current IMC.
- Expanding support to Inova Heart and Vascular Institute (IHVI) with closure of CICU to only MCCS and 24/7 in-house critical care coverage with dedicated intensivist and APP team.
- Ongoing attention to ICU liberation initiatives (pain and sedation management, mobility, etc.).
TRANSITIONAL CARE AND SAFETY NET PRIMARY CARE
John Paul Verderese, MD, FACP
Medical Director of Care Transitions and Safety Net Primary Care, Inova Health System

In close partnership with the Inova Population Health Division, the Department of Medicine (DOM) continues to provide clinical leadership for programs aimed at supporting adult patients who are at risk of hospital admission or readmission, or that do not have access to a traditional medical home.

The Inova Transitional Services Clinic (ITSC) supports all Inova hospitals and emergency departments as a “no barriers” multidisciplinary medical program for those with immediate post-acute needs, such as assistance with care coordination, securing medications, accessing community services, and ultimately securing or returning back to a permanent medical home. The clinic partners work closely with the Inova Transitional Care Management Program (TCM), a 30-day telephonic program for Medicare patients hospitalized with chronic obstructive pulmonary disease (COPD), heart failure, pneumonia, or myocardial infarction, as well as with Inova Home Health. Patients serviced by ITSC and / or TCM year after year have experienced readmission rates well below Inova system goals, and the programs participate in ongoing system-wide efforts that have collectively reduced Medicare-focused diagnoses readmission rates for all hospitals.

Inova Safety Net Primary Care Programs include Simplicity Health, a direct primary care practice that serves those who are not eligible for government insurance or who may have a high deductible health plan, and our new Health Advantage Clinics, established in early 2018 as a response to Medicaid expansion in Virginia. Co-Medical Director, Chad Zik, MD joined the team after finishing his residency last year at Inova and will direct resident education within those clinics. Dr. Verderese has also acted as Interim Director for Fairfax County Community Health Care Network (CHCN) that serves low-income adults in Fairfax County. CHCN will be merging with our area Federally Community Health Services Clinics in July and Inova will continue to work closely with those organizations to promote clinical collaboration in the care of our mutual patients.
ENDOCRINOLOGY SERVICES

Inpatient Clinical Care
We continue to experience a high demand for our endocrinology inpatient diabetes and consultative services. The endocrinology consult service supports all departments, including cardiothoracic surgery, general surgery, OB/GYN, psychiatry, emergency medicine, and anesthesiology. The endocrine providers are well connected with both outpatient Inova Medical Group (IMG) practices and the Centers for Wellness and Metabolic Health, working to ensure the proper coordination of care of patients from the hospital into the larger Inova Health System.

The result of our work has made us a regional referral center for complex endocrine problems. Inova Fairfax Medical Campus (IFMC) has become a destination care center for the treatment of severe diseases. A substantial number of patients hospitalized at IFMC for treatment of hyperglycemic emergencies, thyrotoxicosis and thyroid storm, and adrenal insufficiency are referred from outside hospitals.

Regarding quality, Dr. Clement has led or participated in multiple quality improvement (QI) initiatives both for IFMC and the system, including the system-wide hypoglycemia sprint. This project addresses in-hospital hypoglycemia as a safety concern. The work resulted in system-wide changes in the way insulin is used and increased education for nurses on how to prevent hypoglycemia. The division continues to publish case reports in key journals and participate in large clinical trials.

Teaching and Mentoring
Internal medicine residents are encouraged to perform an elective month rotation with the Endocrinology Consult Team for in-depth teaching in clinical endocrinology. One of our residents was selected for a coveted endocrine fellowship program. Medical students in other specialties also frequently choose to spend 2-4 weeks as a teaching elective with us. Due to the positive teaching experience, the faculty are frequent recipients of teaching awards from the residents and students.

Outpatient Clinical Care
There continues to be a prolific increase in the demand for outpatient endocrinology services. Following comprehensive strategic planning with a focus to build on the existing success of each practice and expand the service line, we anticipate addition of up to four endocrinologists in 2019. In 2018, the outpatient endocrinologists outperformed the targets for both quality metric and patient experience goals. Endocrinology had one of the highest “Likelihood to Recommend Office” scores in 2018 among all the outpatient subspecialties within Inova. Dr. Gundu Rao, along with the administrative team, led the discussion on relevant updates with the Epic Build Team. This also included building an encounter type which will allow remote interpretation and billing for continuous glucose monitoring (CGM) data interpretation. The Outpatient Endocrinology Team has been at the forefront of innovative technology as evidenced by the imminent ability to use implantable CGM at our endocrinology offices. In addition, Drs. Gundu Rao and Gandhi are able to perform ultrasound guided fine needle aspiration of the thyroid and also offer hormonal therapy for transgender patients at the Ashburn office. An upcoming notable addition is the Gestational Diabetes Clinic, which is expected to pilot in Loudoun County. This stemmed from collaborative efforts between the endocrinology and OB / GYN leadership teams. Guidelines for comprehensive care of diabetes in pregnancy were developed and will be made available for use for patients within Inova. We continue to plan collaborative efforts between specialties for the sharing of resources with the goal of improved patient care.
It has been another busy year for the Palliative Care Team with continued growth. Our 2018 volumes are 6% higher than 2017 with nearly 2,000 referrals. We have also seen great growth in our pediatric palliative care program at Inova Children’s Hospital with a 200% growth in our pediatric volumes. This is in part due to the addition of Alva Roche-Green, MD. Dr. Roche-Green joined our team in April 2018 and is our new medical director. She is an internal medicine and pediatrics board certified physician with fellowship training in hospice and palliative medicine allowing her to see patients of all ages. Dr. Roche-Green also has a special interest and more than 8 years previous experience caring for patients with advanced heart failure being evaluated for implantation of Left Ventricular Assist Devices. Our team provided consultation and “preparedness planning” for 44 Pre-LVAD patients in 2018.

Dr. Roche-Green also led the palliative care portion of the Heart Failure Sprint through the Inova Health System this year. As part of the sprint, we were able to:

- Provide education on the role of palliative care in the heart failure population
- Refine the Palliative Medicine Admission Screen to better identify those patients that might benefit from palliative medicine consultation during the current admission
- Create the Palliative Care FYI flag in Epic so that patients previously followed by the Palliative Care Team can be easily seen again
- Creating the Palliative Care ED best practice advisory to prompt palliative consults in the ED for patients previously followed by the Palliative Care Team anywhere in the Inova Health System
- Create a metric that clearly defines the presence or absence of a valid advance directive document in a patient’s chart, prompting more discussion if no document or an invalid document exists in Epic

We continue to advocate for more community based palliative care, partnering with regional palliative care providers to expand the reach to other patient populations, as well as other settings.

In May 2017, Jean-Paul Pinzon, DO joined the Inova Schar Cancer Institute (ISCI) as the medical director for palliative care. His practice is ambulatory-based and embedded within the ISCI oncology offices. This has allowed for increasing partnership between ISCI and hospital-based palliative care in the Inova Health System. The continuity between the two groups has allowed us to continue to move towards higher levels of collaboration of palliative care services for patients that focus on optimizing symptom management, improving outcomes for cancer patients, as well as aiding in patient centered goals of care determination.

As we move towards shifting the mission, vision, and values of the Inova Health System, we are crafting a system-wide strategic plan to reflect this change. Team members from the Department of Medicine and Palliative Care Team are working together to form a plan that will build continuity among all five hospitals, centralized leadership, and allow for the same levels of care for all patients, regardless of where they are treated. This goal reflects the overall values and strategic direction created by system leadership. We are anticipating greater demand for palliative care across the system and are working to scale and meet these needs.
2018 was a very dynamic year for the geriatrics service line. We saw significant growth in the service at Inova Fairfax Medical Campus (IFMC) and launched several initiatives.

The Inova Geriatrics Services
The Geriatrics Team welcomed Puneetinder Mann to the team as the Project Manager. Denise Mohess, MD, Sangeetha Shan-Bala, MD, Keiko Kuykendall, NP, Nikki Taylor, NP, and Suvi Hyytiainen, NP provided geriatrics consultations to over 2,000 patients over the age of 60. The team was also involved in many IFMC committees and initiatives. An Acute Care for the Elderly (ACE) Service pilot was very successful. A geriatrician was the attending physician and through robust collaborations with coordinated transitions of care for patients enrolled in our community geriatrics programs led to improved length of stay and readmission rates. Advance care planning was addressed in over 95% of patients seen by the geriatrics service and patients who were seen in the first quartile of their admission had an improved length of stay compared to those seen later during the hospital course.

The service partnered with the Trauma Team and the Orthopedics Team to provide more comprehensive care for vulnerable elders. We are also partnering with Inova Medical Group (IMG) Oncology for geriatrics oncology research.

Geriatrics medicine is a standard rotation site for pharmacy students, internal medicine residents, and psychiatry residents. It continues to be a popular elective rotation for medicine students and nurse practitioner students.

Quality improvement and safety initiatives to improve care for the elderly include but are not limited to: polypharmacy, frailty, mobility, delirium, nutrition, and advance care planning.

No One Dies Alone (NODA)
Volunteers provide compassionate companionship to patients otherwise dying alone. It is adapted from the NODA program that was created in 2001 at Peace Health Oregon, inspired by Sandra Clarke, RN and is one of over 300 programs nationwide. We celebrated our first anniversary in August 2018.

Compassionate companions are available to provide vigils to all adult patient care areas and we expanded to 24/7 coverage. In 2018, NODA volunteers provided vigils to 63 patients for 297 shifts, serving almost 1,400 volunteer hours. The webpage was launched and we continue to recruit for volunteers. Many of our volunteers are also staff members.

A retired nurse said, “NODA has been the "capstone" of my career. It has provided me fulfillment and completion in what it means to be a nurse.”

Hospital Elder Life Program (HELP)
HELP is an internationally-recognized program that prevents delirium and functional decline in hospitalized geriatrics patients. The program at IFMC is recognized as a HELP Center of Excellence due to its success in combating delirium and its expansion to several units throughout the hospital. In 2018 693 patients from 70 years old to 102 years old were served.
We presented the results from our experience using simulation labs in our training at two national conferences, including at The National Society for Simulation Annual Conference in January 2018 and the HELP / American Geriatric Society Annual Conference in May 2018.

Annual Skills Fair for Patient Safety Associates (PSAs): HELP developed and created three training modules that were used to educate PSA staff during their annual skills fair on proper feeding techniques and mobility interventions, including walking and range of motion (ROM) activities.

**NICHE (Nurses Improving Care for Healthsystem Elders)**
NICHE has grown significantly at IFMC since its initiation in 2001. Re-education is in process on three medical units (Med A, B, and C) using NICHE learning modules and has been completed by 113 RNs (20 hours), 31 clinical technicians (16 hours), and 3 non-clinical staff (5 hours) in the past year related to management changes and staff turnover. Education is planned to begin on Tower 11S, Tower 9S, OB/GYN and IHVI in 2018. IFMC has maintained its NICHE exemplar status since 2017.

**Education**

**The Geriatrics Grand Rounds**
This is a continuing medical education (CME) multidisciplinary rounds that is held the 4th Wednesday of the month from January through October. Attendees include healthcare professionals from many disciplines that provide care to elderly patients, such as physicians, nurses, rehabilitations services, psychiatry, population health, and the community. This CME provides interesting topics which focus on caring for elderly patients with one CME credit being available after attending.

**Workshops**
The geriatrics, neurosciences, HELP, and NICHE programs partnered in May 2018 to create two workshops on “Caring for Patients with Dementia”, for the medical staff and community at no cost. Over 75 attendees participated. Additional workshops will be planned for 2019.
RHEUMATOLOGY PROGRAM

Lynn Gerber, MD
Section Chief of Rheumatology
Director of Research for Department of Medicine

The rheumatology program at Inova was founded in January 2012. Currently, the program consists of the section chief, Lynn Gerber, MD and three clinical rheumatologists: Ramona Raya, MD, Yingxue Zhang, MD, and Pragya (Pooja) Singh, MD, who provide care to both inpatients and outpatients. The inpatient consult service is available Monday through Friday at Inova Fairfax Medical Campus (IFMC). Consultations can include patients with various rheumatologic conditions, such as systemic vasculitis, systemic lupus erythematosus, myositis, rheumatoid arthritis, crystalline arthritis, or ill-defined conditions, such as fever of unknown origin, or other diagnostic challenges.

The outpatient rheumatologists provide comprehensive care for the above conditions, as well as, non-inflammatory conditions, such as osteoporosis, osteoarthritis, and fibromyalgia.

The rheumatology program is involved in several scholarly activities including:

- Provision of a chapter, “Rehabilitation of the Patient with Rheumatic Disease” for the 6th edition of DeLisa / Frontera Physical Medicine and Rehabilitation: Principles and Practices (authored by Ramona Raya, MD and Lynn Gerber, MD)
- Sub-investigator of double blind, randomized, placebo controlled trial evaluating efficacy and safety of oral nintedanib treatment in patients with systemic sclerosis associated interstitial lung disease, extension study started in 2018 (Ramona Raya, MD and Yingxue Zhang, MD)
- Participation of myofascial pain syndromes (contributed by Pragya Singh, MD and Lynn Gerber, MD)
- Participation in study of “NSAIDs vs. Coxibs in the presence of Aspirin: Effects on platelet function, endothelial function and biomarkers of inflammation in RA and increase cardiovascular risk” (Pragya Singh, MD)
- Primary Investigator of “Associations between Autoimmune Diseases and Nonalcoholic Fatty Liver Disease” Study. (Lynn Gerber, MD and Ramona Raya, MD)

The rheumatology program at Inova is actively involved in teaching and mentoring both medical students and residents through educational conference and rheumatology monthly rotations. The rheumatology program has continued to host quarterly journal club meetings in which both the Inova and community rheumatologists participate and discuss latest clinical trials and challenging patients.

Additionally, the rheumatology program works closely with several other departments in collaborating care and research. In 2018, Inova rheumatology, neurology, advanced lung disease, and advanced heart failure programs have collaborated to start a “Sarcoid Center of Excellence.”

In 2018, as patient volume has continued to rise, the rheumatology program was able to recruit two more rheumatologists, who will be joining the team in May 2019. One of the new joining members, Michael Keith, MD will also serve as the rheumatology medical director and will work closely with Dr. Singh who is the new associate rheumatology medical director.
In 2018, Rishi Garg, MD functioned as Associate Chief Medical Officer for Inova Fairfax Medical Campus, as well as, Medical Director of Quality in the Department of Medicine (DOM).

In 2018, Dr. Garg continued to lead the DOM Quality and Safety Team in identifying process improvement opportunities to better serve our patients and to support our providers. Weekly quality team meetings continued with a focus on Safety Always events, patient / family grievances, and quality improvement opportunities. Over the course of the year, our DOM Quality Team reviewed nearly 700 cases referred to us via Safety Always, Patient Relations Team, physician notification, or other departments. Of those cases, 86 were then referred for practitioner peer review as appropriate.

We also welcomed Jeannie Fauntleroy to our team and supported her in receiving her Certification as a Professional in Healthcare Quality (CPHQ). Jeannie came with a wealth of knowledge from Inova Fair Oaks Hospital (IFOH) and has been an outstanding addition to our team.

We also continued to work collaboratively with multiple other disciplines across the campus, including, but not limited to: pharmacy, nursing, interpreter services, providers, imaging, and infection control to promote patient safety and high quality care.

The DOM continues to comply with the Joint Commission’s mandate for Ongoing Professional Practice Evaluation (OPPE). We have worked with our subspecialty section chiefs to identify and assess various quality metrics specific to each section. In addition, we are utilizing Premier physician focus reports and supervisor reviews for our allied health providers as part of our continuous monitoring.

The team’s work aligns perfectly with the evolution to a mission, vision, and values model as we remain one of the strongest ambassadors for quality and safety across all of Inova.
Pictured in the front row, from left to right, are:
Lynn Gerber, MD (Rheumatology); Madeline Erario, MD (Vice Chair of Academics and Medical Subspecialties and DIO / Director for Graduate Medical Education); Zobair Younossi, MD (Chair of Department of Medicine); Chapy Venkatesan, MD (Vice Chair of Quality and General Medicine); and Gregory Trimble, MD (Vice Chair of Medical Subspecialties and Assistant Dean for Faculty for VCU School of Medicine Inova Campus)

Pictured in the middle row, from left to right, are:
Erin Hodson (Administrator and Vice President, Adult Services); Albert Kim, MD (Cardiovascular Disease); Shalika Katugaha, MD (Infectious Disease); Svetolik Djurkovic, MD (Critical Care); Franco Musio, MD (Nephrology); Stephen Clement, MD (Endocrinology); Denise Mohess, MD (Geriatrics); John Paul Verderese, MD (General Internal Medicine); and Z Chris, MD (General Internal Medicine)

Pictured in the back row, from left to right are:
Behzad Kalaghchi, MD (Gastroenterology); Richard Rosenthal, MD (Allergy and Immunology); Eric Libre, MD (Pulmonology); Timothy Cannon, MD (Hematology / Oncology); Trevor Gogoll, MHA (Director, Department of Medicine); and Maruf Haider, MD (Physician Informatics for Epic)

Not pictured: Jennell Nelson, MD (Dermatology)
Department of Medicine (DOM) Education Programs

The educational programs in the Department of Medicine had another successful year under the leadership of Zobair Younossi, MD and Madeline Erario, MD. We graduated our second class of residents in 2018. We have a full complement of 27 residents for three years of training. In addition, we started a new cardiology fellowship with two fellows in July 2018. In addition, our core Internal Medicine Program continues to be fully accredited by the Accreditation Council for Graduate Medical Education (ACGME) without any citations or areas of concern which is remarkable for a new program. We were able to recruit top tier medical students to start our fifth year intern class in 2018. The enthusiasm, support, and dedication to teaching and mentorship of our faculty members have been outstanding. Our core curriculum foundation is based on inpatient training on our inpatient wards, critical care units, and continuity clinics at Inova Medical Group primary care clinics. We are able to augment and individualize electives to include all Internal Medicine subspecialties and also have a focus on quality improvement, procedural training, residents as teachers, ambulatory medicine, and scholarly activities. In addition, we also incorporate women’s health, office-based orthopedics, dermatology, neurology, and geriatrics in our training. Our residents are a crucial part of the rapid response team at Inova Fairfax Medical Campus (IFMC). All of our residents also rotate through the Inova Transitional Care Clinic and help in our efforts to keep vulnerable patients out of the hospital. As of 2018, we have expanded our resident continuity clinic to include Inova Simplicity Clinic where they get a unique opportunity to care for vulnerable patients in our community. Outside of Inova, in partnership with the National Institutes of Health (NIH), we have successfully had eight residents’ complete rotations in critical care, oncology, and rheumatology at the NIH.

We had an extremely successful placement of our residents into fellowships in 2018, which is a testament to the success of our training. Danubia Hester, MD matched into Hematology-Oncology at University of Wisconsin; Omair Alam, MD matched into Nephrology at University of California, San Francisco; Ansha Goel, MD matched into Endocrinology at Georgetown University; Min Kim, MD is pursuing Infectious Diseases at University of North Carolina; and Omer Shahab, MD matched into Gastroenterology at Virginia Commonwealth University. We are proud of our residents and look forward to their continued success.

Complementing a robust clinical training, we also provide ample opportunities for scholarly and quality improvement activities. Our resident presentations for 2018 include presentations at the American College of Physicians (ACP) annual Virginia chapter meeting, Alliance for Academic Internal Medicine (AAIM) annual meeting, American Thoracic Society (ATS) meeting, International Society of Heart and Lung Transplantation (ISHLT), Greater Washington Infectious Disease Society (GWIDS), American Association for the Study of Liver Diseases (AASLD), Society of General Internal Medicine (SGIM), and Digestive Diseases Week (DDW). Omer Shahab, MD was an invited speaker at the Annual Department of Medicine Research Day. This is in addition to several peer reviewed publications in 2018. With regards to quality improvement (QI), the residents are working on four key quality initiatives with direct impact for improving patient care, including: 1) insulin education for newly diagnosed
DEPARTMENT OF MEDICINE EDUCATION PROGRAMS

diabetics; 2) evidence-based high value care curriculum for inpatient medicine; 3) standardized rounding checklist in the intensive care units; and 4) intravenous access for patients admitted with gastrointestinal bleeding. We continue to incorporate simulation training into our resident education. Key areas have been in teaching simulated patient cardiac and respiratory arrests, handling difficult communications, and challenging patients and team leadership in a patient resuscitation setting. For the last four years, we have also organized a dedicated “Transition to Residency” curriculum for our rising second year residents as they move from being a first-year resident to senior resident.

Our faculty member, Gigi Gaudiano, MD was the recipient of 2018 American College of Physicians Virginia Chapter’s Annual Teaching Award. ACP also recognized our residency program in 2018 as an elite program in the country for supporting resident education and professional development. This past year also brought leadership change in the program. Shirley Kalwaney, MD moved from her role as the Associate Program Director to the role of Associate Graduate Medical Education Director, and Ivan Garcia, MD was appointed as the new Associate Program Director for the Internal Medicine Residency Program at IFMC. He has been recognized with several awards for his dedication to teaching and mentoring residents and medical students and is a well-respected clinician dedicated to the teaching program.

Last but not the least, retention of our trainees is a reflection of our success. After completion of training in 2018, two of our graduating seniors, Danubia Hester, MD and Bradley Nitta, MD stayed with us as chief medical residents. We also welcomed Amanda Morgan, MD, Larry Istrail, MD, Denny Song, MD, and Chad Zik, MD as our colleagues upon their graduation from the program in 2018. There is no doubt our program will continue to be the pipeline for dedicated physicians in our community.

Continuing Medical Education (CME)
The Department of Medicine continues to be a leader in high quality Medical Grand Rounds series. In 2018, we had an impressive number of our Inova-based physicians, as well as, national and internationally known experts give important updates on their areas of expertise. Our Grand Rounds topics have been chosen based on needs assessment of our physicians and we have been encouraged by the high quality of speakers in the last few years.

Our annual DOM Research Day in 2018 included a key note speaker and a number of oral and poster presentations from DOM scientists and physicians. Omer Shahab, MD was an invited speaker from the residency program. We also had another successful CME event on Advances in Pulmonary and Critical Care Medicine in March. This full day symposium included many nationally well-known speakers and cutting-edge advances in pulmonary and critical care medicine.

We welcome all of our staff physicians and their guests to our weekly Grand Rounds. Your suggestions for speakers and topics are welcome. Our CME planning committee meets monthly to discuss topics and speakers and our aim is to include both innovative updates in the field of internal medicine, as well as, review of common medical conditions and management updates.
UNDERGRADUATE MEDICAL EDUCATION
Homan Wai, MD
Medicine Clerkship Director for
Virginia Commonwealth University (VCU)

In 2018, the Department of Medicine continued to train third and fourth year medical students from Virginia Commonwealth University (VCU) and regularly hosted fourth year Georgetown University students in our CCU rotation. The clerkship was led by Homan Wai, MD (Clerkship Director), Meena Raj, MD (Associate Clerkship Director), and Kristin Liska (Academic Administrator). Our students continue to rate internal medicine as one of their most fulfilling rotations thanks to dedicated faculty and programmatic innovations.

During this past academic year, the internal medicine clerkship continues to provide leadership in the VCU School of Medicine’s transition to a competency-based entrustment model for student evaluations. The new model focuses on multiple domains, including clinical performance, professionalism, communication and teamwork, as well as knowledge assessment. The clinical performance is judged based on the RIME (Reporter, Interpreter, Manager, and Educator) development model, a nomenclature first coined by Louis Pangaro, MD in Academic Medicine in 1999.

Looking ahead to 2021, we are laying the groundwork for the transition of Inova to become a University of Virginia (UVA) School of Medicine regional campus.

Consider the Clerkship
RIME Framework

The RIME Framework summarizes the Characteristics and Behaviors of students at each level of performance.

These descriptions are customized to reflect the specifics of each Clerkship’s clinical requirements.

The RIME scale provides a standardized way to describe what successful performance "looks like" at each phase of clinical training (Pangaro, 1999).

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Description</th>
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<tbody>
<tr>
<td>Observer</td>
<td>Passive participant. Present, but does not actively contribute to patient care. Does not report information or meaningfully add to discussion.</td>
</tr>
<tr>
<td>Reporter</td>
<td>Consistently good interpersonal skills; reliably obtains and communicates clinical findings.</td>
</tr>
<tr>
<td>Interpreter</td>
<td>Able to prioritize and analyze patient problems.</td>
</tr>
<tr>
<td>Manager</td>
<td>Consistently proposes reasonable options incorporating patient preferences.</td>
</tr>
<tr>
<td>Educator</td>
<td>Consistent level of knowledge of current medical evidence; can critically apply knowledge to specific patients.</td>
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INOVA FAIRFAX MEDICAL CAMPUS INTERNAL RESIDENCY PROGRAM

RESIDENT CLASS OF 2018

RESIDENT CLASS OF 2019

RESIDENT CLASS OF 2020
Our Medicine Informatics Team continued to meet and share technical expertise to support data driven projects for the Department of Medicine (DOM). The team carries on its directive to facilitate DOM collaboration with technology and administrative departments and to streamline data collecting and reporting. The team also continues to be available for in-house IT training and consultation, such as with Microsoft Excel / Word programs for DOM medical directors, clinical staff, and administrative staff. DOM continues to have a number of active Premier Quality Advisor Champions and Epic Superusers to support the wide variety of quality-related reports requested of the team.

We are continually looking to improve our own processes and providing continuing education to our team members so we can better serve our stakeholders.

2018 marked the fourth year for the hospitalist dashboard being integrated into the Oracle database program, which allows for continued streamlining and data mining capabilities. During the year, the Provider Compliance database was completed and implemented. This database allows for the monitoring of time sensitive metrics, such as compliance, credentialing, membership, and licensure deadlines, which is critical for preventing lapses and assuring provider continuity. Our team also collaborated with DOM physician leadership to develop service line portfolio reports that consolidate key performance metrics on a monthly basis. These reports will go-live in 2019 and will provide critical summary information to leadership in key categories, such as human resources, compliance, financial, quality, and research. Moving forward into 2019, the team plans to continue to meet regularly and be available to assist with DOM’s various data driven and Epic-related projects.
JUST CULTURE INITIATIVE
Joseph Hallal, MD

As a former Chief Medical Officer at Inova Fairfax Medical Campus (IFMC), Joseph Hallal, MD continues to use his expertise to assist the Department of Medicine (DOM) with quality and safety issues and initiatives as they arise. In addition, he is an advisor in the DOM as it continued its Just Culture journey in 2018 led by DOM quality physician leaders: Chapy Venkatesan, MD and Rishi Garg, MD.

In January 2018, the DOM Just Culture Team continued the practice of utilizing the Just Culture algorithm in peer review. The driving force behind this is the use of workplace accountability principles. Changes made, include interviewing the relevant physicians prior to each meeting and inviting them to attend the meeting if so desired (though they must forgo their anonymity). In addition, we blind the outcome, and ultimately render a score utilizing the Just Culture algorithm on difficult to determine cases. Toward the end of the year, we began rendering scores by private ballot. We are currently considering next steps to determine whether Just Culture principles in peer review improve near miss reporting and outcome bias. A Just Culture will improve patient safety, reduce errors, and give a voice to physicians and staff without the fear of punitive responses for reporting errors. We have seen an increase in Safety Always reporting by physicians, advanced practice providers (APPs), and residents in 2018. There appears to be a new willingness of physicians to reach out to the DOM Just Culture Team directly to report safety concerns.

In the fall of 2018, Dr. Venkatesan, Dr. Garg, Sameh Elgawly, MD, and Karen Adamouski-Marion all either chaired or co-chaired Just Culture training for IFMC leadership across the campus. This followed the initial system training that occurred in the winter of 2017. The DOM are planning to roll out Just Culture with staff in 2019. As a part of that initiative Dr. Elgawly will be training the Peer Review Committee Chairs in the Just Culture principles.

Our ongoing safety and quality rounding continued in 2018. This has given the DOM Just Culture Team the opportunity to connect with frontline staff and address concerns in real time. We have been able to make improvements in work processes that have been shown to have a direct impact on patient safety and staff satisfaction.
Barry Strauch, MD
Chair Emeritus and Consultant to the Department of Medicine

Barry Strauch, MD, in his role as Chair Emeritus of the Department of Medicine (DOM), continues to use his years of experience and expertise in quality and safety initiatives. He also utilizes his experience over the past several years as an appointee to the Armstrong Institute for Safety and Quality at Johns Hopkins and experience with the Safety and Quality Committee of the Board of Trustees of Johns Hopkins Medicine to continue monitoring several sections of DOM at Inova Fairfax Medical Campus (IFMC). Dr. Strauch continues to attend the DOM monthly meeting on the morbidity and mortality conference, as well as, the IFMC Ethics Committee, which is a committee that is undergoing a major transformation and assuming a major role in the functioning of the hospital.

Richard Binder, MD

The Physician Liaison Program continued to interface with the wide variety of physicians that make up the Department of Medicine (DOM), which include both community and employed physicians. The program is designed to be a resource and support to physicians so that they have an avenue for feedback and enhanced communication. The Inova Simulation Center continues to be a successful facility used by both community and employed physicians to refresh and enhance their medical skills, as well as, build competence in new skills. Also, the internal medicine program has had several classes of residents and the presence of these talented residents have enhanced the quality of care of both inpatients and outpatients. They continue to be mentored by voluntary staff, particularly in the subspecialty areas, as well as, by our hospitalist team. In addition, the hope is to develop specialty fellowships in the near future.

An additional focus has been teaching medical students and residents the art of taking a medical history and performing physical examinations focusing on four principles. These principles include: 1) asking the right question to get the right answer; 2) if you don’t look you won’t see; 3) if you don’t touch you won’t feel; and 4) if you don’t listen you won’t hear. The patient is the reason and focus of all we do.

Ian Shenk, MD

We continue to be involved in global health research projects with undergraduate and graduate students from various affiliated universities to help highlight the major global health issues present in the world today. We are particularly conscious of the ever increasing number of global health problems and aware that all health is global health. We are also especially aware of the socio-political factors that currently compromise our ability to study and respond to these many issues.

We maintain our desire to educate our community and reinforce our community’s devotion to our global neighbors. These efforts are reflected in our encouragement and support of global health educational activities both on our own campus as well as neighboring venues. Many members of our faculty are connected with international and global health organizations.
PATIENT EXPERIENCE
Denise Mohess, MD
Medical Director of Geriatrics Services
Leader of Patient Experience Initiative for the Department of Medicine

2018 was the year of “Excellence” with emphasis on elevating the quality of patient-provider interactions, particularly during Trio Rounds. In the spirit of “One Team” and “Patient Always,” physician and nursing leadership continued to partner together to strengthen and strategize efforts around efficiency, personalization, and high reliability.

Highlights for 2018:
• Daily leader rounding utilizing CipherRounds enabled the tracking and trending of unit-specific data to identify areas of opportunity and improvement around quality, safety, and patient experience.
• Bi-monthly Department of Medicine Quality Initiative Meetings provided a forum for nursing leaders and physician leaders to discuss current work, best practices, and overall concentration on quality and patient experience efforts.
• Standardized daily MDRs including physicians, nurses, and case managers continued to improve communication among care teams.
• Patient Experience Leaders and Medical Directors partnered together to observe physician providers highlighting best practices and providing real-time feedback and coaching.
• Newly created for 2018 – a standard weekly HCAHPS scores and comments report provided to physicians, nurses, and ancillary support teams promoted awareness and transparency of patient and family feedback.
• The creation of an Adult Inpatient Services Patient and Family Advisory Committee to meet monthly and provide guidance on how to improve the patient and family experience.

We look forward to continued collaboration in 2019.
The Inova Advanced Lung Disease (ALD) and Transplant Program enjoyed another very successful and productive clinical and research year in 2018. Our Transplant Program had another robust year with 26 lung transplants in 2018. Our Advanced Lung Disease Program continues to grow with a record number of new referrals in 2018 (n=698), with 493 new evaluations, which is a 28% increase over our prior record year in 2012. We were recognized in 2018 as a World Association for Sarcoidosis and other Granulomatous Diseases (WASOG) Clinic. We are now one of 75 Centers for Medicare and Medicaid Services (CMS) accredited lung transplant centers, one of 52 accredited Comprehensive Care Centers for Pulmonary Hypertension, one of 60 Pulmonary Fibrosis Foundation Care Centers, and one of 112 Cystic Fibrosis Foundation-accredited Adult Programs in the United States. With the WASOG accreditation, we are now only one of 18 programs in the country to hold all of these designations.

Our academic productivity was also very robust in 2018 with 16 original research manuscripts (accepted or published), 9 reviews, 1 editorial, 2 consensus papers, 2 case reports, and 34 abstract presentations at international meetings including: the American Thoracic Society, the European Respiratory Society, the International Society for Heart and Lung Transplantation, the 6th World Pulmonary Hypertension, and the American College of Chest Physicians meetings. Between all the pulmonologists, we delivered about 15 talks at these international meetings. Our research activities include: traditional pharmaceutical studies, collaborative efforts with other renowned academic institutions, blood and tissue banking, and National Institutes of Health (NIH)-sponsored research. Our major areas of interest continue to be idiopathic pulmonary fibrosis (IPF), pulmonary hypertension (PH), PH related to interstitial lung disease, cystic fibrosis (CF), non-CF bronchiectasis, sarcoidosis, and lung transplantation. We participate in multiple registries and are the second highest enrolling sites in the Pulmonary Fibrosis Foundation and ReSAPH (sarcoidosis-PH) registries. We have residents and fellows rotate with us on our clinical service, many of whom also participate in our research activities. In 2018, we had 38 residents and fellows rotate, while 2018 also marked the third year of our PGY-7 Advanced Lung Disease and Transplant fellowship. We were also privileged to have a pulmonologist from Brazil join us for a one month preceptorship. In addition, we offer a competitive summer student program for high school and college students who are introduced to and engage in research.

Members of the team include: Andrea Grajeda (Referral Coordinator); Melany Vidaurre-Llanos (PH administrative Assistant); Denise Lewis (PH and Lead Nurse Coordinator); Priscilla Dauphin (Research Coordinator); Serina Zorrilla (Research Coordinator); Quyen Duong (CF RT); Kim Auguste (Medical Assistant); Latoya Albergottie-Barnes (Nurse Coordinator); Matthew Kott (Nurse Coordinator); Rodrick Likonko (Financial Coordinator); Sarah Scott (Office Manager); Jennifer Pluhaec (Research Coordinator); Brenna Cannon (Research Coordinator); Lori Hill (Financial Coordinator); Danielle Dacosta (Research Coordinator); Michelle Schreffler (Nurse Coordinator); Merte Lemma (Research Coordinator); Carlos Coronel (Sr. Admin Coordinator); Mathew Koslow (Advanced Lung Disease Fellow); Adam Cochrane (Transplant Pharmacist); Jessica Chun (Nurse Practitioner); Leah Papazian (Dietician); Elizabeth Davies (Social Worker); Susan Perry (Social Worker); Deanna Ridgeway (Financial Coordinator); Tina Thronson (Quality Manager); Edwinia Battle (Research Manager); Erin Lopynski (Dietician); Astrid “Julieth” Munoz (Program Manager); Lauren Marinak (Nurse Practitioner); Meg Fregoso (Nurse Practitioner); Shambhu Aryal, MD, Kareem Ahmad, MD; Nargues Weir, MD; Steven Nathan, MD; Oksana Shlobin, MD; Whitney Brown, MD; Shalika Katugaha, MD (Infectious Disease); Melissa Bowen (CF Coordinator); Debbie Campbell (Transplant Director); Chris King, MD; Osman Malik, MD; Lori Schlegel (Research Coordinator); and Drew Venuto (Research Coordinator)
Center for Integrated Research

Clinical Trial & Outcomes Research • Scientific Laboratories
Liver Pathology Research
The Beatty Liver Obesity Research Program
The Center for Liver Diseases
The Department of Medicine (DOM) continued in 2018 to have a robust and innovative research program. Our patient-centered research program allows our investigators to bring together cutting-edge personalized research protocols to our patients, institution, and community, as well as, offer research and education opportunities for our students, residents, and fellows.

The DOM Research Program includes the Beatty Liver & Obesity Research Program (BLORP), Outcomes Research Program, Mental / Emotional Health Research Program (MEHP), Liver Pathology Research Program, and the Advanced Lung Disease (ALD) Research Program.

The staff includes PhD-trained scientists, data analysts, clinical trial research coordinators, and other research support staff. A large number of undergraduate and graduate students are trained at this center. In 2018, the group presented approximately 167 abstracts and published approximately 115 manuscripts in internationally peer-reviewed journals.

Research activities in the DOM primarily have been directed toward program evaluation, quality improvement, assessing the impact of patient educational interventions, and the use of technology to track patient health statuses. Several of the studies in 2018 were aimed at exploring causes and possible remedies for physician burnout. Researchers from the Medical Critical Care Services (MCCS) Team collaborated on studies such as the administration of 23.4% NaCl for treatment of intracranial hypertension, the nutritional status in septic patients, and on the financial / social outcomes in patients with sepsis. We collaborated with the Inova Medical Group (IMG) rheumatologists to identify the possible relationships between autoimmune diseases (AI) and fatty liver or liver fibrosis. In addition, DOM physicians, advanced practice providers, and medical residents / fellows collaborated and supported projects with Advanced Lung Disease, Cardiac Rehabilitation, Geriatrics, and Palliative Care Programs.

The various DOM Research Programs continue to be at the forefront in obesity and non-alcoholic fatty liver disease (NAFLD) research. Our investigators continue to shed new light on NAFLD and non-alcoholic steatohepatitis (NASH) by sharing their findings on the world stage. They have presented at numerous international conferences and written articles which have been published in reputable peer-reviewed journals. This exposure adds to the body of international research on NAFLD and positions Inova as a major player in this critical area of investigation.

Another component of the DOM Research Program is the ALD Research Program, which continues research in the major areas of idiopathic pulmonary fibrosis (IPF), pulmonary hypertension (PH), PH related to interstitial lung disease, cystic fibrosis (CF), non-CF bronchiectasis, sarcoidosis, and lung transplantation. Our investigators also participate in multiple registries, ReSAPH (sarcoidosis-PH) registries, traditional pharmaceutical studies, collaborative efforts with other renowned academic institutions, blood and tissue banking, and National Institute of Health (NIH)-sponsored research.

The following are the core program areas within BLORP and a more detailed description of their aims and accomplishments will be described later in the Annual Report:

- **Clinical Research Team** – The team continued the collection of biological specimens and clinical data. Since 2018, research efforts have focused on subjects diagnosed with NAFLD or NASH and the study of the molecular relationship between NAFLD and coronary artery disease. Along with the collection of biological specimens, these subjects also underwent research ultrasounds to measure the amount of steatosis in their liver and Fibroscans to measure liver stiffness through transient elastography. Subjects were enrolled prior to undergoing a cardiac catheterization and subsequently had biological samples collected during the procedure.
• **Clinical Trials Team** – The team continued to effectively manage numerous phase II and phase III clinical trials over the past year. Their main focus continued to be NASH. Their studies are currently using medications that have the potential to improve fibrosis measures and possibly result in a resolution of NASH. There are currently no approved therapies for treating NASH, so there is a great need for more research in this area.

• **Database and Data Analysis Team** – The team includes database administrators, statisticians, and research investigators who worked to support a wide variety of data initiatives for BLORP and the DOM. The team members developed many new processes and databases that provided new opportunities for improved data control and availability. They integrated the clinical and genomics specimen data system as well as the DNA laboratory testing results which enhanced research data mining and compatibility. The team members also include biostatistics specialists who are responsible for validating, processing, analyzing, and reporting against a wide range of biomedical datasets throughout the year.

• **Liver Pathology Research** – The team continued to lead investigations into the pathogenesis of chronic liver diseases by providing accurate assessment of patient material from participants in translational research and clinical trials. The team also collaborated with other academic institutions and industry sponsors as the central reference laboratory in multibio center clinical trials.

• **Outcomes Research Program** – The team continued its goals and objectives to investigate contributors to functional outcomes important to patients with liver disease and obesity. These measures were utilized to determine an individual’s performance, perception, and overall quality of life as they pertain to physical, social, and psychological activities.

• **Mental / Emotional Health Program** – The team continued its research in mental, emotional, and cognitive dysfunction (MECD), with the goal of improving the quality of life, reducing morbidity, and increasing function in patients with chronic hepatitis C and NAFLD. The team continues to investigate the relationship between MECD and the presence or absence of NAFLD and type 2 diabetes in the primary data collection study. The team also examined patient reported outcomes (PROs) and neurocognitive performance in patients with hepatitis C virus (HCV).

• **Basic Science Laboratory** – The Basic Science Laboratory team continued to refine techniques for identifying and quantifying particular liver lesions which aided in the grading and staging of fatty liver disease. The team also utilized various techniques such as gene expression technologies, proteomic assays, cell culture, and immunology assays to investigate numerous components of obesity-related liver disease. The investigators generated original discoveries and pursued clinical trials for new pharmaceutical interventions, as well as, aided in the development of novel biomarkers for the diagnosis and treatment of NAFLD.

The Beatty Liver & Obesity Research Program support staff members include: Manirath Srishord (Senior Director); Trevor Gogoll (Director); Deena Hallaji (Executive Assistant); Gerry Rice (Program Manager); Aimal Arsalla (Program Manager); Puneetinder Kaur Mann (Project Manager); Brian Lam, PA-C (Physician Assistant); Kathy Terra (Nurse); and Pegah Golabi, MD (Research Fellow)
CLINICAL RESEARCH TEAM

The collection of biological specimens and clinical data remains the most important part of the ongoing lab projects in clinical translational research. In 2018, the team enrolled over 194 subjects across three active protocols and collected close to 3,500 biological samples. Specimens include serum, plasma, and whole blood. Since last year, research efforts have focused on subjects diagnosed with non-alcoholic fatty liver disease (NAFLD) or non-alcoholic steatohepatitis (NASH). Along with the collection of biological specimens, these subjects also undergo research ultrasounds to measure the amount of steatosis in their liver. Patients will also undergo a Fibroscan that measures liver stiffness through transient elastography. These subjects are enrolled through the translational research protocol, which focuses on subjects with chronic diseases, along with healthy controls who are not diagnosed with a chronic disease. Along with subjects diagnosed with NAFLD or NASH, subjects also consist of obese patients undergoing bariatric surgery, individuals diagnosed with chronic kidney disease, or individuals diagnosed with another chronic liver disease, such as hepatitis C virus (HCV) or hepatitis B virus (HBV).

A separate protocol in place assesses the molecular relationship between NAFLD and coronary artery disease. Subjects are enrolled prior to undergoing a cardiac catheterization and subsequently have biological samples collected during the procedure. Lastly, there is a protocol in place that examines response to treatment of hepatitis C as well as quality of life. Subjects have research visits throughout their treatment and follow-up.

We have currently enrolled 3,200 subjects across all of our protocols. This has resulted in over 68,000 samples collected which are stored in ten freezers located in our biorepository.

Members of the team include: Thomas Jeffers (Program Manager); Sean Felix (Program Manager); Zahra Younoszai (Program Manager); and Elena Younossi (Research Project Associate)

Nila Rafiq, MD

CLINICAL TRIALS TEAM

The Clinical Trials Team is headed by our investigator, Nila Rafiq, MD. The team continues to effectively manage numerous phase II and phase III clinical trials over the past year. Our main focus continues to be non-alcoholic steatohepatitis (NASH). Our studies are currently using medications that have the potential to improve fibrosis measures and possibly result in a resolution of NASH. There are currently no approved therapies for treating NASH, so there is a great need for more research in this area.

Members of the team include: Nila Rafiq, MD (Investigator); Rebecca Cable (Research Manager); Huong Pham (Clinical Research Associate); Mariam Afendy (Clinical Research Associate); and Brian Lam, PA-C (Sub-Investigator)
DATABASE AND DATA ANALYSIS TEAM

The Database and Data Analysis Team includes database administrators, statisticians, and research investigators who work to support the Beatty Liver & Obesity Research Program (BLORP) data initiatives, as well as the Department of Medicine (DOM) research endeavors.

The database administrators have developed many new processes and databases providing new opportunities for improved data control and availability. In addition to the integrated clinical and genomics specimen data system that supports all liver and obesity research, the senior database administrator integrated new DNA laboratory testing results to enhance research data availability and compatibility. Finally, there is continuous collaboration with DOM on creating the DOM dashboard/database applications that the administrators, clinicians, and staff utilize for quality or research. Lastly, the team is further developing the post-database applications and data processes for all databases, including the publications database that supports the tracking of all presentations and publications.

The team also includes the biostatistics specialists that are responsible for validating, processing, analyzing, and reporting against a wide range of biomedical datasets for both BLORP and the DOM. They also interface with the scientists to develop data analysis protocols, methodology, and apply data management and quality surveillance. They are responsible for the development of statistical analysis methods, bioinformatics algorithms, data mining techniques, data design implementation, annotation of programming code for data analysis, and provide interpretation and presentation of the results of analysis of biomedical data as needed. Furthermore, they each specialize in epidemiological research using national health surveys or health care data, such as the National Health and Nutrition Examination Survey (NHANES), Nationwide Inpatient Sample (NIS), and Medicare databases, as well as the national cancer database: Surveillance, Epidemiology, and End Results (SEER). Their efforts have resulted in co-authorship in numerous published manuscripts and abstract presentations. In collaboration with the statisticians, our research investigator works with the physicians in designing research studies, analyzing the clinical data, describing the results, and writing the manuscripts. The team also supports large pharmaceutical Patient Reported Outcomes (PROs) investigations that have earned national and international recognition for these endeavors.

Members of the team include: Andrei Racila (Informatics Manager); James Paik, PhD (Biostatistician); Maria Stepanova, PhD (Consultant); Linda Henry, PhD (Consultant); Radhika Tampi, MHS (Health Economics Research Associate); and Wisna’odom Keo (Consultant)
LIVER PATHOLOGY RESEARCH
Zachary Goodman, MD, PhD
Director of Liver Pathology Research

The Liver Pathology Research Team conducts investigations into the pathogenesis of chronic liver diseases. The team supports the activities of the Beatty Liver & Obesity Research Program (BLORP) and other programs by providing an accurate assessment of patient material from participants in translational research and clinical trials. It collaborates with other academic institutions and industry as the central pathology site in multicenter clinical trials. Techniques employed, include qualitative and quantitative histopathologic assessment of liver and adipose tissue, immunohistochemistry for identification of tissue components, and computer-assisted morphometry for quantification of targeted tissue components.

Members of the team include: Zachary Goodman, MD, PhD (Pathologist); Elzafr Elsheikh, PhD (Research Scientist); Fanny Monge (Program Manager); Lakshmi Alaparthi (Image Analysis Scientist); Daisong (Albert) Tan (Research Project Associate); Hala Abdelaal (Research Project Associate); and Nisarg (Nick) Jethi (Research Project Associate)

Current projects include:
1) Evaluation of hedgehog signaling as a marker of hepatocellular injury in nonalcoholic fatty liver disease
2) Identification of hepatic and adipose tissue inflammatory cells in nonalcoholic fatty liver disease
3) Quantitative criteria for liver biopsy adequacy in nonalcoholic fatty liver disease
4) Multicenter trial of selonsertib as treatment for nonalcoholic fatty liver disease
5) Multicenter trial of BMS-986263 as a potential antifibrotic agent in post-transplant patients with sustained virological response after recurrence of hepatitis C
6) Multicenter trial of BMS-986036 as treatment for nonalcoholic fatty liver disease
7) Multicenter trial of emricasan as treatment for nonalcoholic fatty liver disease
8) Multicenter trial of cenicriviroc as treatment for nonalcoholic fatty liver disease
9) Multicenter trial of seblipase alfa as treatment for congenital lysosomal acid lipase deficiency
10) Multicenter trial of obeticholic acid as treatment for nonalcoholic fatty liver disease
11) Multicenter trial of tropifexor as treatment for nonalcoholic fatty liver disease
OUTCOMES RESEARCH PROGRAM

The goals and objectives of the Outcomes Research Program of the Center for Integrated Research are to investigate contributors to functional outcomes important to patients with liver disease and obesity. These measures are utilized to determine an individual’s performance, perception, and overall quality of life as they pertain to general human physical, social, and psychological activities.

Members of the Outcomes Research Program are performing clinical research in several major areas. The first area explores central and peripheral fatigue through patient perception of fatigue during exercise performance, cognitive testing, daily activities and overall impact of fatigue on their lives and behavior choices. Active protocols permit recruitment of participants for study with several different chronic liver diseases (CLD) such as hepatitis C, B, and non-alcoholic fatty liver disease (NAFLD). These studies measure performance, patient experiences of daily routines and assessments of quality of life and serum markers to learn about whether there are metabolic or inflammatory problems associated with CLD. We have identified two types of fatigue. One is associated with physical activity (peripheral fatigue) and the other relates to motivation and the ability to concentrate (central fatigue). For patients with hepatitis C, there is evidence of both. Both improve with eradication of the virus, but there are some whose fatigue persists and we continue to study who is likely to have persistent fatigue and who is not. In patients with obesity and NAFLD, physical fatigue is more prevalent and seems to be related to how well people can metabolize glucose and convert it to energy.

The second area of investigation is trying to understand which approaches are successful in helping people achieve lifestyle changes. Behavioral change is one of the most significant challenges for the healthcare community. We have devised a clinical trial that uses a personalized method that incorporates a unique educational and problem solving approach to nutritional management and an activity-based approach to exercise that teaches patients to target heart rate in the moderate range. We are studying the health benefits of this approach as well as the efficacy of assuring long-term commitment to exercise.

The team have collaborated with the Inova Medical Group rheumatologists to identify the possible relationships between autoimmune diseases (AI) and NAFLD or liver fibrosis. People with AI have a high inflammatory burden and synthesize auto-antibodies that may impact liver metabolism and result in steatosis, steatohepatitis, or fibrosis. This project was begun in the fall of 2017 and continues to recruit.

The team also supports research efforts of other Inova investigators who require assistance in the selection of outcome measures, education about the IRB process, and the performance of clinical research. These support services have been available to the Department of Medicine medical staff and medical residents. We have supported projects with the following teams: Advanced Lung Disease, Cardiac Rehabilitation, Geriatrics / Palliative Care, and Intensive Care.

In addition to the two major areas of clinical research, the team was awarded with a five year sub-award (2016 – 2021) from the American Institutes for Research (AIR), which is a part of the Department of Health and Human Services grant to study aspects of knowledge translation (KT) in the national Model Systems program. This program supports research and care delivery to patients with burn, traumatic brain, and spinal cord injuries. The research focus is to determine how the research and care contributions promote their translation into clinical practice. This project seeks to determine whether the Model Systems program increase the publication of information relevant to the needs of stakeholders.

Members of the team include: Lynn Gerber, MD (Director of Research); Ali Weinstein, PhD (Research Medical Psychologist); Carey Escheik, BS (Research Manager / Program Manager); Jillian Price, PhD (Program Manager); Patrick Austin, MPH, CEP (Clinical Research Associate); Rohini Mehta, PhD (Research Scientist); Michael Estep, PhD (Research Scientist); Haley Bush, MPH (Research Consultant); and Rati Deshpande, MD (Research Consultant).
MENTAL / EMOTIONAL HEALTH PROGRAM

The Mental / Emotional Health Program (MEHP) is led by Ali Weinstein, PhD, and focuses on improving the quality of life, reducing morbidity, and increasing function in patients with chronic hepatitis C and non-alcoholic fatty liver disease (NAFLD). In September 2016, the team launched its first active clinical protocol investigating cognitive performance and quality of life in those with NAFLD. Since then, they have enrolled a total of 56 subjects, administered 648 validated neurocognitive tests, and administered 275 patient-reported outcome (PRO) questionnaires. In addition to NAFLD, the protocol consists of subjects with type 2 diabetes mellitus (T2DM), those with both NAFLD and T2DM, and those without either diagnosis (healthy controls) for comparison. Cognitive domains of interest include attention, psychomotor speed, executive function, and learning and memory.

A separate protocol examines PROs and neurocognitive performance in patients with hepatitis C virus (HCV). Despite improvements in treatment with direct-acting antivirals, psychiatric manifestations (i.e., fatigue, depression, anxiety) still persist in HCV patients that achieve sustained virologic response. In order to define the phenotypes of mental, emotional, and cognitive dysfunction, the MEHP is utilizing neurocognitive performance, clinical, PROs, and serum data from an anti-HCV clinical trial. Associations are measured pre- and post-virus clearance. With the help from our research scientists and Outcomes Research Program, the team presented its preliminary findings at two international liver conferences: American Association for the Study of Liver Diseases (AASLD) and European Association for the Study of Liver Disease (EASL).

Members of the team include: Ali Weinstein, PhD (Program Lead); Leyla de Avila (Program Manager); and Pegah Golabi, MD (Research Fellow)
ULTRASOUND AND ELASTOGRAPHY RESEARCH

Ultrasound and Fibroscan are two non-invasive techniques used to help assess non-alcoholic fatty liver disease (NAFLD) and hepatic fibrosis. The Fibroscan is done by using a modified ultrasound probe to measure the velocity of a shear wave created by a vibratory source. This will estimate the stiffness of the liver and correlation with fibrosis staging. These exams were performed with almost 100% accuracy.

Below are the number of exams performed in 2018 and the breakdown by different studies:

<table>
<thead>
<tr>
<th>Study</th>
<th>Ultrasound</th>
<th>Fibroscan</th>
</tr>
</thead>
<tbody>
<tr>
<td>IR / NAFLD</td>
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<td>35</td>
</tr>
<tr>
<td>PHYSIOFLOW</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>PREDICTORS</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>RHEUMATOLOGY</td>
<td>11</td>
<td>13</td>
</tr>
<tr>
<td>COG / NAFLD</td>
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<td>31</td>
</tr>
<tr>
<td>CHRONIC DISEASE</td>
<td>256</td>
<td>295</td>
</tr>
</tbody>
</table>

Members of the team include: Hussain Allawi, ARDMS (Clinical Research Associate) and Brian Lam, PA-C (Physician Assistant)
Elzafir Elsheikh Abdelrahman, PhD

**Prediction of the coronary artery disease (CAD) severity in patients with non-alcoholic fatty liver disease (NAFLD)**

NAFLD has been considered the hepatic manifestation of the metabolic syndrome because it’s closely related to obesity, insulin resistance, and many other factors of metabolic syndrome. Patients who have this syndrome have been shown to be at an increased risk of developing CAD. NAFLD predisposes to an increased risk of CAD. Most patients with NAFLD die from CAD events.

Our previous work has shown that patients with both NAFLD and CAD have different metabolomics profiling than patients with NAFLD only. In a current ongoing study we went further to see if we could predict the presence of severe forms of CAD in NAFLD patients using a metabolomics profiling approach in the blood (non-invasive). CAD severity was scored from 1 to 3 depending on the number of narrowed heart blood vessels involved. We found that the presence of severe forms of CAD (1, 2, or 3 vessels) can be distinguished from NAFLD without CAD as shown in Figure 1 below.

These findings can lead to identifying which NAFLD patients are in need for CAD intervention and medical management, thus improving the clinical outcomes of these patients. Our next step is to explore possible metabolic changes throughout the progression of CAD in NAFLD.

Funding for this study was secured by the Inova Grants Management Office.
Aybike Birerdinc, PhD

Dr. Birerdinc focuses on research aimed at understanding the role of visceral adipose tissue (VAT) on the overall signaling deregulation in metabolic syndrome in general and non-alcoholic fatty liver disease (NAFLD) in particular. Her background in both biochemistry and molecular biology has allowed the analysis of these signaling cascades, tracing them from the genetic, metabolic to the protein levels. Some of the most prominent research projects are presented below.

**HPLC methodology in the biomarker discovery of metabolic syndrome and components of NAFLD and non-alcoholic steatohepatitis (NASH) with fibrosis**

The objective of this research course is to harness the application of high performance liquid chromatography (HPLC) and its methodology to assess accurate and sensitive markers of metabolic processes involved in the progression of NAFLD. HPLC technology is used in analytical chemistry to separate, identify, and quantify each component in a mixture. This methodology is used to successfully identify differentially expressed metabolites involved in metabolic syndromes and chronic diseases through the analysis of area peaks generated by HPLC chromatograms. The use of serum for these studies allows this methodology to be more accessible for biomarker studies. Since the metabolites under study are inherently a byproduct of cellular reactions, the data generated in this study allows us to not only identify biomarkers but to also compose a better understanding of the molecular deregulations involved in these diseases.

**The TH1 / TH2 pathways may also be involved in the depression disorders seen in patients with NAFLD**

This long term study aims to determine the association of VAT-related TGF-b gene expression, tissue protein and serum protein with levels of serotonin and BDNF in a cohort of obese NAFLD subjects. Numerous studies have proposed the involvement of pro-inflammatory cytokines in the development of depression. Concurrently, our current understanding of VAT is that excessive accumulation pushes the signaling systems to a distinctly pro-inflammatory state. Taken together with the frequent co-diagnosis of obesity and depression, these systemic signaling intersections are of great interest. To date, our profiling of TGFb1, 2 and 3 and levels of serotonin and BDNF indicate that TGF-b signaling is not only involved in the metabolic crosstalk between the liver and VAT, but does indeed contribute to the inflammatory cascade leading to reduced levels of serotonin, but not BDNF, in NAFLD patients with depression. Additional targets at the intersection of inflammatory cytokines and mood modulating molecules are currently under investigation. (Figure 1)

**The fibrosis component of NASH with fibrosis may have upstream pro-fibrotic signaling originating in VAT**

Although VAT is known to be an endocrine organ that contributes to the pathogenesis of NAFLD, its exact contribution to the development of the fibrotic process is still under investigation. While a lot of research has focused on the inflammatory signaling originating from VAT and correlating with liver fibrosis, few studies have concentrated exclusively on the pro-fibrotic signaling itself. Some studies do in fact indicate that the pro-fibrotic signaling cascades seen in NAFLD may be aided by feedback or de novo signaling from VAT. The objective of this research is to determine the pro-fibrotic signaling molecules in VAT, both on the genetic and protein level and to assess these in tandem with circulating protein levels, as well as, liver histology in a cohort of obese NAFLD subjects. To further clarify the liver diagnostic criteria, this study uses computer assisted morphometry to provide semi quantitative data on liver histology pertaining to percent fat and percent collagen. To date, our research indicates that pro-fibrotic signaling pathways are indeed initiated in VAT. Furthermore, the signal can be traced and is amplified and transmitted outward systemically. (Figure 2)
Michael Estep, PhD

2018 has been another exciting year of studying the basic science behind clinically relevant questions in the Beatty Liver & Obesity Research Laboratory. I’m proud to report that in collaboration with Dr. Mehta and under the guidance of Dr. Gerber and Dr. Goodman, I am a co-recipient of this year’s Inova Translational Research Fund (ITRF) grant award for our study “Assessment of Cellular, Morphological and Molecular Characteristics of Hepatic Fibrosis in Obese Patients with Non-Alcoholic Fatty Liver Disease.” In addition, 2018 saw the publication of our manuscript “Hepatic sonic hedgehog protein expression measured by computer assisted morphometry significantly correlates with features of non-alcoholic steatohepatitis” which reports findings that have the potential to improve the resolution and consistency of steatohepatitis diagnosis. Additionally, I’m proud to report two additional manuscripts exploring the biochemistry underlying chronic hepatitis sequela affecting patient quality of life and neurocognitive function have been submitted and currently under review.
Azza Karrar, PhD

Projects on immune dysregulation of non-alcoholic fatty liver disease (NAFLD) is an area of research started in 2012 and is led by Azza Karrar, PhD. Dr. Karrar has several years of experience working on immunopathology of liver disease. The significance of these projects is that they may reveal new pathogenic pathways that may influence individualized patient response, which will ultimately improve personalized medicine. Some of the main projects we focused on in 2018 are as follows:

**NASH biomarker development in patients with non-alcoholic steatohepatitis (NASH)**

There is an urgent need for non-invasive serum biomarkers for accurate assessment of fibrosis. Liver biopsy is currently the only reliable tool for the staging of liver fibrosis, which is the only independent histologic predictor of mortality. NASH is the target diagnosis for treatment; therefore, the development of NASH biomarkers is important for selecting patients for treatment and also for monitoring treatment response. Furthermore, our main aim is to develop a biomarker panel to accurately predict advanced fibrosis in NASH. Serum levels of 58 proteins were evaluated using Luminex Beadbased Multiplex Assays. Using multivariate regression analysis, after stepwise selection of potential predictors among clinico-demographic and biomarker parameters, lower IGFBP-3 and higher Thrombospondin-2 were independently predictive of significant fibrosis; the area under the curve (AUC) was AUC=0.86 (0.80-0.92). The same parameters, IGFBP-3 and Thrombospondin-2 were also predictive of advanced fibrosis (F3-4); AUC=0.85 (0.78-0.91). We have developed a simple biomarker panel able to predict advanced fibrosis in NASH. After external validation, this panel could potentially be used in clinical practice to identify NASH patients with significant and advanced fibrosis.

**Advanced liver fibrosis in NASH is associated with low levels of key members of membrane attack complex**

Hepatic fibrosis involves chronic activation of the wound healing process leading to the recruitment of inflammatory cells and activation of collagen-producing cells (stellate cells). Recent evidence has proven that complement membrane attack complex (MAC) may play an important role in cell activation, proliferation, and differentiation, thereby contributing to the maintenance of liver homeostasis. Our main goal was to investigate the role of complement component 9 (C9) and its upstream cascade in NASH related fibrosis. We tested for Complement (C) upstream pathways and their regulators; (MBL), Complement Factor I, Factor H, Factor D, Factor B, properdin, C1q, C2, C4, C4b. and complement downstream components (C3, C3b, C5, C5a, C9) using multiplex human magnetic Luminex screening. Patients with NASH have lower levels of the complement C5 and lower levels of the complement regulatory Factor H. NASH patients with significant fibrosis were found to have lower levels of key membrane attacking factor C9 and higher level of the upstream MBL. Furthermore, C5 was found to negatively correlate with ballooning degeneration of hepatocytes on the liver biopsy while Factor H negatively correlated with Mallory-Denk bodies and C9 negatively correlated to Kupffer cells and Polymorphnuclear cells. Multivariate models showed that low level of C9 was independently associated with advanced fibrosis in NASH (Figure1). In Summary, NASH and NASH-related significant fibrosis are associated with low levels of complement components. In this context, low level of C9 seems to be predictive of significant fibrosis in NASH. After external validation, this test may be useful to identify NASH patients with advanced fibrosis.
Mitochondria as a predisposing factor for progressive non-alcoholic fatty liver disease (NAFLD)
Mitochondrial response to energy requirements is dynamic involving altered mitochondrial DNA mass and gene expression. Methylation of DNA often contributes to transcriptional silencing. Because changes in mtDNA affect the integrity, assembly, and operation of the mitochondrial respiratory chain, it is conceivable that methylation of mitochondrial DNA can dynamically regulate mitochondrial function. Further, mtDNA represents one of the most informative systems for inter- and intra-specific study of human genetic diversity. The existence of hypervariable sites (sites that evolve at a rate much faster than average) in the non-coding human mtDNA control region has been well documented in human mtDNA. Given the role of mitochondria in metabolic pathways, we are investigating the mitochondrial genetic variation as well as changes in mitochondrial function via DNA methylation and/or DNA amounts as a predisposing factor in metabolic diseases and fibrotic NASH.

Detecting chromosomal number abnormalities in patients with fibrotic non-alcoholic steatohepatitis (NASH) by in-situ hybridization (ISH)
Polyploidy (containing more than two paired sets of chromosomes) in the liver is extensively described in many vertebrate species, including humans, rats, and mice. Since most hepatocytes become polyploid in the postnatal period when growth and regeneration are ongoing, the overall result is that most hepatocytes are aneuploid (presence of an abnormal number of chromosomes in a cell). Aneuploidy in the liver is pervasive, affecting 60% of hepatocytes in mice and 30%-90% of hepatocytes in humans. Does the liver utilize polyploidy mechanisms to adapt to chronic injury? Could polyploidy afford resistance to cellular and tissue damage and thus be protective against fibrosis? Specific gains and losses of chromosomes harboring injury-resistance alleles in normal, non-transformed hepatocytes may render them differentially resistant to chronic insults such as viral hepatitis, as well as, alcohol- and fat-induced hepatitis. New evidence suggests that random hepatic aneuploidy can promote adaptation to liver injury. For instance, in response to chronic liver damage, subsets of aneuploid hepatocytes that are differentially resistant to the injury remain healthy, regenerate the liver, and restore function. The hypothesis is, hepatotoxic insults (high lipid, high glucose, inflammation, etc.) selects for hepatocytes with aneuploidy, rendering them resistant to injury. Thus, aneuploidy may be a pro-adaptive and protective mechanism.

Figure 1: Pathways in NAFLD. There are several pathways with extensive crosstalk amongst them that are known to be involved in NAFLD.
One of the most important outcomes of an academically active department is the number of high-caliber publications and presentations that are generated by the members of the department. Authorship, especially first or senior authorship of articles published in peer-reviewed, high-impact journals, provide validity of the academic standing of the department and its members. Additionally, research presentations to national and international scientific meetings will bring immense recognition to the department, the faculty, and the institution. Finally, delivering faculty lectures during these international meetings is a great honor that recognizes our faculty as the top leaders in their fields. This productivity is not only invaluable to the department, but also brings great value to Inova Health System.

Members of the Department of Medicine enjoyed tremendous success and academic productivity by publishing articles in high-impact journals and presenting their research to a number of international meetings. Furthermore, a number of our faculty had opportunities to discuss their research findings in the media. Also, a number of members of our department were listed as top doctors in their fields by the U.S. News and World Report. Finally, our faculty served on the editorial board of several important journals. In fact, Zobair Younossi, MD is now a co-editor of Liver International which is the official journal of the International Association for the Study of the Liver (IASL).
DEPARTMENTAL ACADEMIC PRODUCTIVITY

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72) Zobair M Younossi, Maria Stepanova, Wirth Stefan, Kathleen B. Schwarz, Philip Rosenthal, Regino Gonzalez-Peralta, Karen Murray, Fatema Nader. Health-Related Quality of Life in Young Children with Hepatitis C Viral (HCV) Infection Treated with Sofosbuvir and Ribavirin, American Association for the Study of Liver Diseases.

73) Zobair M Younossi, Maria Stepanova, Linda Henry, Kwang-Hyun Han, Sang Hoon Ahn, Young-Suk Lim, Wan-Long Chuang, Jia-Horng Kao, Nguyen Kinh, Ching-Lung Lai, Man-Fung Yuen, Henry Lik-Yuen Chan, Lai Wei. The Impact of Treatment with Different Antiviral Regimens and Sustained Virologic Response (SVR) on Health Related Quality of Life (HRQL) of East Asian Patients with Hepatitis C Virus (HCV) Infection, European Association for the Study of the Liver.

74) Zobair M Younossi, Maria Stepanova, Issah Younossi, Calvin Q. Pan, Harry Janssen, Georgios Papatheodoridis, Linda Henry, Fatema Nader. Long-Term Follow-up of Treated Patients with Chronic Hepatitis B Infection: Patient-Reported Outcomes, American Association for the Study of Liver Diseases.


76) Zobair M Younossi. Reliability and Validity Assessment of the Chronic Liver Disease Questionnaire NAFLD-NASH in Patients with Non-Alcoholic Fatty Liver Disease in the Community-Based Setting, American Association for the Study of Liver Diseases.

77) Zobair M Younossi. Cenicriviroc for the Treatment of Liver Fibrosis in Adults with Nonalcoholic Steatohepatitis: Aurora Phase 3 Study Design, American Association for the Study of Liver Diseases.


DEPARTMENTAL ACADEMIC PRODUCTIVITY


96) Stoddard S, Kurzke K, Monge F, Alaparthi LP, Abdul-Al H, AbdelaalH, Keo W, Goodman Z, Chandhoke V, Birerdinc A, Younossi ZM. Liver fibrosis as assessed by percent collagen deposition by morphometry shows an inverse correlation to both il-7 and inf-g in obese non-alcoholic liver disease (NAFLD) patients. Gastroenterology 2018; 1054: S-1247.

97) Reddy RK, Curry MP, Frenette CT, Regenstein FG, Schiff ER, Goodman ZD, Robinson JM, Chan JL, Imperial JC, Hagerty D. Multicenter, double-blind, randomized trial of emricasan in subjects post liver transplantation (LT) with recurrent hepatitis c virus (HCV) and liver fibrosis or cirrhosis despite achieving sustained viologic response (SVR). Hepatology 2018; 68:711A


DEPARTMENTAL ACADEMIC PRODUCTIVITY


111) Dr. Chad Zik – Poster Presentation at the American College of Physicians Annual Virginia Chapter Meeting, March 2018. Vanishing Bile Duct Syndrome and ANCA Vasculitis; Coincidence? Authors: C Zik, JP Verderese, G Trimble.

113) Dr. Chad Zik - Poster Presentation at the Society of General Internal Medicine Annual Meeting, April 2018. A Rare Endocrine Phenomenon: Triphasic Response to Pituitary Stalk Injury following Mechanical Trauma. Authors: F Farhat, C Zik.

114) Dr. Chad Zik - Poster Presentation at the Society of General Internal Medicine Annual Meeting, April 2018. A Rare Case of Polymicrobial Nocardia Abscessus and Mycobacterium Tuberculosis Bacterial Pericarditis. Authors: C Zik, R Dinh, F Farhat.

115) Dr. Min Kim and Dr. Shalika Katugatha – Poster Presentation at the International Society of Heart and Lung Transplant Conference, April 2018. Persistent Candida Lusitaniae Fungemia in a Left Ventricular Assist Device Recipient.


118) Dr. Omair Alam, Dr. Nibras Chowdhury, Dr. Manuel De La Rosa, Dr. Min Kim, Dr. Omer Shahab, Dr. Megan Terek, Dr. Svetolik Djurkovic. Poster Presentation: Implementing a Standardized Checklist During Multidisciplinary Rounds in the Intensive Care Unit; QI Symposium, May 2018, IFMC

119) Dr. Tamoore Arshad, Dr. Natsu Fukui, Dr. Danubia Hester, Dr. Woderyelseh Kassa, Dr. Jessica McLaughlin, Dr. Daniel Song, Dr. Yamini Sterrett: Assessing Barriers to Effective Trio-Rounds; QI Symposium, May 2018, IFMC

120) Dr. Ansha Goel, Dr. Amita Rajani, Dr. Logan Rhea, Dr. Mehmet Sayiner. A Resident-Led Education Resource for High Value Care: QI Symposium, May 2018. IFMC


122) Dr. Veena Katikineni; Libre E; Poster acceptance and presentation: American Thoracic Society Meeting, A Case of Mycobacterium Simiae in an Immunocompetent Post-Menopausal Woman with Persistent Cough, May 2018, San Diego, CA

123) Dr. Min Kim, Digestive Disease Week Poster Presentation, June 2018

DEPARTMENTAL ACADEMIC PRODUCTIVITY


128) Among Medicare Patients with Hepatocellular Carcinoma, Non-alcoholic Fatty Liver Disease Is the Most Common Cause of Mortality, Poster Presentation, Omer Shahab, MD, Danubia Hester, MD, James Paik, MD, Ansha Goel, MD, Issah Younossi, MD, Pegah Golabi, MD, Miriam Afendy, MD, Alita Mishra, MD, Z Younossi, MD. AASLD Meeting, November, 2018.

129) Implementing a Standardized Checklist During Multidisciplinary Rounds in the Intensive Care Unit, Omair Alam, MD, Nibras Chowdhury, MD, Manuel De La Rosa, MD, Min Kim, MD, Omer Shahab, MD, Megan Terek, MD, Svetolik Djurkovic, MD, AAIM Fall Meeting, October, 2018

130) Resident-Led Educational Resources for High Value Care, Amita Rajani, MD, Ansha Goel, MD, Mehmet Sayiner, MD, Logan Rhea, DO, AAIM Fall Meeting, October, 2018

131) Implementing a Standardized Checklist During Multidisciplinary Rounds in the Intensive Care Unit, Omair Alam, MD, Nibras Chowdhury, MD, Manuel De La Rosa, MD, Min Kim, MD, Omer Shahab, MD, Megan Terek, MD, Svetolik Djurkovic, MD, AAIM Meeting, October 2018

132) A Novel Worksheet-Based Clinical Reasoning Exercise, Manuel De La Rosa, MD, Homan Wai, MD, AAIM Meeting, October 2018

133) Liver and Biliary Cancer, Omer Shahab, MD, AASLD Meeting, San Francisco, November 9-13, 2018

134) Not to Be Taken With A Grain of Salt: Underlying Diabetes Insipidus Unmasked by the Treatment of Adrenal Insufficiency, Ansha Goel, MD, Nila Rafiq, MD, Stephen Clement, MD, American Medical Association AMA Research Symposium, November,2018

135) Dr. Omer Shahab. Chronic kidney disease in patients with chronic hepatitis C virus infection. Invited speaker to IFMC Research Day, April 24, 2018

PULMONARY DIVISION AND ADVANCED LUNG PROGRAM ACCEPTED ABSTRACTS AND PRESENTATIONS


DEPARTMENTAL ACADEMIC PRODUCTIVITY

15) Waxman AB, Tapson VF, Smith PM, Deng C, Nathan SD. A Multicenter, Randomized, Double-Blinded, Placebo-Controlled Trial to Evaluate the Safety and Efficacy of Inhaled Treprostinil in Subjects with Pulmonary Hypertension due to Parenchymal Lung Disease (Study RIN-PH-201).

16) Behr J, Nathan SD, Harari S, Wuyts W, Kirchgaessler K, Bengus M, Gilberg F, Wells A. Baseline Characteristics From a Pre-specified Interim Analysis of a Phase IIb, Randomized, Double-Blind, Placebo-Controlled Trial of Sildenafil Added to Pirfenidone in Patients With Advanced Idiopathic Pulmonary Fibrosis and Pulmonary Hypertension.


20) Biru N, King CS, Shlobin OA, Aryal S, Nathan SD, Marinak L, Woods C, Brown AW, King CS. Rare case of rapidly progressive interstitial lung disease following adult tetanus, diptheria, and pertussis (Tdap) vaccination.


24) Kouranos V, Shlobin OA, Nathan S, Wells A, Baughman RP. Factors associated with reduced survival in sarcoidosis associated pulmonary hypertension: results of the registry for sarcoidosis associated pulmonary hypertension (ReSAPH).


27) Behr J, Nathan SD, Harari S, Wuyts W, Kirchgaessler K, Bengus M, Gilberg F, Wells A. Sildenafil added to pirfenidone in patients with advanced idiopathic pulmonary fibrosis (IPF) and pulmonary hypertension (PH): a Phase IIb, randomized, double-blind, placebo-controlled study. Presented at World PH meeting Nice, France 2018
DEPARTMENTAL ACADEMIC PRODUCTIVITY


31) Kareem Ahmad, MD; Christopher S. King, MD; Oksana Shlobin, MD; Nargues Weir, MD; Shambhu Aryal, MD; Steven D. Nathan, MD; A. Whitney Brown, MD. Connective Tissue Disease associated Interstitial Lung Disease and Outcomes after Hospitalization: a Cohort Study. Podium Presentation


ZOBAIR YOUNOSSI, MD, MPH NATIONAL AND INTERNATIONAL MEETINGS AND LECTURES

1) AASLD Colloquium Meeting Introducing NASH-related Health Measures in Population Health Studies. Munich, Washington, D.C. January 2018


3) International Liver Transplantation Society Meeting-Epidemiology and Prevention of NAFLD. Venice, Italy. February 2018

4) 2018 American College of Gastroenterology Regional Post-graduate Course- Evolving Treatment of NASH. New Orleans, LA. March 2018

5) The Epidemiology of NAFLD: Western & Asian Perspectives. Paris, France. April 2018

6) NAFLD: The 21st Century Epidemic Disease. American College of Physician Annual Meeting, New Orleans April 2018

7) Natural History of NAFLD. AASLD Clinical Hepatology Update Meeting, Austin Texas. May 2018

8) Patients with Radiologic Evidence of Fatty Liver Should Not Undergo Liver Biopsy. Digestive Disease Week, Washington DC 2018

9) Patient Reported Outcomes in Hepatitis C. 2nd European Policy Summit on HBV and HCV. Brussels, Belgium. June 2018

10) Non-alcoholic Steatohepatitis. XIV International Symposium on Viral Hepatitis and Liver Disease, Barcelona, Spain June 2018
DEPARTMENTAL ACADEMIC PRODUCTIVITY

11) AASLD and EASL Joint Endpoint Conference in NASH. Session Chair. June 2018


13) Advanced Hep Ed Summit: NASH: Current Approach and When Will New Treatment Option Be Available. Chicago, IL August 11, 2018

14) Grand Rounds: Advances In Nash: Disease Burden, Diagnostic/Management Considerations, And Emerging Therapies. Alleghany Hospital, Pittsburgh August 22, 2018

15) Falk Institute Symposium on Diabetes and Liver: East Meet the West. NAFLD Epidemiology. Kyoto, Japan. September 2018

16) Patient Reported Outcomes in NASH. EASL NAFLD Summit Meeting. Geneva, Switzerland. September 2018

17) NASH/NAFLD Disease State and Trial Awareness. Gut Club Presentation, Mobile, Alabama, September 26, 2018

18) 2018 HCV Advances. University of Alabama Medical Ground Rounds, Mobile, Alabama, September 27, 2018

19) Advances in NASH: Disease burden diagnostic/management considerations, and emerging therapies. Pikesville, MD, October 3, 2018

20) Current Management of NAFLD/NASH: Medical, endoscopic, and surgical therapies, American College of Gastroenterology Annual Meeting Course-Philadelphia, PA, October 8, 2018

21) Advances in the Management of Cirrhosis (Co-Chair). AASLD Annual Meeting. San Francisco, CA November 2018

22) Current and emerging treatments for Non-alcoholic steatohepatitis. NYU Langone Medical Center, New York, November 30, 2018

23) Burden of NAFLD. Padova, Italy, December 1, 2018

24) NASH is all about fibrosis: Clinical and Economic Implication. Kolkata, India, December 7, 2018

25) Efforts to alter the NASH epidemic world-wide-an integrated approach. Kolkata, India, December 7, 2018

26) How long will we have to treat NASH once effective pharmacotherapy is available-and outcomes perspective? Kolkata, India, December 8, 2018

27) The Global Epidemic of Non-alcoholic Fatty Liver Disease. Cairo, Egypt, December 13, 2018

28) The impact of HCV as a systemic disease and the comprehensive benefit of HCV cure. Cairo, Egypt, December 13, 2018

29) Diagnosis and treatment of Non-alcoholic Steatohepatitis. Cairo, Egypt, December 13, 2018
DEPARTMENTAL ACADEMIC PRODUCTIVITY

30) Advancing the field of weight management and NASH treatment. Amsterdam, Netherlands, December 14, 2018

31) What is New in NASH? Egyptian Gastroenterology Hikma Meeting. Aswan Egypt (Via Web). December 20, 2018

ZACHARY GOODMAN, MD, PHD NATIONAL AND INTERNATIONAL MEETINGS AND LECTURES

1) “Drug-induced Liver Injury”, presented at annual meeting of International Liver Study Group, Athens, Greece, May 14, 2018

2) “Cirrhosis Reversal: Cases from a Pathologist’s Perspective”, presented at AASLD Symposium: Fibrosis: Unlocking the Key to Cirrhosis Prevention and Reversal; Digestive Disease Week, Washington, DC, June 4, 2018

3) “Wound healing after severe acute liver injury”, presented at annual meeting of the Laennec Liver Pathology Society, Halifax, Canada, June 7, 2018

4) “Regression of fibrosis/cirrhosis with antiviral therapy”, presented at Global Hepatitis Summit 2018, Toronto, Canada, June 15, 2018

5) “The Next Big Thing – Quantitative Liver Biopsies”, presented at Liver Unit, NIDDK, National Institutes of Health, Bethesda, MD, September 20, 2018

LYNN GERBER, MD NATIONAL AND INTERNATIONAL MEETINGS AND LECTURES


2) Digestive Disease Week (DDW). Washington, DC; June 1-5, 2018.


5) National Institute on Disability, Independent Living, and Rehabilitation Research (NIDILRR). Washington, DC; October 18, 2018.


8) Foundations of Clinical Research (Inova Residents) - February, September, October, November

9) International Society of Physical and Rehabilitation and Medicine (Speaker (2 presentations, 1 workshop)) - Paris, France; July, 2018

10) Model Systems Directors’ Meeting (Speaker) - Arlington, VA; June & December, 2018

11) Spaulding Rehab Fatigue in CLD/CA - April 2018

12) The International Classification of Function - George Mason University; November 5, 2018
DEPARTMENTAL ACADEMIC PRODUCTIVITY

PULMONARY DIVISION AND ADVANCED LUNG PROGRAM NATIONAL AND INTERNATIONAL MEETINGS AND LECTURES

1) IPF Pathogenesis: A Clinicians Perspective. Turkish Thoracic Society meeting, January 13th, 2018 (Steven Nathan, MD)

2) Pulmonary Hypertension due to Lung Disease. World Symposium on Pulmonary Hypertension Nice, France March 1st 2018 (Steven Nathan, MD)

3) What do we really do with PH in lung disease?-pro/con debate ATS post-graduate symposium May 18th, 2018, San Diego (Steven Nathan, MD)

4) Complicated Pulmonary Sarcoidosis. ATS post-graduate symposium May 18th, 2018, San Diego (Steven Nathan, MD).

5) Group 2 and 3 pulmonary hypertension. Meet the Professor ATS San Diego May 22nd, 2018 (Steven Nathan, MD)

6) IPF and Other ILDs: At the Crossroads of Current Clinical Challenges and Emerging Therapeutic Strategies. ATS CME conference May 22nd, 2018 (Steven Nathan, MD)

7) Lung Transplantation for IPF. UCSD Fellows Conference June 5th, 2018 (Steven Nathan, MD)

8) Pulmonary Hypertension: When lung disease meets pulmonary vascular disease. Inova Fairfax Hospital. Medical Grand Rounds July 31st, 2018 (Steven Nathan, MD)

9) IPF and Other ILDs: At the Crossroads of Current Clinical Challenges and Emerging Therapeutic Strategies. Keynote Speaker, Piedmont IPF Education Day. Atlanta Georgia Sep 29th, 2018 (Steven Nathan, MD)

10) Updates in IPF and Related Fibrotic Lung Diseases. Chair of symposium and speaker. October 10th, 2018. San Antonio, Chest meeting satellite symposium (Steven Nathan, MD)