MICHIGAN MEDICINE
UNIVERSITY OF MICHIGAN

# Annual Report
## Department of **Pathology**

# Message From the Chair

**Charles A. Parkos, MD, PhD**

*Carl V. Weller Professor and Chair*

A decade ago, I was honored to join Michigan Medicine as Chair of the Department of Pathology. With this new chapter, we embarked on a transformative journey of growth and innovation. At that time, our team was spread across outdated spaces throughout Ann Arbor, limiting our potential to grow alongside the health system. Recognizing this challenge, we set in motion the Pathology Relocation and Renovation (PRR) Project—a bold vision to bring together our people, our resources, and our expertise in state-of-the-art neighborhood-style spaces.

In 2018, we took a significant step forward by completing the renovation of the North Campus Research Complex. This milestone represented more than just a physical move—it symbolized the unity, resilience, and shared purpose of our faculty, trainees, and staff, who came together in a remarkable effort to lay the foundation for a future-ready department. With the completion of new spaces for our clinical laboratories, faculty offices, pathology informatics, and education programs, we began reimagining our future. As of FY24, the PRR project came to a close with the final renovations at University Hospital, culminating in the completion of a cutting-edge core laboratory, modernized offices, and dynamic spaces for our trainees and staff.

The transformation has been nothing short of revolutionary. Our trainees now thrive in bright, open spaces equipped with state-of-the-art tools, including digital pathology and multi-headed microscopes, positioning them alongside our faculty for seamless collaboration. This year, we welcomed Dr. Kamran Mirza as the Godfrey D. Stobbe Professor of Pathology Education, Assistant Chair for Education, and Division Director for Training Programs and Communication. Dr. Mirza brings a visionary spirit to our team, grounded in deep expertise in building modern learning systems. Under the leadership of our dedicated Residency Directors—Drs. Shih Hon (Sean) Li, Sara Abbott, and David Manthei—our residency program has ascended to #3 in the nation and #1 among public academic medical centers, reflecting our unwavering commitment to excellence in training. In addition, our Molecular and Cellular Pathology Graduate Program is thriving under the leadership of Drs. Jean-Francois (Jeff) Rual and Simon Hogan, who have brought fresh energy and innovative thinking to our research and education initiatives.

Our enhanced facilities have further fueled expansion of our clinical services. This year, we were proud to welcome Dr. Annette Kim as the Henry Clay Bryant Professor of Pathology and Director of the Division of Diagnostic Genetics and Genomics. A renowned molecular diagnostician, Dr. Kim has quickly built a world-class team dedicated to delivering the most advanced molecular testing available. Together with the Michigan Center for Translational Pathology, she has begun integrating the MiOncoSeq platform into our clinical laboratory—a groundbreaking step supported by the acquisition of the NovaSeq X Plus sequencer and other cutting-edge equipment.

In our Anatomic and Clinical Pathology laboratories, the results of our expansion speak for themselves. We processed a record-breaking 7.5 million billed tests this year and generated $1.08 billion in gross revenue—an all-time high. In Anatomic Pathology, the implementation of digital pathology represents a transformative leap forward, with plans to digitize all glass slides moving forward, allowing our faculty and trainees to review patient samples from anywhere. In Clinical Pathology, our automated core laboratory lines continue to multiply our capacity, ensuring we keep pace with the ever-growing needs of Michigan Medicine.

This extraordinary progress has been made possible by the dedicated efforts of Brooklyn Khoury, MBA, MHSA, MS, and her

Finance and Administration team. Their relentless pursuit of excellence ensures that we are fully prepared for the next chapter, as we look toward the 2025 opening of the new U-M Hospital Pavilion and the expansion of our statewide network, including Sparrow Health System. Their close collaboration with our Pathology Informatics team has been critical in ensuring that every aspect of this transition—equipment, interfaces, and training—is seamlessly executed.

Our research teams have also achieved remarkable milestones. This year, they published 549 manuscripts in high-impact journals—a 40% increase over the previous year—and secured $31.8 million in grant funding, demonstrating their unwavering commitment to advancing science and patient care. Additionally, we are making significant strides in global pathology, expanding our reach and expertise to impact patient outcomes far beyond our local community. Even as several senior researchers approach retirement, the vibrancy of our junior faculty ensures that our department will continue to lead the way in groundbreaking research.

As I reflect on these ten years of progress, I am filled with pride and gratitude for the dedication, passion, and vision that our faculty, trainees, and staff have brought to every challenge and opportunity. Together, we have built a department that not only meets the needs of today but is poised to lead in the decades to come. I invite you to explore this annual report and celebrate the tremendous successes we have achieved—successes that are only possible because of the collective strength of our department.

The best is yet to come.


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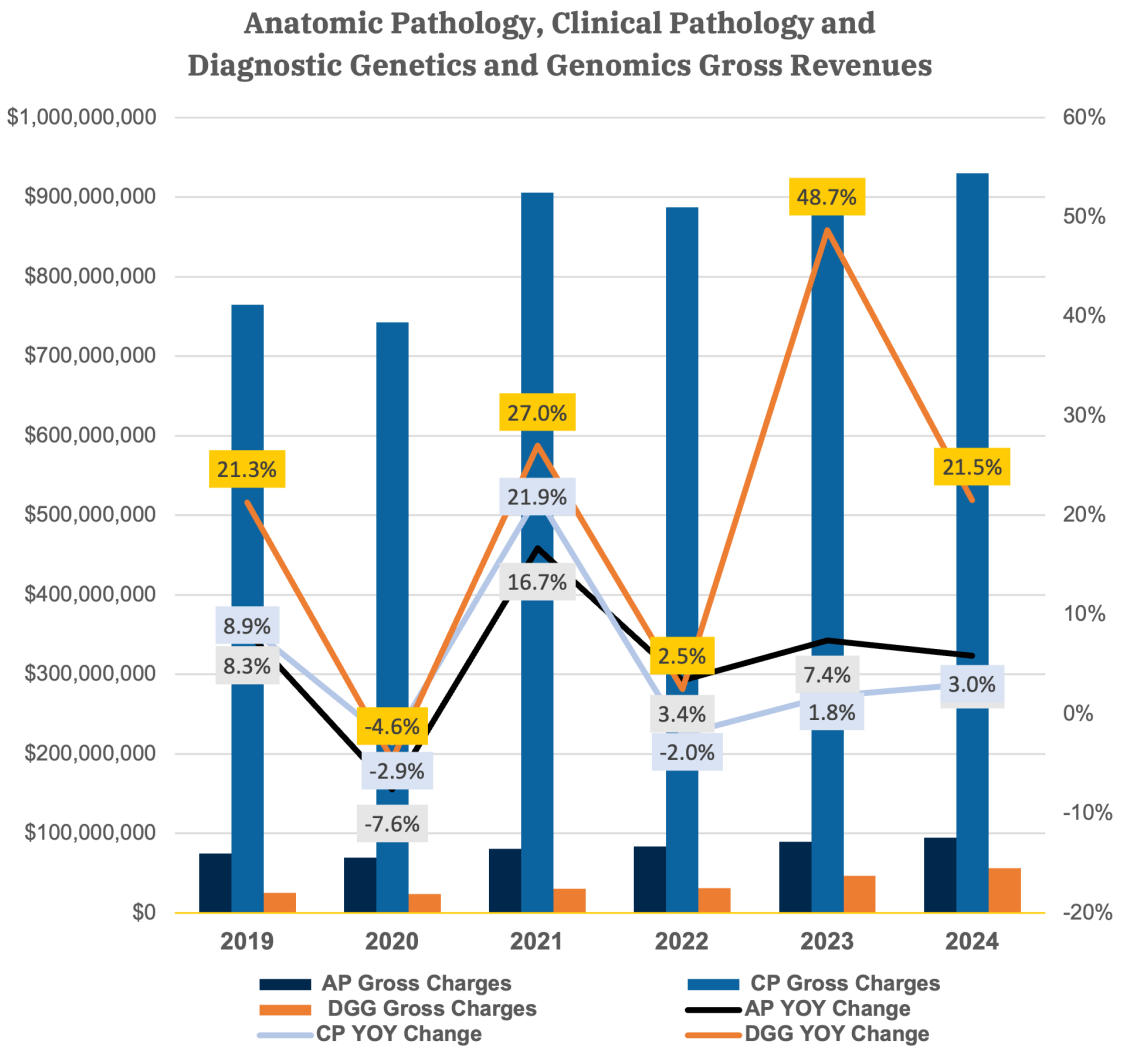
# Clinical Mission

The mission of the Department of Pathology is "to create the future of our discipline by educating and nurturing the leaders and health providers who will care for us, unifying our common commitment to excellence across traditional barriers to collaboration and creativity, building solutions that leverage the power of data to solve real problems and create unique value, and leading the way for application of the right diagnostic tools, for the right patient, at the right time."

To accomplish this mission, our department has three primary foci: Clinical Care, Research, and Education. The clinical mission is committed to providing the best patient care, taking advantage of the strengths of our research and education expertise. To enhance our ability to provide optimal patient care, we built state-of-the-art clinical laboratories at the North Campus Research Complex and at the University Hospital (UH).

The clinical laboratory services are divided into four primary divisions: Anatomic Pathology, Clinical Pathology, Diagnostic Genetics and Genomics, and Michigan Medicine Laboratories (MLabs). The following pages describe the activities of these four divisions.



# By the Numbers


| | |
|---|---|
| Instructional | 46 |
| Clinical | 89 |
| Research | 36 |
| Supplemental | 22 |


| | |
|---|---|
| PhD | 23 |
| Fellows | 23 |
| Post Doc | 36 |
| Residents | 28 |

## RESEARCH

| | |
|---|---|
| Annual Expense Budgets | |
| — Medical School | $87 M |
| — UM Hospital | $202 M |
| Sponsored Spending | $34.6 M |
| Billable Tests | $7.4 M |
| DC/SF | $387 |
| IDC/SF | $167 |

CDA Direct Reports
**10**

Dotted Line Reports
**3**

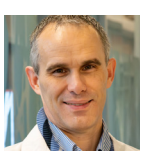

RANKED
**#9**
NIH GRANT FUNDS AWARDED

AWARDS RECEIVED
**115**

# Anatomic Pathology

**L. Priya Kunju, MD**
*Director,* Anatomic Pathology

**Stephanie Skala, MD**
*Section Head*, Surgical Pathology



**Kyle Perry, MD**
*Service Director*, Bone and Soft Tissue Pathology

Anatomic Pathology (AP) deals with the testing of tissues, solid tumors, and cells as well as autopsies and forensics. AP experienced an increase in volume of 1.2% from 155,579 cases from FY23 to 157,403 cases in FY24 as volumes stabilized following the COVID-19 pandemic. The AP clinical service is comprised of several sections including Surgical Pathology, Cytopathology, Dermatopathology, Ophthalmic Pathology, Renal Pathology, Neuropathology, Autopsy and Forensic Pathology, and Pediatric/Perinatal Pathology, each with its own section head. Surgical pathology includes multiple subspecialty services each with a designated service chief. Most of these services support weekly multidisciplinary tumor boards.

## Clinical Activities

### RVU Trends in Anatomic Pathology

Total RVUs generated by AP in FY24, expressed as a 12-month rolling average, were 25,066 RVUs/month. This represents a 6.0% increase over FY23. RVU stands for relative value unit and is an incomplete payer-imposed measure of professional work that has become an industry standard for monitoring clinical productivity.

### FTE Trends in Anatomic Pathology

Total clinical FTEs for AP faculty was 51.2 in FY24 compared to 55.1 in FY23, representing a 7.0% decrease. Over five years, AP staffing has increased by 25.4% from 40.9 FTEs to 51.2 FTEs due to hiring new faculty members each year to meet the demands of our constantly growing AP service workload and complexity. This included employing faculty with dual fellowships and hybrid skill sets in an AP subspeciality paired with molecular pathology and hiring three new AP Hospitalists to primarily cover hospital-based services such as frozen sections.

### RVU and FTE Trends in Anatomic Pathology

Total work RVUs/FTE in FY24 showed a 15.0% increase. On average, each clinical FTE in AP generated 788.4 RVUs/month in FY24 compared to 685.4 in FY23. However, these data vary for different AP services and from month to month due to faculty hiring throughout the year. (See Table on pg. 11)

## Surgical Pathology

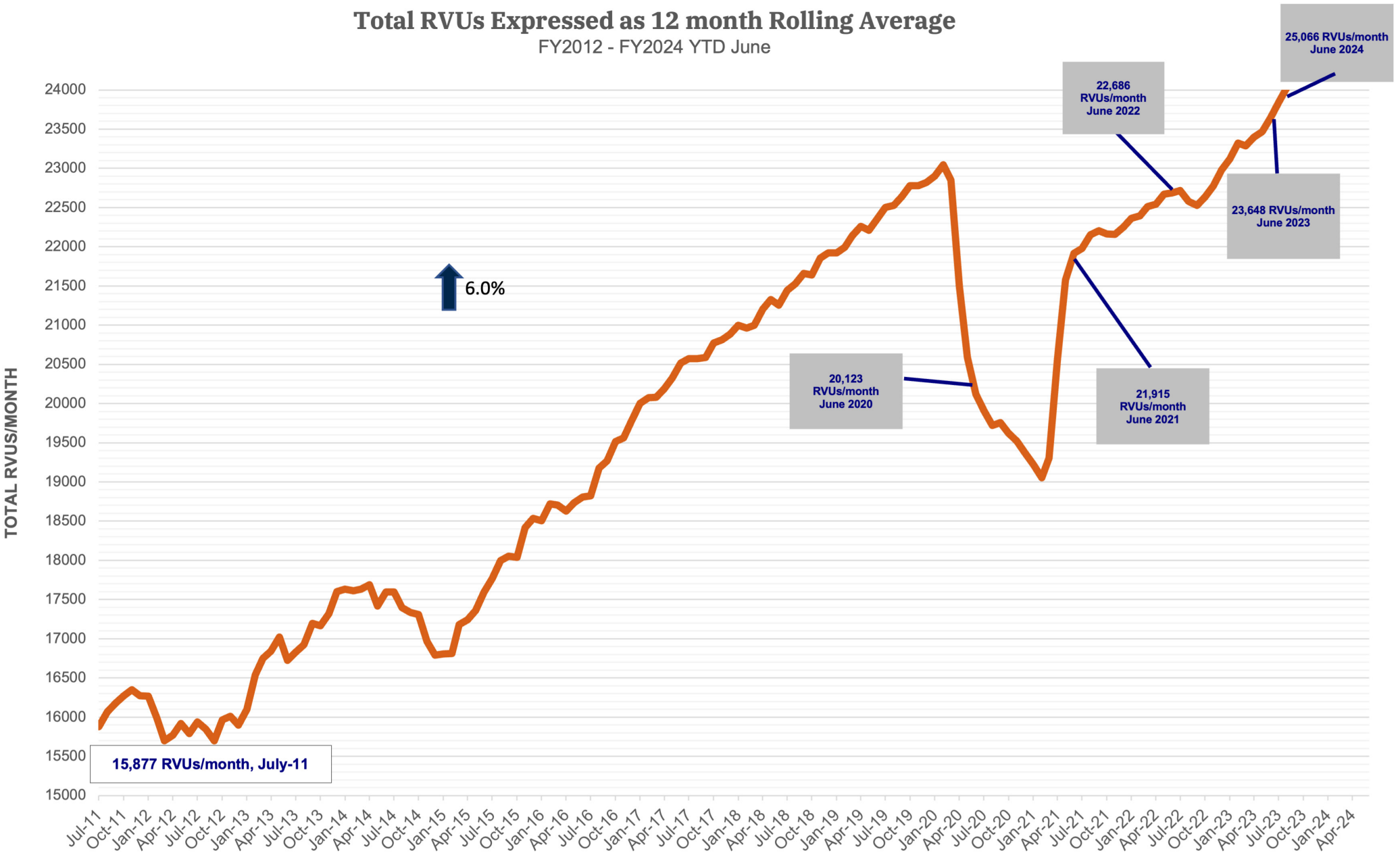
The Surgical Pathology section encompasses a general sign-out service and multiple subspecialty services, each with its own service chief. The clinical service provided by surgical pathology faculty includes frozen section coverage at University Hospital (UH), adult surgeries at C.S. Mott Children's and Von Voigtlander Women's Hospital, Frankel Cardiovascular Center, East Ann Arbor Medical Center, and Brighton Center for Subspecialty Care. Telepathology continued to be leveraged to support our frozen section service remotely. General Surgical Pathology (also known as "Room 1") service handles biopsies and surgical resection specimens not covered by other subspecialty areas. In FY24, 13,683 general specimens were processed, which represents an increase of 1.6% from the prior year. Likewise, this service has experienced an 8.8% overall increase when compared to specimen volumes from five years ago.

### Bone and Soft Tissue Pathology

Bone and Soft Tissue Pathology is focused on the diagnosis and study of diseases of the bone and surrounding soft tissues. Bone & Soft Tissue consult cases, which include very challenging, unique, and rare lesions, decreased by 5% with 2,003 cases received in FY24. This consult service has shown an overall 35.3% increase compared to specimen volumes from five years ago.

### Breast Pathology

Breast Pathology is a subspecialty of surgical pathology with expertise in the interpretation of breast lesions from various


Total RVUs Expressed as 12 month Rolling Average
FY2012 - FY2024 YTD June
TOTAL RVUS/MONTH
24000
23500
23000
22500
22000
21500
21000
20500
20000
19500
19000
18500
18000
17500
17000
16500
16000
15500
15000
6.0%
15,877 RVUs/month, July-11
20,123 RVUs/month June 2020
21,915 RVUs/month June 2021
22,686 RVUs/month June 2022
23,648 RVUs/month June 2023
25,066 RVUs/month June 2024
Jul-11
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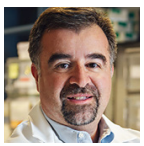
**Rouba Ali-Fehmi, MD**
*Service Director*, Breast Pathology

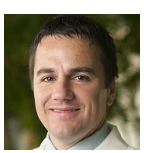


**Thomas Giordano, MD, PhD**
*Service Director,* Endocrine Pathology

**Laura Lamps, MD**
*Service Director*, Gastrointestinal / Hepatobiliary Pathology

**L. Priya Kunju, MD**
*Service Director*, Genitourinary Pathology

**Kathleen Cho, MD**
*Service Director*, Gynecologic Pathology



**Jonathan McHugh, MD**
*Service Director*, Head and Neck / Oral-Maxillofacial Pathology

specimen types including needle core biopsy, lumpectomy, and mastectomy specimens. Our Breast Pathology service includes a unique dedicated frozen section laboratory for margin assessment and intraoperative consultation. The Breast Pathology division also features a consultation service that assists with diagnostically challenging cases. In FY24, the Breast Pathology service processed 4,339 cases which represents a 9.7% growth compared to FY23 and 68.5% growth compared to five years ago. This service also completed 1,891extramural consultations (transfer and private consults) in FY24, which is a 1.0% decrease from FY23 and represents a 22.7% increase compared to volumes from five years ago.

## Endocrine Pathology

Endocrine Pathology is the study of diseases of the endocrine system including the thyroid, parathyroid, pituitary gland, endocrine pancreas, and adrenal glands. This service completed 810 challenging consult cases in FY24, which is a 2.8% increase from FY23 and represents a 47.0% increase compared to specimen volumes from five years ago.

## Gastrointestinal/Hepatobiliary Pathology

Gastrointestinal Pathology (GI) is a subspecialty of surgical pathology that deals with the diagnosis and characterization of neoplastic and non-neoplastic diseases of the digestive tract and accessory organs such as the pancreas, gallbladder, and liver. The Gastrointestinal/Hepatobiliary service completed 24,289 in-house cases in FY24, an increase of 8.9% as compared to FY23. Case numbers show a 23.7% increase compared to five years ago. This service also completed 5,866 extramural consultations (transfer and private consults) in FY24, which is a 0.1% decrease from FY23 and represents a 16.3% increase compared to volumes from five years ago.

## Genitourinary Pathology

Genitourinary Pathology (GU) is a subspecialty of surgical pathology that deals with the diagnosis and characterization of neoplastic and non-neoplastic diseases of the urinary tract, excluding medical disorders of the kidneys, which fall under renal pathology. This includes diseases of the male genital tract and testes. The GU service processed 3,562 cases in FY24, which was up 6.9% from the prior year. Overall, GU specimen volumes are up 0.5% compared to specimen volumes from five years ago. The decrease in in-house GU specimens is partially due to Michigan Medicine urologists frequently operating at Chelsea Hospital (owned by Michigan Medicine), but pathology evaluation of these GU cases is performed at Trinity Health by contract. This service also completed 2,342 extramural consultations (transfer and private consults) in FY24, which is a 0.2% decrease from FY23 and represents a 19.6% increase compared to volumes from five years ago.

## Gynecologic Pathology

Gynecologic Pathology (GYN) is the subspecialty that deals with the study and diagnosis of diseases involving the female genital tract. The GYN service processed 7,516 cases in FY24, which is a 1.4% decrease from the prior year. This represents a 13.7% increase compared to specimen volumes from five years ago. This service also completed 1,968 extramural consultations (transfer and private consults) in FY24, which is a 2.8% increase from FY23 and represents a 25.3% increase compared to volumes from five years ago.

## Head and Neck Pathology/Oral-Maxillofacial Pathology

Head and Neck Pathology covers neoplastic diseases of the thyroid gland, salivary glands, and head and neck. Oral-Maxillofacial Pathology is concerned with the diagnosis and study of diseases affecting the oral and maxillofacial region and is sometimes considered to be a specialty of dentistry and pathology. Internally generated head and neck cases were included in the general Surgical Pathology service described above. Consult cases are handled by our head and neck service and amounted to 1,624 cases in FY24, which was a 4.6% increase over FY23 and represents a 29.4% increase compared to specimen volumes from five years ago.

## Pulmonary/Thoracic Pathology

Pulmonary Pathology is a subspecialty of surgical pathology that


AVEN
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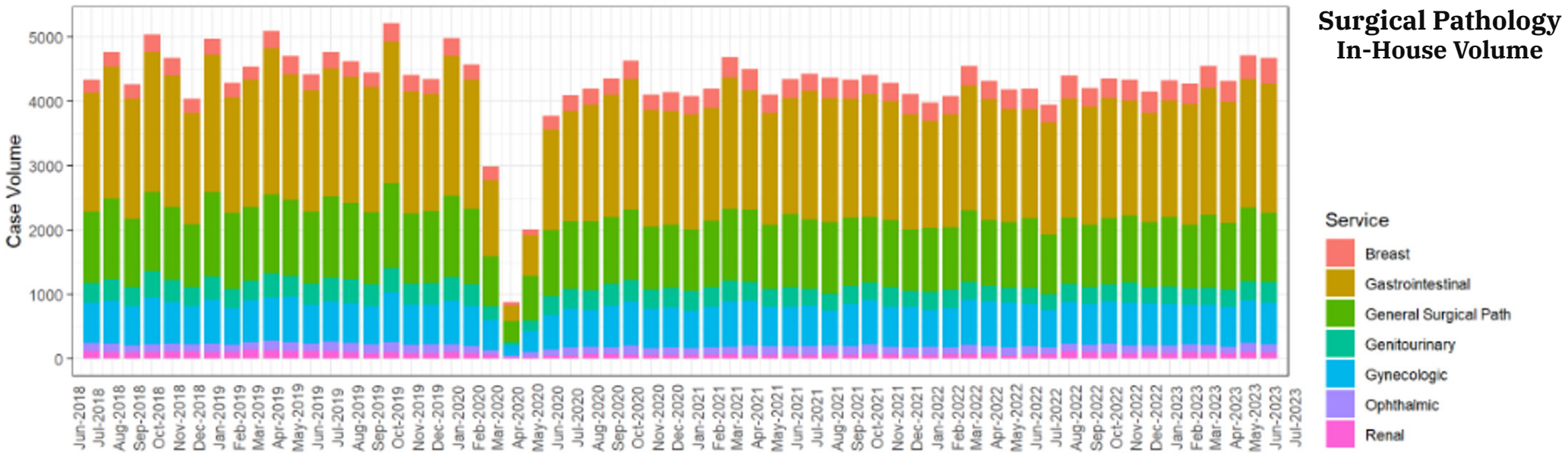



## Annual Case Volumes

| AP Service | FY20 | FY21 | FY22 | FY23 | FY24 | 1-YR | 5-YR |
|---|---|---|---|---|---|---|---|
| Autopsy & Forensics | 1,983 | 2,050 | 1,659 | 676 | 585 | -13.46% | -70.50% |
| Cytopathology | 28,737 | 35,305 | 35,942 | 35,391 | 33,945 | -4.09% | 18.12% |
| Dermatopathology | 20,992 | 23,681 | 23,646 | 23,884 | 22,011 | -7.84% | 4.85% |
| Frozen Sections | 3,156 | 3,068 | 2,872 | 2,849 | 2,551 | -10.46% | -19.17% |
| Neuropathology | 681 | 710 | 753 | 707 | 1,033 | 46.11% | 51.69% |
| Ophthalmic Pathology | 1,353 | 1,384 | 1,453 | 1,445 | 1,595 | 10.38% | 17.89% |
| Outside Case | 27,704 | 27,996 | 30,935 | 32,878 | 33,743 | 2.63% | 21.80% |
| Pediatric & Perinatal | 5,297 | 5,645 | 5,890 | 6,172 | 6,617 | 7.21% | 24.92% |
| Renal Pathology | 941 | 809 | 856 | 1,166 | 1,155 | -0.94% | 22.74% |
| Surgical Pathology | 42,294 | 47,136 | 47,085 | 48,322 | 51,598 | 6.78% | 22.00% |
| Technical Only | 1,531 | 1,216 | 2,123 | 2,089 | 2,570 | 23.03% | 67.86% |
| **Total** | **134,669** | **149,000** | **153,214** | **155,579** | **157,403** | **1.17%** | **16.88%** |

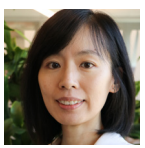
## Outside Case Volumes

| AP Service | FY20 | FY21 | FY22 | FY23 | FY24 | 1-YR | 5-YR |
|---|---|---|---|---|---|---|---|
| Breast | 1,541 | 1,508 | 1,768 | 1,911 | 1,891 | -1.0% | 22.7% |
| Cardiac | 21 | 24 | 15 | 39 | 41 | 5.1% | 95.2% |
| Cytology | 1,192 | 1,076 | 1,223 | 1,192 | 1,409 | 18.2% | 18.2% |
| Dermatopathology | 6,512 | 6,377 | 6,757 | 6,421 | 6,568 | 2.3% | 0.9% |
| Endocrinology | 551 | 539 | 655 | 788 | 810 | 2.8% | 47.0% |
| Gastrointestinal | 5,043 | 5,108 | 5,548 | 5,873 | 5,866 | -0.1% | 16.3% |
| Genitourinary | 1,959 | 1,845 | 2,252 | 2,346 | 2,342 | -0.2% | 19.6% |
| Gynecologic | 1,571 | 1,520 | 1,735 | 1,914 | 1,968 | 2.8% | 25.3% |
| Head & Neck | 1,255 | 1,303 | 1,403 | 1,552 | 1,624 | 4.6% | 29.4% |
| Hematopathology | 2,347 | 2,400 | 2,713 | 2,783 | 2,821 | 1.4% | 20.2% |
| InterDepartmental Consult | 356 | 608 | 296 | 394 | 278 | -29.4% | -21.9% |
| Misc Outside Case | 9 | 6 | 1 | 5 | 4 | -20.0% | -55.6% |
| Muscle | 29 | 22 | 34 | 25 | 16 | -36.0% | -44.8% |
| Neuropathology | 597 | 879 | 1,144 | 1,536 | 1,327 | -13.6% | 122.3% |
| Ophthalmic | 73 | 75 | 83 | 92 | 92 | 0.0% | 26.0% |
| Pediatric | 407 | 408 | 456 | 445 | 648 | 45.6% | 59.2% |
| Pulmonary | 2,712 | 2,563 | 2,961 | 2,960 | 3,082 | 4.1% | 13.6% |
| Renal | 43 | 34 | 52 | 87 | 38 | -56.3% | -11.6% |
| Soft Tissue | 1,481 | 1,696 | 1,827 | 2,109 | 2,003 | -5.0% | 35.2% |
| **Total** | **27,699** | **27,991** | **30,923** | **32,472** | **32,828** | **1.1%** | **18.5%** |

**Jeffrey Myers, MD**
*Service Director,* Pulmonary/ Thoracic Pathology

**David Gordon, MD**
*Service Director,* Cardiovascular Pathology

**Raja Rabah, MD**
*Section Head*, Pediatric and Perinatal Pathology



**May Chan, MD**
*Section Head*, Dermatopathology

**Andrew Lieberman, MD, PhD**
*Section Head*, Neuropathology

deals with the diagnosis and characterization of neoplastic and non-neoplastic diseases of the lungs, pleura, and mediastinum. In-house cases are not tracked separately from other Surgical Pathology cases. However, the Pulmonary Pathology service evaluated 3,082 complex consultation cases in FY24, with a 4.1% increase compared to FY23, and a 13.6% increase compared to specimen volumes from five years ago.

**Case Volume:** All Surgical Pathology services in FY24 include all in-house specimens and extramural consultations (transfer and private consults). This case volume for Surgical Pathology was 88,901, which represents a varied year-over-year change for different subspecialties, with an overall 3.7% increase from the prior year and 18.6% increase over five years ago.

**Frozen Sections:** Case volume for FY24 was 2,523 representing a decrease of 11.4% compared to FY23 and a 20.0% decrease from five years ago.

**Surgical Pathology In-house Turnaround Time:** Defined from when a specimen is received in pathology until the case is signed out, overall decreased an average of 1.7% compared to one year ago. This turnaround time is 13.5% faster compared to five years ago. This can be attributed to several measures including leveraging informatics for better tracking of turnaround time and delayed cases, as well as immediate notification of faculty about late cases.

## Cardiovascular Pathology

Cardiovascular Pathology examines the heart and major blood vessels to determine the diseases of these organs, whether congenital or acquired in life. Cases include surgical specimens from living patients or autopsy specimens from deceased patients as well as heart biopsies. A formal cardiovascular pathology service was created in February 2022 in Anatomic Pathology.

**Case Volume:** The cardiovascular surgical pathology case volume of 1,126 for FY24 reflects a 13.6% increase compared to the previous year.

**Turnaround Time:** Average turnaround time for cardiovascular surgical pathology cases was 2.36 days in FY24, which decreased by 11.2% .

## Pediatric and Perinatal Pathology

This medical subspecialty is focused on childhood diseases as well as perinatal conditions affecting the placenta and fetus. The work includes pediatric surgical pathology cases as well as autopsies and placental examinations.

**Case Volume:** The pediatric surgical pathology case volume of 7,350 for FY24 reflects a 9.0% increase compared to FY23 and a 25.7% increase compared to specimen volumes from five years ago. Placental exams increased by 12.3% to 2,319 cases in FY24 and showed a 22.4% increase over five years. Pediatric fetal exams increased 16.7% from FY23 with 280 cases performed, whereas pediatric autopsies had 31 cases, which is a 34.8% increase from FY23.

**Turnaround Time:** Average turnaround time for pediatric surgical pathology cases was 2.4 days in FY24, which increased by 0.5% in the last year and increased by 1.4% in the last five years.

## Dermatopathology

Dermatopathology focuses on the study of cutaneous diseases at a microscopic and molecular level. The dermatopathology service utilizes light microscopy, immunofluorescence, and molecular testing.

**Case Volume:** The Dermatopathology service experienced an overall 6.1% decrease in FY24 and handled a total of 28,446 cases. This included a 2.4% decrease in specimens from Michigan Medicine patients (in-house cases) which accounted for 53.5% of the cases seen. Cases from patients outside Michigan Medicine (MLabs cases) were down 19.8% in FY24.

**Turnaround Time:** Overall turnaround time for dermatopathology cases averaged 4.0 days, showing an average 5.55% decrease from FY23.

## Neuropathology

Neuropathology is a branch of pathology that focuses on the diagnosis of diseases of the central and peripheral nervous systems and incorporates non-neoplastic conditions targeting skeletal muscle.

**Case Volume:** For FY24, there were a total of 2,699 cases signed out compared to 2,613 cases in FY23, representing a 3.3% increase. Over a five-year period, this service has witnessed a 65.5% increase in neuropathology cases. Consult cases saw a 13.6% decrease from FY23, but a 124.8% increase over five years.

**Turnaround Time:** On average, cases decreased to 3.8 days, showing a 9.8% improvement from FY23 and a 28.2% improvement compared to five years ago.

### Ophthalmic Pathology

Ophthalmic Pathology focuses on diseases of the eye and unique periorbital structures. These cases are predominantly signed out at the W.K. Kellogg Eye Center in Ann Arbor.

**Case Volume:** This service accounted for 1,697 cases in FY24, an increase of 10.0% as compared to the prior year and a 17.9% increase over the past five years.

**Turnaround Time:** Averaged 4.3 days, showing an increase of 1.2% in FY24 and a 12.1% improvement over five years.

### Renal Pathology

The Renal Pathology service focuses on the diagnosis and characterization of medical diseases (non-tumor) of the kidneys.

**Case Volume:** Medical renal biopsy case volume increased to 1,193 in FY24, representing a 4.9% decrease and a 21.2% increase in one-year and five-year-over-year changes, respectively. The FY24 increase was driven in part by changes in transplantation surveillance biopsy practices related to COVID-19 in the prior years.

**Turnaround Time:** For medical renal biopsies, the overall turnaround time was 13.0 days in FY24, representing a decrease of 0.8% compared to last year, but an 83.5% decrease compared to five years ago.

## Cytopathology

Cytopathology is a branch of pathology that performs diagnostic testing on samples consisting of mostly individual cells, such as Pap tests, body fluids, brushings, and fine needle aspirations (FNA). Our cytopathologists perform rapid on-site evaluations (ROSE) at multiple clinics and procedure rooms throughout Michigan Medicine. Telecytology is frequently employed to support this service. ROSE enables rapid specimen triage and diagnostics for patients while they are still at the medical center, eliminating the need for follow-up visits due to inadequate sampling. Our cytopathology team is also skilled at performing palpation-guided and ultrasound-guided FNA themselves.

**Case Volume:** Our cytopathology service processed 33,945 cases in FY24, which was down 4.1% from FY23 and up 18.1% compared to five years ago. Gynecologic Pap tests represented the bulk of these cytopathology cases. There were 8,163 non-gynecologic cytopathology cases in FY24, in addition to 3,618 FNAs, which included percutaneous and endoscopic aspirations.

**Turnaround Time:** The average turnaround time for all cytology cases was 1.6 days in FY24, which is approximately a 6.2% decrease from previous years.

## Autopsy and Forensic Pathology

Hospital and forensic autopsies and examinations represent major activities within Anatomic Pathology. Our fellowship-trained forensic pathologists handle forensic cases from Washtenaw County. All Michigan Medicine adult and pediatric autopsies as well as all forensic cases from Washtenaw County are performed in the University Hospital (UH) morgue. Wayne and Monroe County forensic cases, performed at the Wayne County Medical Examiner's Office, were discontinued in FY22, and Livingston County cases were discontinued in FY23, which will account for overall decreases in the number of autopsies and exams.

**Case Volume:** Autopsies performed in the UH morgue were up 19.7% from FY23 and showed a 20.0% decrease over the past five years. Case volumes of autopsies performed at the Wayne County Medical Examiner's Office were discontinued in FY22.

**Turnaround Time:** Demonstrated an average of 47.6 days to finalize an autopsy, representing a 16.6% overall decrease compared to last year and a 7.8% decrease compared to FY20.

**Victor Elner, MD, PhD**
*Section Head,* Ophthalmic Pathology

**Evan Farkash, MD, PhD**
*Section Head*, Renal Pathology

**Judy Pang, MD**
*Section Head*, Cytopathology

**Allecia M. Wilson, MD**
*Section Head,* Autopsy & Forensic Pathology

### Autopsy and Forensic Services FY23

| | FY20 | FY21 | FY22 | FY23 | FY24 |
|---|---|---|---|---|---|
| Wayne County | 3,007 | 3,463 | 3,626 | - | - |
| Washtenaw/Livingston County | 560 | 647 | 588 | 560 | 393 |
| Michigan Medicine | 184 | 151 | 141 | 131 | 161 |

### Case Volume / UH, Washtenaw, and Livingston Counties

| | FY20 | FY21 | FY22 | FY23 | FY24 | 1-YR | 5-YR |
|---|---|---|---|---|---|---|---|
| Brain Cases | 50 | 42 | 44 | 48 | 64 | 33.33% | 28.00% |
| Livingston Autopsies | 123 | 137 | 120 | 25 | - | -100.00% | -100.00% |
| Livingston Exams | 26 | 28 | 32 | 3 | - | -100.00% | -100.00% |
| UH (Adult) Autopsies | 160 | 127 | 113 | 107 | 128 | 19.63% | -20.00% |
| UH (Adult) Exams | - | - | - | 1 | - | -100.00% | -100.00% |
| UH (Peds) Autopsies | 24 | 24 | 28 | 23 | 33 | 43.48% | 37.50% |
| Washtenaw Autopsies | 344 | 378 | 336 | 383 | 311 | -18.80% | -9.59% |
| Washtenaw Exams | 67 | 104 | 100 | 101 | 82 | -18.81% | 22.39% |
| **Total** | **794** | **840** | **773** | **691** | **618** | **-10.56%** | **-22.17%** |

## Consultation Service

Our extramural consultation service is an important component of our practice. The rare and difficult cases encountered with this service challenge our faculty to continue to deepen their expertise and expose our trainees to cases otherwise rarely seen.

This practice strengthens our brand at regional and national levels, leads to research opportunities in rare diseases, is fundamental to the success of subspecialty fellowships, drives revenue, and enhances patient recruitment to Michigan Medicine.

**Case Volume:** In FY24, the extramural AP consultation practice total case volume was 32,828, which represents a 1.1% increase over FY23 and an 18.5% increase as compared to five years ago.

**Turnaround Time:** Increased to an average of 4.1 days per case. This represents a 24.9% increase over last year and a 4.8% slower turnaround time compared to five years ago. The increase in turnaround time is primarily due to changes in staffing.

## Technical-Only Histological Service

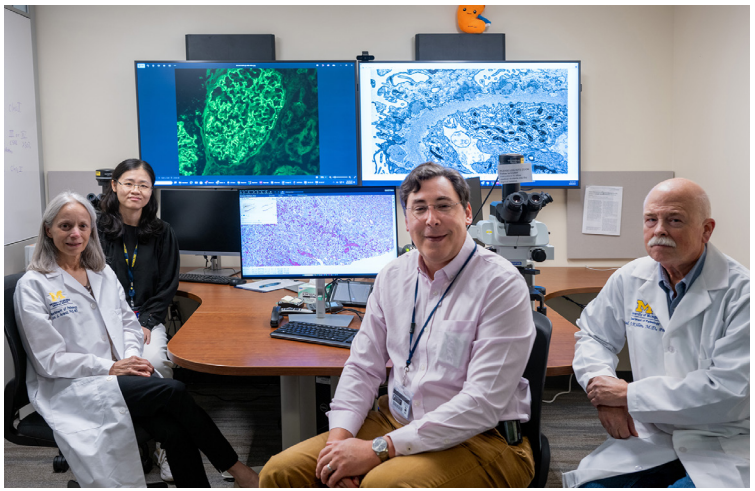
Our histology laboratory offers outside laboratories access to our test menu including immunohistochemical and *in situ* hybridization stains, which are handled by our highly skilled technologists. For a limited menu, we also perform both technical stains and pathologist interpretation.

**Case Volume:** Cases were up 23.0% compared to FY23 at 2,570 and have increased 67.9% over five years ago.

**Turnaround Time:** Cases decreased by 22.9% from FY23 to 2.3 days and demonstrated a 42.8% reduction from FY20.

## Digital Pathology

Anatomic Pathology moved forward with our digital pathology initiative, obtaining budget approval in early FY24. By the end of 2023, hardware had been procured using the Sectra platform and seven Leica scanners with a Hamamatsu scanner for manual scanning for frozen section diagnoses. The Michigan Medicine Health Information Technology Services (HITS) team worked with our Pathology Informatics team on system integrations



and training. Meanwhile, we utilized Lean facility design processes to plan and renovate the histology laboratory to create a digital scanning laboratory with an adjacent slide staining area and established mock sign-out rooms to ensure our facility design met the needs of our faculty, trainees, and laboratory professionals.

By November 2023, the Sectra kick-off meeting was held, and faculty super users and go-to persons were identified. We conducted process evaluations for time studies to ensure proper staffing levels, scanner demo trials in brightfield, polarized, and fluorescent microscopy, and began hiring needed staff. By the end of FY24, our business analyst and six of the eight-planned scan technicians had been hired. Our Sectra server configurations, test interfaces, and end-to-end testing were completed, and validation studies were done.

Phase 1 implementation, planned for early FY25, focusing on pediatric, cardiovascular, and medical renal cases, was prepared and workflow configurations were completed. We are poised to launch digital pathology with plans to add several more services over the coming year.

## Personnel

In AP there are 62 faculty members that sign out, including many world-renowned pathologists. This does not include pathologists who are part of leadership or other divisions, and it also does not include active emeritus faculty. Since July 2023, four new faculty were hired. The service also involves 12 ACGME fellows and 10 non-ACGME fellows/clinical instructors.

## Academic Activities

AP faculty excelled at fulfilling our research mission. AP pathologists collectively published 151 peer-reviewed articles in prestigious journals. Our faculty delivered numerous presentations at regional, national, and international meetings and other institutions.

## Education

**Medical School Teaching/Graduate School Teaching**

Under the organizational leadership of Dr. Madelyn Lew, nearly 25 AP faculty participated in medical school teaching (M1-M4 students), including lectures, labs, and experiential learning. Several AP faculty members also participated in teaching and mentoring our graduate students.

**Residency Program/Fellowship Program**

AP faculty across disciplines dedicated many hours to teaching our residents and fellows. Residents in AP were exposed to excellent learning opportunities in surgical pathology, cytopathology, and autopsy/forensic pathology. AP fellows were exposed to challenging cases from our extensive consultation practice and participated in many multidisciplinary conferences and tumor boards.

# Clinical Pathology

**Riccardo Valdez, MD**
*Director,* Clinical Pathology

The Division of Clinical Pathology (CP) medically and operationally administers the high-volume and specialized clinical laboratory services provided by the Department of Pathology and Clinical Laboratories. While the medical laboratory services provided by the CP Division largely occur at the University Hospital and NCRC locations, the CP Division also oversees the clinical services provided at all offsite laboratories, including (but not limited to) West Ann Arbor, Northville, Brighton Center for Specialty Care, Domino Farms, Kellogg Eye Center, and East Ann Arbor Surgery. Several members of the CP faculty and operations staff actively work to maintain the accreditation and regulatory compliance for all the Department's clinical laboratories, regardless of Division.

Like the medical laboratories in the Anatomic Pathology and Diagnostic Genetics and Genomics Divisions, the CLIA-certified and multi-agency accredited (CAP, AABB, ASHI, FACT) laboratories within the Clinical Pathology (CP) Division support the diagnosis and management of human disease using automated and/or manual testing of blood, body fluids, bone marrow, and fresh or fixed tissue specimens, augmented by medical interpretation and clinical consultation; the latter being an essential component of the value delivered by the CP Division to the clinical, educational, and research missions of Michigan Medicine and the University of Michigan at large.

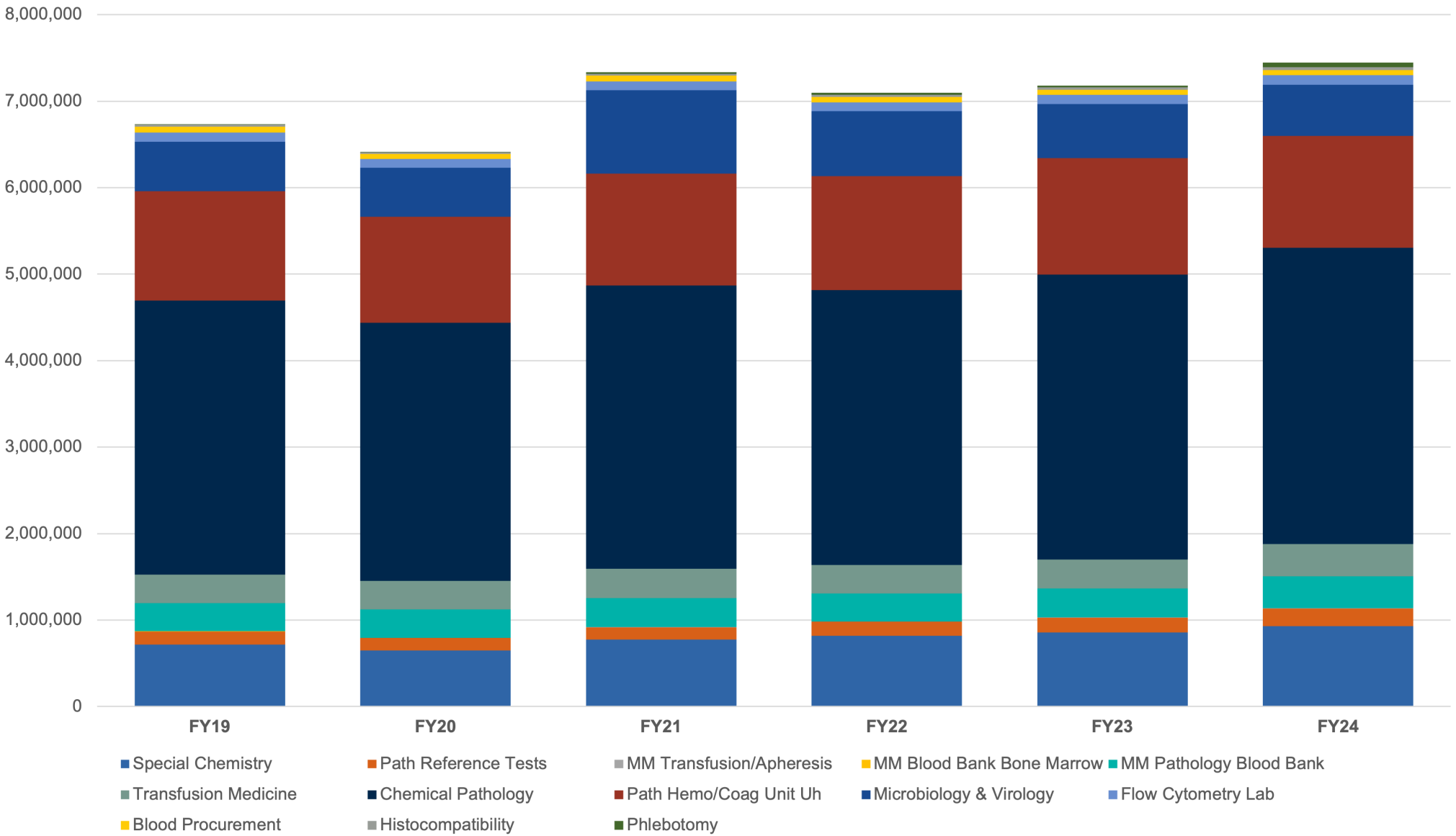
The medical laboratory disciplines and support services administered by the CP Division in FY24 included the following: Clinical Chemistry, Toxicology, Drug Analysis, Hematology, Coagulation, Biochemical Genetics (Clinical Core Laboratory); Blood Bank, Apheresis, and Cell Therapy (Transfusion Medicine); Special Chemistry and Clinical Immunology; Clinical Microbiology; Bone Marrow Morphology and Flow Cytometry (Hematopathology); Histocompatibility; Point-of-Care Testing; Onsite and Offsite Phlebotomy; Specimen Processing. Divisional administration of the Clinical Cytogenetics, Molecular Diagnostics, and Medical Genetics (MMGL) laboratories were fully shifted to the Division of Genetics and Genomics in FY24. The medical laboratories in the CP Division achieved 7,120,529 billed tests and $986,599,582 in gross charges in FY24, representing increases of 2.2% and 3.9% year over year, but with overall increases of 1.9% and 4.5% respectively, over the past five years.

The CP Division has twenty-six active clinical faculty, three active emerita/emeritus faculty, and one active adjunct faculty member. Three new clinical faculty were recruited to the Division in FY24, all officially joining in late 2023: Brian Harry, MD, PhD joined the Clinical Immunology/Special Chemistry and Clinical Core Lab faculty rosters; Jennifer Jones, MD was hired as an attending physician for the Transfusion Medicine Section with a dry appointment in Internal Medicine; Jensyn Cone Sullivan, MD was recruited as an attending physician for the Transfusion Medicine Section, as well as the incoming Medical Director of the Blood Bank and Transfusion Medicine Fellowship Program Director. Two members of the CP Division received academic promotions in May 2024: Dr. Chisa Yamada was promoted to Clinical Professor and Dr. Carmen Gherasim was promoted to Clinical Associate Professor. These promotions were effective in September 2024.

The number of allied health staff supporting the CP laboratories remained relatively stable in the past year. A notable exception was the onsite phlebotomy service, which grew by ten phlebotomists, specifically for the inpatient blood drawing team. This staff expansion was one of the outcomes of the work performed by a multidisciplinary team that undertook the task of performing a comprehensive overhaul of the onsite phlebotomy service and one that resulted in marked performance improvement in this essential and highly `visible clinical service. The last major components of the UH clinical laboratory portion of the Pathology Relocation and Renovation (PRR) Project were completed, with the apheresis and cellular therapy services

## Clinical Pathology Billed Tests by Service

Fiscal Years 2020-2024



**Carmen Gherasim, PhD**
*Director*, Clinical Core Laboratory

moving into their new spaces during the summer months.

The CP Division Director and team oversaw the interim inspection of the Department's seven CAP-accredited medical laboratories (performing patient testing for all clinical Divisions) in May 2024. The interim inspection is a requirement of the CAP accreditation, and it is historically conducted by an internal team consisting of laboratory staff, supervisors, managers, pathology residents, and clinical fellows. This year, however, the Department took advantage of the newly formed affiliation with the Sparrow Hospital Laboratories and invited a team of 28 to perform the internal inspection. This not only provided a deeper inspection of our clinical laboratories but also a wonderful way to begin to establish connections and shared practices. Ungraded proficiency testing investigations, timeliness of QC performance, complete documentation, timeliness of competency assessments, method verification, and reagent labeling and handling were among the observed deficiencies. The Department's clinical laboratories are due for external CAP inspection between March 1 and May 31, 2025. Lastly, the Division invested substantial effort toward documenting all sustainability (green) activities being performed by each of the clinical laboratory areas as well as obtaining formal certification from the University for these activities. All Clinical Laboratories have reached some level of certification under the Green Labs Initiative, with several of them reaching Gold or Platinum levels. The Histocompatibility and Hematopathology Lab not only completed their certification at Gold Level, but they also won the international portion of the Freezer Challenge due to their excellent work maintaining their large number of freezers and managing inventory.

## Clinical Core Laboratory Section

The Clinical Core Laboratory (CCL) is located on the University Hospital main campus and provides 24/7/365 clinical testing for hundreds of different health- and disease-related analytes in blood, urine, or body fluids. The around-the-clock staff supports the inpatient, outpatient, and emergency service practices for adult and pediatric patients. In addition, the CCL performs testing for patients seen at our offsite laboratory and medical practice locations (e.g., West Ann Arbor, Northville, Canton, East Ann Arbor, Brighton Specialty), as well as from our MLabs patients.

The CCL was medically supported by Drs. Carmen Gherasim, Shih-Hon (Sean) Li, David Manthei, Steven Pipe, Riccardo Valdez, Jeffrey Warren, and Mark Girton in FY24. In June 2024, the technical supervisor responsibilities for the hematology laboratory were delegated to Dr. Girton by Dr. Valdez. The subsection of the clinical microbiology laboratory based at UH was moved to the operational oversight of the CCL, but the subject matter expertise continues to be provided by Drs. Michael Bachman, Paul Lephart, and Virginia Pierce of the Clinical Microbiology Section based at NCRC. Additionally, with the planned integration of the Biochemical Genetics Laboratory (BGL) into the Clinical Core Laboratory in July 2024, Dr. Lidong Zhai (BGL technical supervisor), together with Drs. Shane Quinonez and Ayesha Ahmad from the Department of Pediatrics, worked with CCL and BGL managers to assist with the transition process. Drs. Zhai, Quinonez, and Ahmad will continue to provide medical support for the BGL.

Eric Vasbinder continued to serve as the administrative manager for the CCL, leading the integration processes and working together with the chief technologists, Kristy Wendt and Amy Rosendaul, to provide essential leadership to the Hematology, Coagulation, Chemistry, Toxicology, Drug Analysis, Emergency Department Laboratories, and offsite laboratories. The management team continued to work closely with the CCL faculty to ensure the maintenance of accreditation standards and regulatory compliance. Other ongoing efforts included realignment of internal organization, continuous focus on quality improvements, and maintenance of a clinically relevant test menu. CCL staff continued to be involved in professional development activities including cross-training with CCL sections, participation at internal CAP inspections, and attending scientific conferences

### Clinical Chemistry, Drug Analysis, Toxicology, Emergency Lab, Services and Offsite Labs

These areas of the CCL perform STAT and routine testing in the areas of general chemistry, endocrinology, drug analysis, and toxicology. The test menu includes routine chemistries

(electrolytes, creatinine, liver function, glucose, and proteins), lipids, vitamin testing, cardiac markers, tumor markers, reproductive hormones, hepatitis serology testing, metals testing (e.g., lead), therapeutic drug monitoring, drug-of-abuse testing, and intraoperative parathyroid hormone testing. The area is equipped with state-of-the-art automated analyzers utilizing spectrophotometry, immunoassays, mass spectrometry, and other methods for a full range of diagnostic testing. The clinical labs in the Adult and Children's Emergency Services areas are administered by the chemistry section of the CCL. With many COVID testing sites closing in FY23, the CES laboratory continued to support diagnostic COVID testing using the Abbott ID NOW COVID for both symptomatic and asymptomatic patients where a rapid TAT was needed to support clinical decision making.

In FY24, Chemistry performed 3,425,770 billed tests, with a 3.9% increase in total testing compared to FY23. Outpatient testing showed a 6.0% increase, and a 1.1% decrease was observed for inpatient testing. The toxicology lab performed 144,264 tests, representing an 11% increase compared to FY23. The volume of COVID-19 diagnostic testing performed in the CES lab decreased by 73% in FY24. Increased efficiencies in the operations continued to decrease over time in the Chemistry labs by 22.0% compared to FY23.

Additional highlights from this area include:

- Validation and implementation of an HIV confirmatory testing performed using Biorad Geenius instrument for all positive HIV Ab/Ag screening tests that reduced the TAT from 7-10 days to <1 day.
- Validation and implementation of Total Bile Acids testing for the detection of hepatobiliary dysfunction and to aid in diagnosis of intrahepatic cholestasis of pregnancy, previously sent out to reference laboratory.
- Validation and implementation of Cardiac Troponin I assay for pediatric patients with Duchenne Muscular Dystrophy (DMD) receiving gene therapy.
- Validation of a new diazo-based method for measurement of Direct and Total Bilirubin for neonates to harmonize bilirubin testing with other local healthcare systems where MM patients may be transferred.
- In collaboration with Hematology and ED Labs, a new reflex testing algorithm was implemented (ERUC) to decrease duplicate UA/UC testing. The new test reflexes to UC which would include reflex to a culture if indicated.
- Implementation of a new Lead test to include a state-mandated declaration of specimen type.

**Hematology and Coagulation**

This area of the CCL performs automated and manual testing to measure the various components of blood and body fluids (e.g., red blood cells, white blood cells, and platelets), identifies and quantitates abnormal cells, assesses clotting factor levels, determines the impact of medications on blood clotting processes, and helps diagnose diseases of kidneys and urinary tract. Quantitative flow cytometry is performed on peripheral blood and stem cell harvest products to assess CD34-positive stem cells in support of the Transfusion Medicine Section and the stem cell transplant program. The CCL hematology lab also remains involved in the bone marrow biopsy process, providing lab technicians to assist with these bedside clinical procedures.

The hematology and coagulation areas of the CCL performed 1,293,539 billed tests in FY24, a 4.1% decrease from last year. These lab areas had experienced a 6.3% increase in billed tests and a 3.8% increase in gross charges over the previous five years, but they have seen a 9.2% decrease in inpatient requests in the past year, likely due to lab stewardship projects. The hematology and coagulation lab areas benefited from the completion of the core chemistry automation line project and continue to work closely with the chemistry area and specimen processing service to improve preanalytical workflows using new pre-analytical instruments added this past year.

Additional highlights from this area include:

- Verification of the Sysmex UN-3000 automated urinalysis platform that utilizes more cost-effective reagents and reduces the cost per test by more than 50.0%.

**Daniel Boyer, MD, PhD**
*Director*, Clinical Flow Cytometry Laboratory

**David Manthei, MD, PhD**
*Section Director*, Clinical Immunology & Special Chemistry

- Completion of the validation of the Sysmex PS-10 flow cytometry preparation instrument and two XF-1600 flow cytometers, along with the creation of one orderable panel to replace four older panels, to optimize quantitative T and B cell subset testing in the CCL. The new platform offers 10 color testing, communication between the PS-10 and XF-1600s, and walk-away analysis.
- Validation of Siemens Atellica CH analyzers at the satellite labs to align with instrumentation at CCL instrumentation.
- Optimization of user-defined PLT and Monocyte percentage rules to reduce manual smear review and decrease TATs without compromising quality and patient safety.
- Improvements in coagulation testing by pooling heparin reagent following a validation study was completed. Pooling the reagents saves in reagent costs and reduced analyzer downtime due to changing and performing QC on new reagent vials.

### Biochemical Genetics Laboratory

This specialized lab area was integrated into the CCL in July 2024. The BGL performs primarily mass spectrometry-based tests for the diagnosis and management of inborn errors of metabolism. The tests performed by the laboratory include Plasma Amino Acids, Urine Organic Acids, and Methylmalonic Acid. Major activities for the laboratory include ongoing re-validation of acylcarnitine testing and amino acid monitoring via dried blood spots testing planned with further development.

## Clinical Immunology & Special Chemistry Section

The Clinical Immunology and Special Chemistry laboratories perform testing to assess immune responses in patients with autoimmune, infectious, and similar conditions; testing for patients with protein disorders such as those seen in multiple myeloma and related disorders; and hemoglobin evaluations in patients with suspected red blood cell disorders. The following CP faculty provided clinical service in this section in FY24: Drs. David Manthei (Section Director), Jeffrey Warren, David Keren, David Ferguson, Lee Schroeder, Shih-Hon (Sean) Li, and Carmen Gherasim. Dr. Brian Harry was welcomed to this clinical lab section in late 2023. In combination, these laboratories performed 492,779 tests in FY24, representing a 5.0% increase from FY23 and with increases spanning all aspects of the offered testing. The historical organization of these labs within the clinical chemistry section continues to be deconvoluted for greater clarity in annual longitudinal comparisons.

| Area | FY23 | FY24 | % Change |
|---|---|---|---|
| Special Chemistry | 176,056 | 187,483 | 6.5% |
| Clinical Immunology | 293,061 | 305,286 | 4.2% |
| **Total** | **469,117** | **492,779** | **5%** |

Highlights from this section include:

- Consolidation to a single supervisor (Mary Lou Erber) over the entire laboratory section following the retirement of Dave Harro.
- Initiation of additional laboratory staffing hours including limited evening and weekend hours to improve throughput and capacity.
- Continued collaboration with clinical stakeholders to refine ordering of appropriate tests, including anticipated revamped syphilis and Lyme disease testing in FY25.
- Planning for equipment replacement needs with space assessment, with multiple end-of-life instruments and transition of immunofluorescence slide preparation to alternative platforms.
- Continued staffing cross-coverage with the ability to absorb increasing volumes of non-automated testing.

In FY24, as staffing movement occurred (retirements, replacements, cross-training, etc.), the laboratory leaned into the opportunities to evaluate workflow, test menus, and future

growth laying the foundation for FY25 to continue forward to create the space to grow into potential test menu expansion.

## Transfusion Medicine Section

The Transfusion Medicine Section consists of the following areas: Blood Bank and Immunohematology Laboratory, Apheresis Procedure Unit, and Cellular Therapy Laboratory. The section was supported by the following faculty during the last year: Drs. Laura Cooling, Robertson Davenport, Chisa Yamada, and Shih-Hon Li. Two new faculty members, Drs. Jensyn Cone Sullivan and Jennifer Jones, and new Administrative Manager, Zack Shea, were hired at the end of FY23 and onboarded in early FY24. The Blood Bank also onboarded two supervisors in FY24.

Blood product utilization was relatively stable for packed red blood cell units and apheresis platelet units in FY24 compared to FY23. Plasma usage increased slightly, and cryoprecipitate usage continues to increase annually since a nadir during the first year of the COVID-19 pandemic. This year, the Blood Bank began annual reporting of low-titer group O whole blood utilization. The Blood Bank continues to participate in the Chilled Platelet Study (CHIPs), a phase 3, multicenter clinical trial. The Blood Bank also completed enrollment and data collection for an internal pre-clinical study on the manufacture and storage of an autologous packed red blood cell product from umbilical cord blood. The Blood Bank embarked on several initiatives including validation of anti-K, anti-Jka, and anti-Jkb antisera from a cost-competitive alternate manufacturer, transition of high-volume bone marrow blood types and antibody screens from manual to automated testing, improved workflow to resolve unable-to-duplicate positive antibody screens, improved monitoring and management of the platelet inventory to significantly decrease the frequency of critical shortages, and utilization review of low-titer group O whole blood in the Adult Emergency Department. Recognized for its sustainability efforts, the Blood Bank was awarded Platinum Status by Planet Blue.

The Cellular Therapy Laboratory (CTL) saw overall decreased numbers of hematopoietic stem cell (HPC) collections and transplants in FY24 compared to FY23, largely due to decreased laboratory staffing and staffing turnover. One exception was Unrelated Transplants, which doubled compared to last year and exceeded pre-pandemic numbers. The CTL offered six commercial, FDA-approved CAR-T products for seven clinical indications. Contributing heavily to clinical research, the CTL participated in 16 clinical trials including five for autoimmune diseases, a rapidly growing area for cellular therapies. Cellular Therapy Laboratory staffing steadily improved throughout FY24, with the laboratory almost fully staffed by the end of the fiscal year.

The Apheresis Procedure Unit (APU) officially returned to University Hospital from its temporary location in the Med Inn Building in FY24, after renovations were completed as part of the Pathology Renovation and Relocation Project. The new space includes ten patient bays, a dedicated clean supply room, a kitchenette, an updated patient bathroom, and a central nursing station. The APU saw overall stable numbers of procedures in FY24 compared to FY23, except for HPC collections which were intentionally reduced during the staffing shortage in the CTL. The APU continues to be lauded for excellence in patient care, receiving awards from Michigan Medicine's Office of Patient Experience reflecting outstanding patient survey results for July-to-September 2023 and October-to-December 2023. Furthermore, three APU nurses were nominated by patients, families, and co-workers for School of Nursing DAISY Awards. In FY24, the APU was recognized by the Office of Campus Sustainability as a Platinum level Michigan Medicine Sustainable Lab.

The Transfusion Medicine Section was successful in inspections by the FDA, AABB, KITE Pharmaceutical, and BMS Pharmaceutical, demonstrating its continuing commitment to quality, compliance, and patient care. The Blood Bank contributed to the successful re-verification of Mott Children's Hospital as a Level 1 Pediatric Trauma Center by the American College of Surgeons.

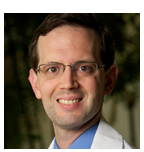
## Hematopathology Section

This section focuses on the evaluation of blood, bone marrow,

**Robertson Davenport, MD**
*Director*, Blood Bank and Transfusion Service

**Chisa Yamada, MD**
*Director*, Apheresis Services

**Laura Cooling, MD**
*Director*, Cellular Therapy Laboratory



**Daniel Boyer, MD, PhD**
*Service Director*, Hematopathology

**Michael Bachman, MD, PhD**
*Associate Director*, Clinical Microbiology Laboratory

**Paul Lephart, PhD**
*Associate Director*, Clinical Microbiology Laboratory

**Virginia Pierce, MD**
*Associate Director*, Clinical Microbiology Laboratory

lymph nodes, and other tissue to assess for benign, reactive, and neoplastic disorders, using a variety of techniques including routine microscopy (morphology), flow cytometry, and immunohistochemistry with incorporation of data from cytogenetic and molecular diagnostic testing in many cases. This section was supported by eleven hematopathologists in FY24 (Drs. Daniel Boyer, Robert Bell, Noah Brown, Mark Girton, Annette Kim, Kamran Mirza, Anamarija Perry, Charles Ross, Russell Ryan, Lauren Smith, and Riccardo Valdez) who variably participate on each of three clinical services (in-house biopsies, flow cytometry/blood and body fluid smear interpretation, and transfer and consult case interpretation). Four of the primary hematopathology section faculty participated in the interpretation of myeloid next-generation sequencing test interpretation in FY24 (Drs. Bell, Boyer, Brown, and Kim). Case volumes continued to increase in FY24. In FY24, 2,403 bone marrow and other tissue biopsies collected from Michigan Medicine patients were diagnosed and signed out by the hematopathology team, compared to 2,281 in the previous year. The diagnostic service also managed 1,148 cases from external healthcare systems associated with patients seeking care at Michigan Medicine (transfer cases) and 1,798 external cases sent by other pathologists for primary diagnosis or expert opinion (consult cases), compared to 1,680 consult cases in FY23. The flow cytometry lab performed 110,751 billed tests in FY24 compared to 103,741 in FY23, a 6.8% increase. Of note, the test volume in flow cytometry specifically includes 6,312 leukemia and lymphoma immunophenotyping panels. There has been a 28% increase in volume since FY20 based on actual flow cytometry tests performed for leukemia and lymphoma immunophenotyping. Efficiency gains from modifying specimen preparation protocols and workflow has helped to accommodate the increase in test volume.

Notable FY24 achievements in this section include:

- Validation and implementation of five new laboratory developed flow cytometry panels (Myeloid+T, Myeloid+B, Myeloid+P, Monocytic, and T-ALL) leading to increased specificity and consistency for identifying abnormal population in clinical samples.
- Planning and preparation for additional panel revisions and updates to include hairy cell leukemia, anti-CD19 therapy B-ALL MRD, and PNH
- Onboarded two new hematopathologists during FY24 (Drs. Annette Kim and Kamran Mirza).
- The hematopathology flow technologists were trained to perform and enter preliminary case reports for MLabs and in-house flow cases. This endeavor has decreased the amount of time spent by pathologists on report preparation when there is no trainee assigned to the flow cytometry/fluid service.

## Clinical Microbiology Section

The Clinical Microbiology Laboratory consists of multiple subspecialty areas (bacteriology, virology, mycology, mycobacteriology, parasitology, antimicrobial susceptibility, molecular microbiology, and the core microbiology laboratory). These clinical laboratory areas focus on identifying various pathogens to aid in the diagnosis and treatment of patients. The section was supported by three CP faculty providing medical direction during the past year: Drs. Michael Bachman, Paul Lephart, and Virginia Pierce.

In FY24, the Clinical Microbiology Laboratory performed 591,524 total billed tests compared to a total of 624,379 the previous year, representing a 5% decrease from the prior year. The decreased test volume is attributed to less COVID-19 testing performed by PCR for pre-admission screening and symptomatic patients. It should be noted the FY23 volume does show a 3.4% increase compared to pre-pandemic (FY19) levels.

During FY24, the Clinical Microbiology Laboratory successfully implemented the following:

- Completed transition of all viral load tests from Abbott m-2000s onto either Roche 6800 or Alinity (HBV, BKV, CMV, EBV).
- This includes the transition of three lab-developed assays to FDA-approved platforms (BKV, EBV, CMV).

- Implemented the Roche 6800 and Prime instruments for HPV, reducing the risk of repetitive motion injuries for staff and improving workflow efficiency by enabling direct specimen loading and aliquoting.
- Expanded our online non-conforming event (NCE) database to monitor, trend, and drive quality improvement. We have improved the database to allow graphing for quarterly quality reporting, and feedback to staff. This system was highlighted in a quality month poster and is serving as a template for databases in other sections of the department.
- Installed and performed instrument verifications of new HiQ Sensititre antimicrobial susceptibility analyzers (Go-live in 10/2024).
- Completed purchase and installation of next-generation MALDI-TOF instruments to replace current end-of-life instruments.
- Implemented congenital cytomegalovirus (CMV) testing, enabling rapid assessment and intervention in patients suspected of neonatal infection.
- Implemented Synapsis on Kiestra line for improved workflow of laboratory automation, improving traceability and hand-offs between staff working on the culture work-up of infections.
- Implemented General Lab Staff meetings to drive communications.
- Completed a successful internal CAP inspection.
- Alysia Welsh was hired as a new senior technologist for antimicrobial susceptibility testing and Jonathan Grant was promoted to Senior Technologist of the Core Microbiology Laboratory.
- Sunita Punjabi retired after 33 years of service in the Clinical Microbiology Laboratory.
- Through our employee engagement team, we secured a grant to support a lab outing (axe throwing) and Vitamin D lamps to provide simulated sunlight in parts of the lab that get little natural light.

In FY24, the clinical microbiology lab took advantage of the foundation of quality and clear operational structure established in 2023 to update technologies leading to maintenance and expansion of the test menu. This included the transition of multiple assays to updated platforms and the rollout of a new congenital CMV assay. In FY25, we will continue our forward progress by implementing next-generation MALDI-TOF instruments for bacterial and yeast identification and rolling out new molecular testing for women's health that enables patient collection.

## Histocompatibility Laboratory

**Matthew Cusick, PhD**
*Service Director*, Histocompatibility Laboratory

The Histocompatibility (HLA) Laboratory performs various clinical tests to assess donor-recipient compatibility and evaluate immunologic risks for solid organ and stem cell transplants. In addition, the laboratory performs disease association testing. Analytical methods employed include serologic techniques, flow cytometry, and molecular methods like next-generation sequencing. Ongoing projects focus on enhancing informatics systems to improve turnaround times, reduce costs, and create an interactive test result platform for healthcare providers, all while upholding the highest standards of quality and accreditation.

The clinical testing activity of the HLA laboratory over the past five years is shown:

| YEAR | FY20 | FY21 | FY22 | FY23 | FY24 |
|---|---|---|---|---|---|
| Disease Association | 1,961 | 1,739 | 923 | 1,638 | 1,946 |
| High Res.Typing | 1,469 | 1,477 | 838 | 5,952 | 6,647 |
| Low Res. Typing | 3,979 | 1,245 | 2,341 | 4,905 | 4,640 |
| Antibody Screening | 3,618 | 3,687 | 2,064 | 3,903 | 4,038 |
| Antibody Specificity | 9,801 | 10,801 | 6,900 | 13,167 | 14,530 |
| Flow Cross Match | 521 | 526 | 209 | 475 | 599 |
| **TOTAL** | **19,157** | **22,209** | **25,917** | **30,039** | **32,304** |

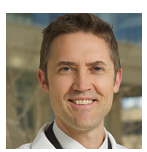
As part of its mission to support clinical transplantation, the HLA lab faculty and staff are available 24/7/365 to provide help

and consultation to the direct care providers deciding if and/or how to proceed with an organ or stem cell transplant. In the past year, Dr. Matthew Najor was onboarded as an associate director of the HLA lab. In addition to CAP accreditation, the HLA laboratory also maintains accreditation by the American Society for Histocompatibility and Immunogenetics (ASHI).

Notable highlights for FY24 include:

- Found a new supplier for transplant monthly mailers at a substantial cost reduction.
- Completed the discrete donor-specific antibody (DSA) project June 2024.
- Continued the duplicate order quality improvement project with improved success.
- Optimized the HLA Flow Crossmatch procedure to achieve greater sensitivity and more reliable results including the addition of a new cell counter to improve consistency.
- Utilized MiChart reports for transplant evaluation updates and post-transplant follow-ups to drastically reduce email correspondence.

The substantial efforts made by the HLA Manager, HLA Supervisor, and Director over the past few years have yielded the progress noted above in addition to the revenue growth shown in the graph below.



**Lee Schroeder, MD, PhD**
*Section Director*, Point of Care Testing

## Point-of-Care Testing Section

Point-of-Care Testing (POCT) is clinical laboratory testing performed at or near the patient's bedside by thousands of operators throughout Michigan Medicine in both the inpatient and ambulatory care settings. The operators include nursing and other non-traditional laboratory-trained personnel. Testing ranges from the simpler (waived) glucometer and urine pregnancy tests to more complicated (non-waived) blood gas and viscoelastic testing to assess coagulation status in places such as the operating rooms.

The POCT team, led by Dr. Lee Schroeder (Section Director) and Andrew Szczembara (Administrative Manager), supports clinical units with laboratory instruments, reagents, operator training, quality assurance, and regulatory guidance. Their mission is to improve patient health by providing access to safe and efficient laboratory testing at the point-of-care, through technology, service, and education.

A significant component of POCT services is the provision of training and quality assurance throughout the enterprise. In FY24, this consisted of:

- Training hundreds of operators to perform point-of-care testing in blitzes as well as targeted educational sessions to several groups: Nursing, Anesthesia, Radiology, Labor and Delivery, Survival Flight, ECMO, physician offices, ambulatory health centers, surgery, and procedure centers, Pinckney Student-Run Free Clinic and Regional Alliance of Healthy Schools program.
- Maintaining the glucometer program, which includes over 630 glucometers, over 14,000 operators, and 520,000 patient tests in FY24.
- Managing over twenty different test systems and over 900 instruments for point-of-care testing.
- Performing over 500 quality assurance rounds and troubleshooting visits at the various supported sites.

Additional notable initiatives for FY24 included the following:

- ROTEM Sigma platform go-live in August 2023.
- Launch of Gem Web Live which allows remote viewing of Blood Gas and ROTEM Sigma results in the ORs.
- Assisted Hematology to launch Gem Web Live for the Core Laboratory.
- Completed the Hemochron Signature Elite Interface for Activated Clotting Time in at all locations.
- Transitioned all Ambulatory Care i-Stat Creatinine testing in

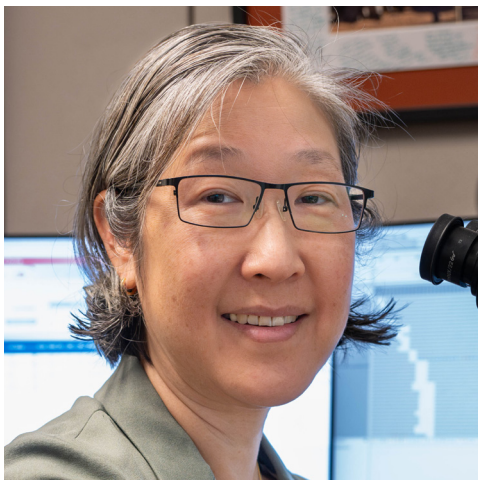
Radiology from a non-waived to waived collection method.

- Completed Verifications for the following tests: Abbott ID Now Flu, ROM Plus, i-Stat Chem8+, and iSCREEN Urine Test DX Drug Screen Square Cup.
- Rolled out a new POC Urine Drug Screen when previous method was discontinued.

A sampling of test volumes for some tests performed at the point-of-care is shown below.

| Test Name | FY22 | FY23 | FY24 |
|---|---|---|---|
| POC Glucose (Glucometer) | 530,749 | 514,891 | 520,057 |
| POC UA (Clinitek) | 52,852 | 56,644 | 54,305 |
| POC Blood Gas/Electrolytes | 36,580 | 39,132 | 40,569 |
| POC PT/INR | 25,381 | 21,327 | 25,199 |
| POC Hemoglobin A1C | 23,056 | 22,423 | 22,493 |
| POC Urine Pregnancy | 19,720 | 20,645 | 20,537 |
| POC Activated Clotting Time | 18,000 | 16,798 | 29,991 |
| POC Strep Antigen | 7,749 | 10,789 | 11,832 |
| PPM Urinalysis | 8,287 | 5,885 | 4,240 |
| ROTEM | 5,405 | 5,495 | 4,116 |
| POC Protime-INR | 2,196 | 3,495 | 3,429 |
| POC Urinalysis Manual | 3,630 | 2,387 | 4,950 |
| POC Sars-Cov-2/Flu/RSV | 3,498 | 3,201 | 2,373 |
| POC Specific Gravity | 3,097 | 2,889 | 3,027 |
| PPM Wet Preparation | 1,653 | 1,350 | 1,162 |
| POC Urine Drug Screen | 1,503 | 1,386 | 1,127 |
| POC Basic Metabolic Panel (i-Stat) | 1,456 | 1,643 | 1,862 |
| POC OR CBC | 1,469 | 1,553 | 1,841 |
| POC Creatinine (i-Stat) | 1,044 | 1,042 | 1,143 |

# Diagnostic Genetics & Genomics



**Annette Kim, MD, PhD**
*Director,* Diagnostic Genetics and Genomics (DGG)

**Bryan Betz, PhD**
*Director*, DGG Technical

Genetics and genomics are the sciences of analyzing biological markers in the genome, i.e., an individual's genetic code from the nucleotide to the chromosome and epigenome levels, to determine how cells express their genes as proteins and how genetic variation and mutation contributes to disease. Several specialized laboratory techniques are utilized in clinical genetic tests to diagnose and monitor disease, assess risk stratification, and help determine which therapies will work best for individual patients. The Division of Diagnostic Genetics and Genomics has made considerable strides in advancing the goal of coordinating the efforts of the various clinical laboratories performing molecular tests within the Department of Pathology. The administrative home of the Molecular Genetics Laboratory (MGL) was transitioned from the Department of Pediatrics to the Department of Pathology and Clinical Laboratories in November 2022, further facilitating integration of resources and alignment of overall strategy with Cytogenetics and Molecular Diagnostic laboratories (MDL).

**New Division Rebranding**

In July 2023, Dr. Annette S. Kim was hired as the new Division Director for Diagnostic Genetics and Genomics (DGG) to provide the vision necessary to enable technological advances and to define the strategic objectives for this increasingly important clinical and research area. The division held a retreat in October 2023 and rebranded officially as DGG, united under a single mission of bringing state-of-the-art molecular medicine to Michigan Medicine. The retreat was wildly successful with over 80 attendees, including pathology leadership, key pathology and interdepartmental stakeholders, DGG faculty, and laboratory professionals. Importantly, greater than 50% of attendees were staff from the lab. Out of this retreat arose a new structure of intradivisional staff-driven committees, including a social committee, a journal club that fulfills all CE requirements for the technical staff, a shadowing committee to encourage better intradivisional understanding of the different laboratories, and three harmonization committees to help find areas of synergy and to reduce redundancy between the laboratories.

Building Relationships: DGG has had a transformative year with the support of the entire department. DGG has continued to build relationships with our pathology colleagues by engaging them in the development of new assays. We have forged new/stronger ties with Michigan Center for Translational Pathology (MCTP) under Dr. Arul Chinnaiyan and his team, the Pediatric and Adult Genetics groups including their genetic counselors, the Chief Technology office under Tim Callahan, the Chief Information office under Andrew Rosenberg, the Precision Health and Michigan Genomics Initiatives (MGI), the Department of Computational Medicine & Bioinformatics, and the Rogel Cancer Center and the UMH Sparrow and West oncology groups. In addition, DGG has joined the Genomic Organization of Academic Laboratories (GOAL), providing critical networking and career opportunities as well as the benefits of group purchasing arrangements.

**Building the Team**

Dr. Kim has instituted all-staff meetings as well as other division-wide meetings and meets regularly with the staff team members over lunch to foster personal connections. In addition, DGG has defined new roles for Drs. Betz and Bell, recruited a new division operations director (Emily Schwedler), a new executive administrator (Brittney Williams), appointed Dr. Marcin Cieslik as a division director of bioinformatics (50% effort), and recruited Dr. Dan Hovelson as division director of informatics as well as three new faculty, Drs. Jaeseung Kim, Suguna Narayan, and Navin Mahadevan. DGG has also hired the part-time effort of three genetic counselors: Michele Jacobs, Colby Chase, and Addie Biel. The division was also approved for 4 incremental technical staff and 2.5 informatics staff based upon prior growth of the division.

In the interim, DGG has benefitted from the contracted work of Dr. Birgit Funke, a world leader in molecular constitutional disease, as well as of several informatics staff. This all comes while optimizing the quality assurance and improvement processes of the division.

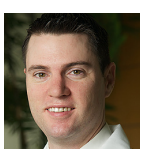
**Research and Education**
DGG has similarly transformed its contributions to the academic and educational missions of Michigan Medicine. In the last year, the division funded over $71K in research grants to its team members, all in collaboration with other pathology faculty, elevating the entire department in its molecular savvy. In addition, the educational experience of trainees in DGG has been updated to include a truly hands-on experience for all levels of learners with onboarding for important planned transitions of fellowship program directorships in FY25 and FY26.

## Molecular Diagnostics Laboratory

The Molecular Diagnostics Laboratory (MDL) performed 23,079 billed tests in FY24, which is a 13.0% increase over FY23 (20,458). Staffing for this part of the clinical laboratory operation remained stable in FY24. The following initiatives were completed in FY24:

- Myeloid NGS version 4 – updated with new gene content for broadened clinical applications.
- IGH-MYC Dual Fusion FISH – Critical for classification and treatment of large B-cell lymphoma as well as Burkitt lymphoma.
- Solid Tumor Fusion Panel – Detection of a broad range of diagnostic and targetable fusions critical for the diagnosis of many solid tumors.
- Neuropathology Methylation Array – Updated to provide the most current tumor classification.
- Introduction of a novel specimen type, combined cell-free and cellular DNA from fluids including cerebrospinal fluid, vitreous humor, and aqueous humor, for the diagnosis of B cell neoplasms from these paucicellular and challenging specimen types (methods published due to their innovation!).
- To minimize the bloat of tests for which MDL offers better replacements and/or for cost savings, the following assays were discontinued, and collaborative purchasing engaged:
  - KIT Mutation for AML – Exons 8, 17 and CEBPA Mutation were discontinued, and testing redirected to the more sensitive Myeloid NGS assay.
  - FGFR2 (10q26) Rearrangement by FISH was discontinued and testing redirected to the Solid Tumor NGS panel.
  - KIT Mutation – Exons 9, 11, 13, 17 and PDGFRA Mutation for GIST were discontinued and redirected to the more sensitive and broad coverage provided by the Solid Tumor NGS Panel


***Above Image:*** *Dr. Kim (left) showcasing the laboratory's equipment to David Miller and colleages.*



**Noah Brown, MD**
*Director*, Molecular Diagnostics Laboratory

**Lina Shao, PhD**
*Director*,Cytogenetics

for a cost avoidance of $4,620.00 in technologist time alone.

- Discontinuation of our BCR::ABL1 Kinase Mutation test which not only saved the cost of the sequencing assay, but also the cost of the Quantitative BCR::ABL1 required to first confirm presence of the fusion, for a total cost savings of $54,823.
- Discontinuation of the following reverse transcription PCR (RT-PCR) tests and redirection to our Comprehensive Solid Tumor Fusion Panel which provides a more comprehensive result for patients. Cost savings are from 1) $1,804.28 from unenrolling in the CAP SARCOMA survey and 2) $5,695.80 from the technologist time.
  - EWSR1/FL1 & EWSR1/ERG Translocations (Ewing Sarcoma) by PCR
  - SYT/SSX Translocation (Synovial Sarcoma) by PCR
  - PAX/FOX01 Translocation (Alveolar Rhabdomyosarcoma) by PCR
  - EWSR1/WT1 Translocation (Desmoplastic Small Round Blue Cell Tumor) by PCR
  - EWSR1/ATF1 Translocation (Clear Cell Sarcoma) by PCR
- Consolidation of ordering of Qiagen Tissue kits with MGL for a cost avoidance of $1,305.62

Projects in progress for FY25 (noteworthy examples of the ambitious goals below):

- Clinical DGG Oncoseq – Transitioning MCTP's MiOncoseq – a comprehensive genomic profiling (CGP) assay - performed by the MCTP to a clinically orderable assay in MDL, build for scale with full automation, updated methods and informatics, and the world's most sophisticated sequencing instrument, the NovaSeq X Plus. This assay will expand current testing volume by providing more advanced results and bring current send-out testing in-house.
- Evaluation of alternative, EDTA-based decalcification method for improved molecular and immunohistochemical testing.
- Validation of Oncomine Precision Assay, OPA, as an adjunct to DGG Oncoseq as a fully automated solid tumor panel optimized for very small tissue biopsies capable of delivering rapid turnaround times.
- Validation of automated extraction for DNA and RNA to replace the current manual process.

## Clinical Cytogenetics Laboratory

The Clinical Cytogenetics Laboratory performed 19,777 billed tests in FY24, which was a 22.0% increase in testing compared to FY23 (16,192). Laboratory staffing numbers remained stable in FY24. The Clinical Cytogenetics Laboratory continued to improve patient testing and workflow during the past year with the following points representing highlighted projects and initiatives:

- Successful internal CAP inspection with no citations.
- Implemented Rounding with staff and the highest internal staff engagement survey scores ever.
- Continuation and refinement of Education program for Medical Laboratory Scientist Interns that rotate through Michigan Medicine Clinical Laboratories. We are on our second year with our education program and more MLS inters are receiving education on the role Cytogenetics has on patient care.
- Incorporated the Dermpath Melanoma CMA into cytogenetics orderable. Changing the code has allowed us to streamline the ordering and reporting process.
- Received Platinum status on sustainability for Planet Blue.
- Maintained overtime level with no significant increase.
- Validation and go live with automated cell harvester (Hanabi).

Projects in progress for FY25:

- AneuVysion FISH panel for prenatal screening.
- Optical genome mapping which can detect both copy number

and structural abnormalities at very high resolution.

## Molecular Genetics Laboratory

The MGL performed 1,534 billed tests in FY24, similar to FY23 (1,580), and the laboratory was staffed at prior year levels. Clinical test development and service improvement were a major focus during the past year with the following notable accomplishments:

- Received Platinum status on sustainability for Planet Blue.
- PHOX2B Gene Sequencing - testing for a polyalanine repeat expansion in PHOX2B gene in patients with a phenotype consistent with congenital central hypoventilation syndrome or neuroblastoma with Hirschsprung disease.
- Illumina GDCMA Custom Reference Cluster File –improved the signal/noise ratio and save analysis time for GDCMA microarray.
- Newborn Screening (NBS) NGS panels (51 panels and single genes) –follow-up testing to confirm diagnosis in individuals with positive NBS results (performed at the State of Michigan Laboratory) or who have a phenotype consistent with the associated metabolic disease.
- Updated FMR1 methylation PCR using Asuragen AmplideX mPCR kit –provides more informative FMR1 (CGG repeat expansion premutation and full mutation) allele specific and semi-quantitative methylation status compared to the prior test.
- Saliva validated as a new sample type for Fragile X assay, Sanger sequencing, next generation sequencing, and chromosomal microarray.
- Initial operationalization of sending saliva kits to patient homes for all MM and MLabs patients. A pilot project is in progress with the Hereditary Breast and Ovarian Clinic (Q1 FY24) and the Pediatrics Genetics Clinic (Q3 FY24) which is helping to optimize the complex operational workflow. This will bring germline genetic testing back in-house, reducing tests sent to reference laboratories.
- Noonan Syndrome & RASopathies Expanded NGS panel (28 genes) – A comprehensive panel for detecting pathogenic variants in patients with a phenotype consistent with Noonan Syndrome and other related RASopathies. NGS data generation completed Q3 FY24. Validation report in progress.

Cost savings initiatives:

- Converted from the Illumina CytoSNP850K array to the GDAC array, resulted in a yearly saving of $68,875 for 551 arrays run in FY24.
- High-quality NGS sequencing data continued to reduce costs for verifying variants detected by NGS. The estimated saving is calculated to be $13,537 per year, by avoiding approximately 100 unnecessary Sanger sequencing.

Projects in process for FY25:

- Whole Genome Sequencing (WGS) – Transitioning to WGS will enable the lab to offer the most comprehensive sequencing and copy number variant detection for inherited and rare diseases while simultaneously decreasing test costs for gene panels and single gene assays. The projected range of savings is estimated at $238,000 to $375,213, depending on the final flow cell (25B vs 10B) chosen. Additionally, rapid WGS for Mott ICU patients could be performed in-house instead of being sent to reference laboratories; based on the FY24 MI Medicaid fee schedule and FY24 send-outs, which has the potential to generate a net revenue of $565,020.
- Long Range PCR (LR-PCR) - LR-PCR is being validated to assist in differentiating PMS2 variants from PMS2 pseudogene variants.
- Large volume automation of DNA isolation from saliva and cheek swab samples.
- Saliva kit validation is ongoing for SMA-MLPA, and MS-MLPA assays.

**Chen Yang, PhD**
*Director*, Molecular Genetics Lab

**Robert Bell, MD, PhD**
*Clincal Section Head*, Informatics

**Dan Hovelson, PhD**
*Director*, DGG Informatics

**Marcin Cieslik, PhD**
*Director*, DGG Bioinformatics

## DGG Informatics

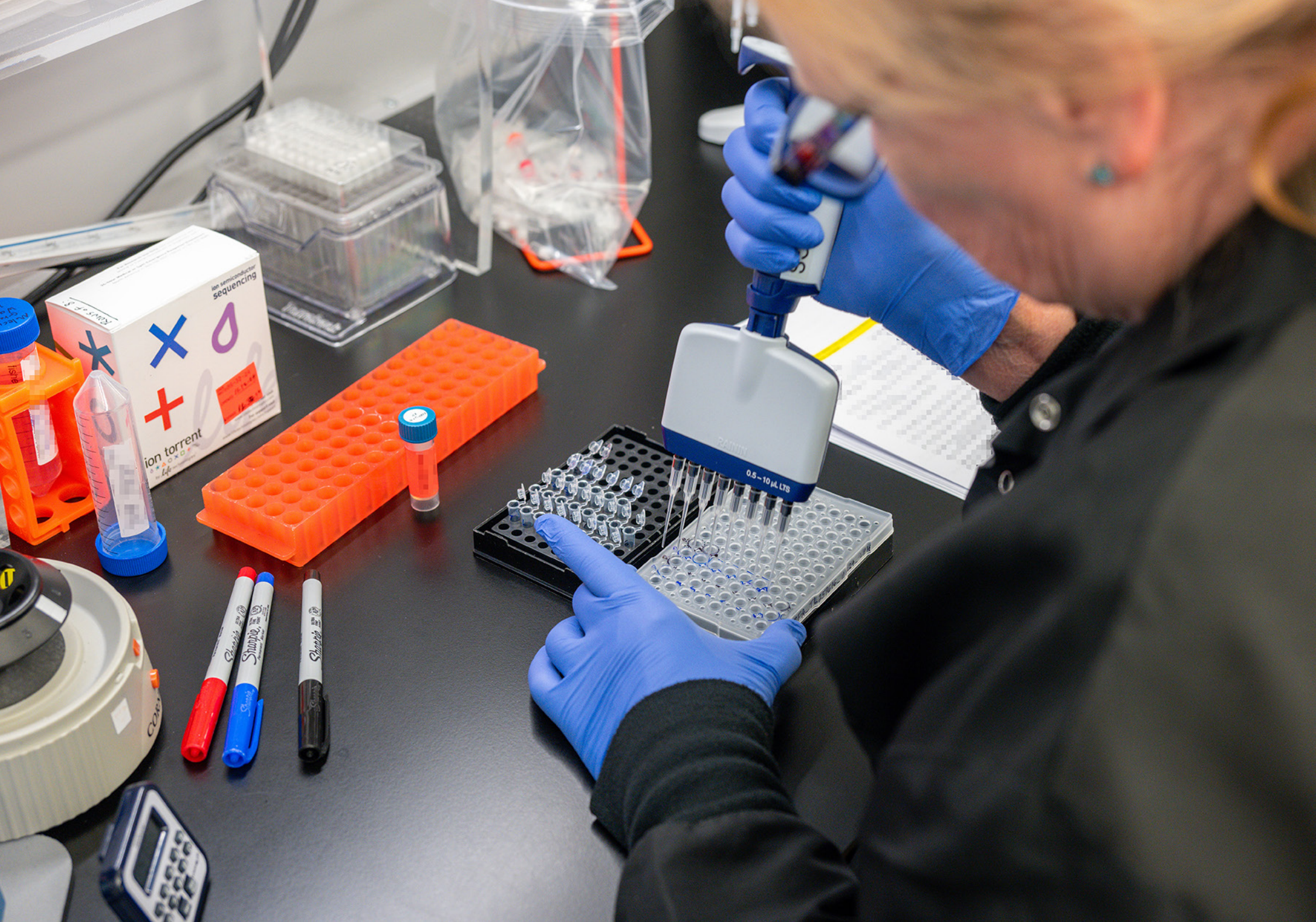
The Informatics group has expanded from 2 staff and one clinical lead with the addition of a director of informatics, a director of bioinformatics, a contractor, and the approval of 2.5 more full time positions and 3 contractors. This team supports the many informatics efforts of the entire division.

Although this group as an independent section is under development, there were key successes from FY24:

- Development of a new quality control and sex confirmation analysis for the neuropathology methylation array.
- Two informatic verifications for updates to the myeloid NGS assay.
- Informatic validation of the solid tumor fusion assay.
- Complete modernization of the informatic pipeline for the next generation sequencing assay for MGL and various tools for the technologists and faculty.
- Successful transition of infrastructure hosting DGG's solid tumor informatics pipeline from Red Hat Enterprise Linux 7 to Red Hat Enterprise Linux 8.

Projects in progress for FY25:

- Complete modernization and refitting of the Oncomine Focus Assay pipeline for the Oncomine Precision assay.
- Adaption of the Turnkey Precision Oncology pipeline (developed by Dr. Marcin Cieslik) for the DGG OncoSeq assay, including new modules for determination of tumor mutational burden and mismatch repair status.
- Updates to the chromosomal microarray tools used by Cytogenetics.
- Collaboration with HITS and the CTO office to pioneer utilization of Michigan Medicine's emerging cloud ecosystem for safe compute and storage of genomic clinical data.
- Development of a database schema to create a relational database for all forms of genetic and genomic data.
- Development of informatic solution for results visualization and clinical report generation.
- Development of a sample tracking/handling system.
- Support for the optical genome mapping validation.
- Development of traceable and versioned documentation for all informatic processes in the division.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# Michigan Center for Translational Pathology

**Arul M. Chinnaiyan, MD, PhD**
*Director,* Michigan Center for Translational Pathology

The Michigan Center for Translational Pathology (MCTP) has been at the forefront of precision oncology and cancer biology, advancing innovative approaches to diagnosing and treating cancer. In precision oncology, the development of the MyProstateScore 2.0 (MPS2), a non-invasive urine test for high-grade prostate cancer, exemplifies MCTP's impact, combining 18-gene panel testing with TMPRSS2-ERG gene fusion specificity to reduce unnecessary biopsies. Complementary research on prostate cancer screening advocates integrating advanced diagnostics like multiparametric MRI to mitigate overdiagnosis. Studies on metastatic castration-resistant prostate cancer (mCRPC) elucidate immune checkpoint blockade outcomes and highlight therapies combining abiraterone and olaparib for DNA repair-deficient tumors, further enhancing treatment precision.

In cancer biology, MCTP researchers have identified novel vulnerabilities and therapeutic targets in aggressive cancers. Innovations include orally bioavailable degraders targeting CDK12/13 and mSWI/SNF ATPases, underscoring synthetic lethality and transcriptional regulation in tumor progression. The identification of immune evasion mechanisms, such as the UBA1-STUB1 axis and progestogen-driven B7-H4 expression, has expanded therapeutic avenues in immuno-oncology. Additional studies on lipid metabolism and chromatin remodeling complexes emphasize MCTP's commitment to translating molecular insights into clinical solutions. The Center's robust grant funding, including renewals of prominent awards and support for novel research, highlights its sustained leadership in cancer research.

## Precision Oncology

**Development and Validation of an 18-Gene Urine Test for High-Grade Prostate Cancer.**
Tosoian JJ, Zhang Y, Xiao L, ... , Chinnaiyan AM; EDRN-PCA3 Study Group. *JAMA Oncology* 2024 Jun 1;10(6):726-736. PMCID: PMC11190811.

Leveraging the specificity of the TMPRSS2-ERG gene fusions for prostate cancer, we developed an 18-gene urine test called MyProstateScore 2.0 (MPS2) for the non-invasive detection of aggressive prostate cancer. This test, which is specific for high-grade PCa (grade group ≥2), demonstrated 95% sensitivity with up to 99% negative predictive value and has the potential to reduce unnecessary biopsies. MPS2 was introduced in a CLIA/CAP lab setting and made available to patients in 2023.

**A Pragmatic Approach to Prostate Cancer Screening.**
Tosoian JJ, Penson DF, Chinnaiyan AM. *JAMA* 2024 PMID: 38581253.

In our 2024 *JAMA* editorial, Drs. Tosoian, Penson, and Chinnaiyan discuss the evolution of prostate cancer screening, highlighting the initial success of prostate-specific antigen (PSA) testing in reducing metastasis and mortality rates. However, we note that this approach led to significant drawbacks, including overdiagnosis and overtreatment of low-grade, clinically insignificant cancers, resulting in unnecessary biopsies and diminished quality of life for patients. We advocate for a more pragmatic screening strategy that incorporates advanced diagnostic tools, such as multiparametric magnetic resonance imaging (MRI) and biomarker panels, to enhance specificity and minimize the detection of indolent cancers. We emphasize the importance of shared decision-making between clinicians and patients to balance the benefits and harms of screening, aiming to improve patient outcomes and reduce unnecessary interventions.

**Integrative multi-region molecular profiling of primary prostate cancer in men with synchronous lymph node metastasis.**

Singhal U, Nallandhighal S, ..., Chinnaiyan AM, Tomlins SA, Briganti A, Palapattu GS, Udager AM, Salami SS. *Nature Communications* 2024 May 21;15(1):4341. PMCID: PMC11109137.

In this study, Singhal et al. conducted integrative multi-region molecular profiling of primary prostate cancer and synchronous lymph node (LN) metastases to identify the primary tumor foci most likely to spread. Analyzing 14 patients, they found that in cases with extraprostatic extension (EPE), the EPE regions often matched the LN metastases' molecular profiles, suggesting these areas as the metastasis source. In organ-confined disease, high-grade tumor foci were linked to LN metastasis. Shared oncogenic alterations, such as gene fusions and somatic mutations, were present in both primary tumors and LN metastases. The study highlights that specific histopathologic and molecular features, including tumor grade, EPE, cellular morphology, and genomic alterations, are associated with synchronous LN metastasis, underscoring the importance of these factors in understanding prostate cancer progression.

**Evaluating Immune Checkpoint Blockade in Metastatic Castration-Resistant Prostate Cancers with Deleterious CDK12 Alterations in the Phase 2 IMPACT Trial.**
Nguyen CB, Reimers MA, ..., Chinnaiyan AM, Alva AS. *Clin Cancer Res.* 2024 Aug 1;30(15):3200-3210. PMCID: PMC11293970.

The Phase 2 IMPACT trial evaluated the efficacy of immune checkpoint inhibitors in patients with metastatic castration-resistant prostate cancer (mCRPC) harboring deleterious CDK12 alterations. In cohort A, 23 patients received a combination of ipilimumab and nivolumab, resulting in a 9% PSA50 response rate, with two responders lacking high tumor mutational burden or microsatellite instability. Cohort C, comprising 14 patients treated with nivolumab alone, showed no PSA50 responses. The study concluded that immune checkpoint blockade demonstrated minimal activity in this patient population.

**Abiraterone, Olaparib, or Abiraterone + Olaparib in First- line Metastatic Castration-Resistant Prostate Cancer with DNA Repair Defects (BRCAAway)**
Hussain M, Kocherginsky M, ..., Chinnaiyan AM, Antonarakis ES. *Clin Cancer Res.* 2024 Aug 8. PMID: 39115414.

The BRCAAway trial, a randomized phase 2 study, evaluated the efficacy of abiraterone, olaparib, and their combination in men with metastatic castration-resistant prostate cancer (mCRPC) harboring BRCA1, BRCA2, or ATM mutations. The combination therapy significantly extended progression-free survival compared to either agent alone or sequentially. These findings suggest that upfront combination therapy may offer superior outcomes for this patient population.

## Cancer Biology and Therapeutics

**Targeting the mSWI/SNF complex in POU2F-POU2AF transcription factor-driven malignancies.**
He T, Xiao L, Qiao Y, ..., Vakoc CR, Chinnaiyan AM. *Cancer Cell.* 2024 Aug 12;42(8) PMID: 39029462.

In this study, He et al. investigated the dependency of certain cancers on the mammalian SWI/SNF (mSWI/SNF) chromatin remodeling complex, particularly focusing on malignancies driven by the POU2F3-POU2AF2/3 transcription factor complex, such as the POU2F3 subtype of small cell lung cancer (SCLC-P). We discovered that SCLC-P cell lines are highly sensitive to the degradation of mSWI/SNF ATPase components. The researchers developed an orally bioavailable proteolysis targeting chimera (PROTAC) degrader, AU-24118, which effectively reduced tumor growth in preclinical models of SCLC-P without significantly affecting normal tuft cells or causing notable toxicity in mice. Additionally, B cell malignancies dependent on the POU2AF1 cofactor also showed remarkable sensitivity to mSWI/SNF ATPase degradation. These findings suggest that targeting the mSWI/SNF complex could be a promising therapeutic strategy for cancers driven by POU2F-POU2AF transcription factors.

**NSD2 is a requisite subunit of the AR/FOXA1 neo-enhanceosome in promoting prostate tumorigenesis.**
Parolia A, Eyunni S, ... , Chinnaiyan AM*, Asangani IA. *Nature Genetics*. 2024 Sep 9.: 39251788. PMCID: PMC11525188.*corresponding author

**Discovery of LLC0424 as a Potent and Selective in Vivo NSD2 PROTAC Degrader**

Liu L, Parolia A, ...Chinnaiyan AM*, Ding K*. *J Med Chem*. 2024 May 9;67(9; PMCID: PMC11094793. *corresponding authors.

In the first study, Parolia et al. identified Nuclear Receptor Binding SET Domain Protein 2 (NSD2) as a critical component of the androgen receptor (AR) and Forkhead Box A1 (FOXA1) neo-enhanceosome complex, which is essential for prostate cancer development. NSD2 expression is abnormally elevated in prostate cancer cells, and its inhibition disrupts over 65% of AR's binding sites on chromatin, leading to reduced AR transactivation potential. We also developed a dual NSD1/2 PROTAC degrader, LLC0150, which selectively induced cell death in AR-dependent prostate cancer models, suggesting that targeting NSD2 and its paralog NSD1 could be an effective therapeutic strategy for advanced prostate cancer. The second study referenced above describes the development of NSD2 PROTAC degraders.

**Targeting the lipid kinase PIKfyve upregulates surface expression of MHC class I to augment cancer immunotherapy**
Bao Y, Qiao Y, ..., Zou W, Chinnaiyan AM. *Proc Natl Acad Sci USA*. 2023 Dec 5;120(49); PMCID: PMC10710078.

In this study, Bao et al. investigated the role of the lipid kinase PIKfyve in cancer immunotherapy resistance. We found that inhibiting PIKfyve, either genetically or pharmacologically, increased the surface expression of major histocompatibility complex class I (MHC-I) molecules on cancer cells by disrupting autophagic flux. This upregulation enhanced the ability of CD8+ T cells to recognize and kill tumor cells. In multiple mouse models, PIKfyve inhibition led to slower tumor growth and improved responses to various immunotherapies, including immune checkpoint blockade, adoptive cell therapy, and therapeutic vaccines. Additionally, high PIKfyve expression was associated with poor outcomes in patients undergoing immunotherapy, suggesting that targeting PIKfyve could enhance the effectiveness of cancer immunotherapies.

**Progestogen-driven B7-H4 contributes to onco-fetal immune tolerance.**
Yu J, Yan Y, Li S, Xu Y, Parolia A, ... , Cho KR, Chinnaiyan AM, Schon S, Wen F, Kryczek I, Wang S, Chen L, Zou W. *Cell.* 2024 Aug 22;187(17); PMCID: PMC11344674.

In this study, Yu et al. investigated the role of the immune checkpoint protein B7-H4 in mediating immune tolerance during pregnancy and its implications in cancer. We found that progestogens, hormones critical for pregnancy maintenance, induce B7-H4 expression in placental trophoblasts, which suppresses maternal CD8+ T cell activity, thereby protecting the fetus from immune rejection. Notably, this progestogen-driven B7-H4 expression was also observed in various cancers, where it contributed to immune evasion by inhibiting anti-tumor T cell responses. The study suggests that targeting B7-H4 could enhance the effectiveness of immunotherapies in cancers exhibiting high B7-H4 expression.

**PIKfyve, expressed by CD11c-positive cells, controls tumor immunity.**
Choi JE, Qiao Y, ..., Zou W, Chinnaiyan AM. *Nature Communications* 2024 Jun 28;15(1):5487. PMCID: PMC11213953.

In this study, Choi et al. investigated the role of the lipid kinase PIKfyve in tumor immunity, focusing on its expression in CD11c-positive cells, predominantly dendritic cells (DCs). We found that high PIKfyve expression in DCs was associated with poor patient responses to immune checkpoint blockade (ICB) therapy. Genetic deletion or pharmacological inhibition of PIKfyve enhanced DC function by selectively altering the non-canonical NF-□B pathway, leading to restrained tumor growth, improved DC-dependent T cell immunity, and increased efficacy of ICB in tumor-bearing mouse models. Additionally, combining a vaccine adjuvant with the PIKfyve inhibitor apilimod further reduced tumor progression in vivo, suggesting that PIKfyve inhibition could be a promising strategy for cancer immunotherapy and vaccine treatments.

**Targeting PIKfyve-driven lipid homeostasis as a metabolic vulnerability in pancreatic cancer.**
Cheng C, ... , Qiao Y, Lyssiotis CA, Chinnaiyan AM. *bioRxiv* [Preprint]. 2024 Mar 20; PMCID: PMC10983929.

In this study, Cheng et al. identified PIKfyve, a lipid kinase essential for lysosomal function, as a critical factor in pancreatic ductal adenocarcinoma (PDAC) progression. We observed that PIKfyve is overexpressed in PDAC cells compared to adjacent

normal cells. Using a genetically engineered mouse model, we demonstrated that PIKfyve is necessary for PDAC development. Inhibiting PIKfyve disrupted autophagic flux and compelled PDAC cells to upregulate de novo lipid synthesis, creating a dependency on this metabolic pathway. The study also revealed that the KRAS-MAPK signaling pathway drives de novo lipid synthesis by enhancing the expression of genes such as FASN and ACACA. Combining PIKfyve inhibition with KRAS-MAPK pathway inhibitors resulted in significant tumor regression in both syngeneic orthotopic and xenograft PDAC models. These findings suggest that targeting PIKfyve, alongside KRAS-MAPK-directed therapies, could be a promising strategy for treating PDAC.

**p300/CBP degradation is required to disable the active AR enhanceosome in prostate cancer.**
Luo J, … , Wang S, Parolia A, Chinnaiyan AM. *bioRxiv* [Preprint]. 2024 Mar 30; PMCID: PMC10996709.

**Discovery of CBPD-409 as a Highly Potent, Selective, and Orally Efficacious CBP/p300 PROTAC Degrader for the Treatment of Advanced Prostate Cancer.**
Chen Z, …, Chinnaiyan AM, Wang S. *J Med Chem*. 2024 Apr 11; PMID: 38530938.

In the first study, Luo et al. investigated the role of the lysine acetyltransferases p300 and CBP in maintaining the active androgen receptor (AR) enhanceosome in prostate cancer. We found that p300/CBP-mediated histone H2B N-terminal acetylation (H2BNTac) marks active enhancers and is significantly elevated in prostate cancer tissues compared to adjacent benign epithelia. Degradation of p300/CBP using a novel, orally active proteolysis targeting chimera (PROTAC) degrader, CBPD-409 (described in the second publication listed above), effectively abrogated H2BNTac, leading to a stronger suppression of oncogenic gene programs than bromodomain inhibition alone. In preclinical models of castration-resistant prostate cancer, p300/CBP degradation with CBPD-409 significantly inhibited tumor growth and showed synergistic effects when combined with AR antagonists, suggesting that targeting p300/CBP could be a promising therapeutic strategy for advanced prostate cancer.

**Development of an orally bioavailable mSWI/SNF ATPase degrader and acquired mechanisms of resistance in prostate cancer.**
He T, Cheng C, Qiao Y, …, Parolia A, Xiao L, Chinnaiyan AM. *Proc Natl Acad Sci USA*. 2024 Apr 9; PMCID: PMC11009648.

He *et al.* developed an orally bioavailable PROTAC degrader targeting the mSWI/SNF ATPase, a key component of the chromatin remodeling complex, which is crucial for prostate cancer progression. The degrader demonstrated significant efficacy in preclinical models, reducing tumor growth and disrupting critical oncogenic transcriptional programs dependent on the mSWI/SNF complex. However, the study also identified mechanisms of acquired resistance to the degrader, including compensatory upregulation of parallel chromatin remodelers and mutations in the target ATPase. These findings not only highlight the therapeutic potential of targeting mSWI/SNF ATPases in prostate cancer but also emphasize the importance of addressing resistance mechanisms to improve treatment durability.

**Circular RNA in cancer.**
Conn VM, Chinnaiyan AM, Conn SJ. *Nature Reviews Cancer.* 2024 Sep;24(9):597-613. PMID: 39075222.

In our comprehensive review, Conn, Chinnaiyan, and Conn explore the multifaceted roles of circular RNAs (circRNAs) in cancer biology. We discuss how circRNAs, characterized by their covalently closed loop structures, contribute to tumorigenesis through various mechanisms, including acting as microRNA sponges, interacting with RNA-binding proteins, and modulating gene transcription. We also highlight the potential of circRNAs as diagnostic biomarkers and therapeutic targets, given their stability and abundance in bodily fluids. Additionally, the review addresses the challenges in circRNA research, such as the need for standardized nomenclature and functional validation and emphasizes the importance of advanced sequencing technologies and bioinformatics tools in overcoming these obstacles. Overall, the article provides valuable insights into the emerging significance of circRNAs in cancer and underscores the necessity

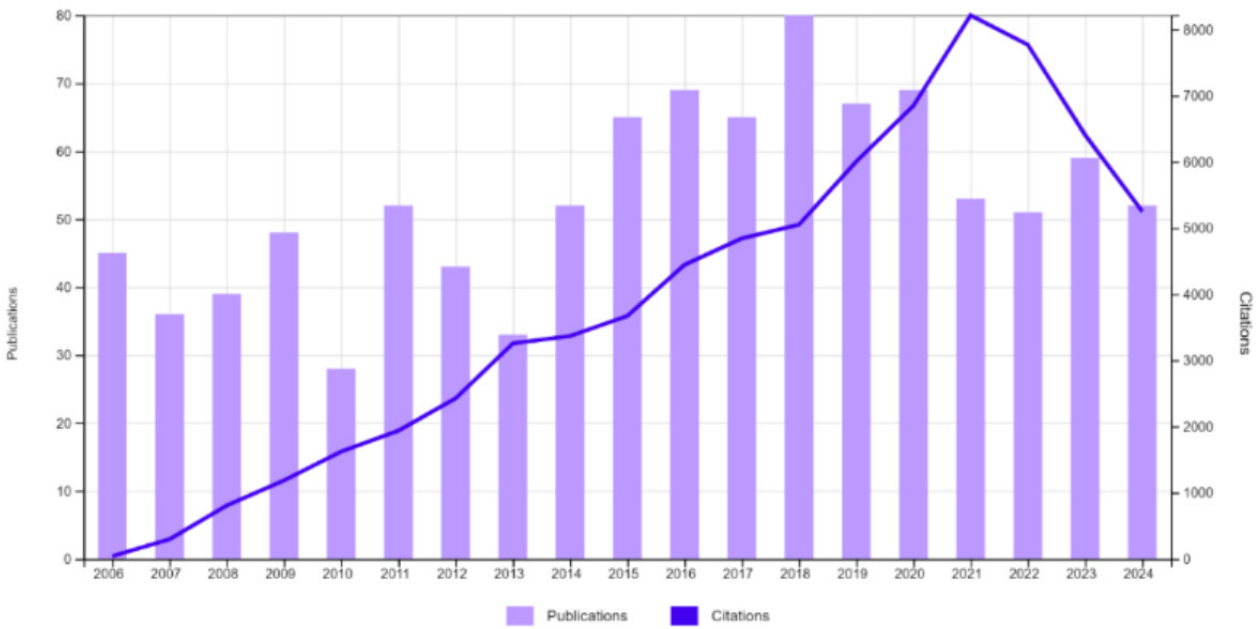



***Chart:*** *Publications by year and Web of Science© citation report.*

for further studies to fully elucidate their functions and clinical applications.

**Development of an orally bioavailable CDK12/13 degrader and induction of synthetic lethality with AKT pathway inhibition**. Chang Y, Wang X, ... , Mehra R, Ding K, Chinnaiyan AM. *Cell Reports Medicine* 2024 Sep 21:101752. PMID: 39353441. PMCID: PMC11513842.

**CDK12 Loss Drives Prostate Cancer Progression, Transcription-Replication Conflicts, and Synthetic Lethality with Paralog CDK13.**
Tien J, Luo J, Chang Y, ..., Parolia A, Ding K, Chinnaiyan AM. *Cell Reports Medicine* 2024 Oct 15. PMID: 39368479 PMCID: PMC11513839.

In these studies, Chang et al. and Tien et al. explore the critical roles of cyclin-dependent kinases CDK12 and CDK13 in cancer progression and therapeutic targeting. Chang et al. report the development of an orally bioavailable degrader for CDK12/13, demonstrating its effectiveness in suppressing tumor growth and uncovering a synthetic lethality interaction with AKT pathway inhibition. Tien et al. focus on the consequences of CDK12 loss in prostate cancer, showing that it drives disease progression through transcription-replication conflicts and creates vulnerabilities that can be exploited through targeting the paralog CDK13. Together, these studies highlight the therapeutic potential of CDK12/13 targeting strategies, particularly in cancers with specific genetic alterations, and provide a framework for combination therapies to enhance treatment efficacy.

**The UBA1-STUB1 axis mediates cancer immune escape and resistance to checkpoint blockade.**
Bao Y, Cruz G, Zhang YP, Qiao Y, Mannan R, ..., Zou WP, Chinnaiyan AM. *Cancer Discovery*. 2024 Nov 14. doi: 10.1158/2159-8290.CD-24-0435. Online ahead of print. PMID: 39540840.

In this study, Bao et al. identified the ubiquitin-activating enzyme UBA1 as a key mediator of cancer immune evasion and resistance to immune checkpoint blockade (ICB) therapies. Through screening genes frequently amplified in cancers, they found that high UBA1 expression inversely correlated with effector CD8+ T-cell activity within tumors. Functional assays demonstrated that UBA1 promotes tumor growth by facilitating immune escape, as its overexpression reduced intratumoral CD8+ T-cell infiltration, while its depletion had the opposite effect. Mechanistically, UBA1, in conjunction with the E3 ubiquitin ligase STUB1, was shown to degrade JAK1, a critical component of the interferon signaling pathway, thereby diminishing the expression of immune-stimulatory molecules such as CXCL9, CXCL10, and MHC class I. Importantly, pharmacological inhibition of UBA1 using the selective inhibitor TAK-243 synergized with ICB therapies in multiple mouse models, leading to enhanced anti-tumor immune responses and tumor regression. These findings suggest that targeting the UBA1-STUB1 axis could potentiate the efficacy of immunotherapies by reversing tumor-mediated immune suppression

## Key Highlights in Grants/Awards

**Renewal of the Chinnaiyan HHMI Award**

- *Howard Hughes Medical Institute (HHMI)*
  02/01/08 – 08/31/32
- *Role:* Investigator

Dr. Chinnaiyan renewed his Howard Hughes Medical Institute (HHMI) Investigator award. These funds are not awarded to a specific research proposal or project but provide support to Dr. Chinnaiyan.

**Re-submission of NCI Prostate SPORE Renewal**

- *GRANT14257677 (PI: Chinnaiyan/Palapattu)*
  09/2025-08/2030
- *NIH/NCI*
  $7,600,000 direct costs / $4,214,000 indirect costs
- *Status:* Pending
- *Title:* Michigan Prostate SPORE 2025-2030

*Major Goals:* 1) Support multidisciplinary, collaborative projects that pair basic and clinical investigators and draw on expertise of scientists from within and outside the prostate cancer field. 2) Provide support for pilot projects with high potential to advance prostate cancer research to obtain preliminary data that will form the basis for grant submissions to extramural sponsors. 3) Recruit and train early-stage scientists to become the next generation of leaders in translational prostate cancer research through access to mentors that are renowned senior investigators and leaders in basic and clinical arenas, as well as networking opportunities among other project Co-Leaders. 4)Provide world-class infrastructure to carry out innovative, high-impact translational prostate cancer research. 5) Support efforts to develop bench-to-bedside discoveries for clinical diagnostics and therapeutics. 6) Foster collaborations among investigators within the institution and with other institutional SPORES or extramural prostate cancer programs.

**Submission of Chinnaiyan R35 Award Renewal**

- GRANT14290814 (PI: Chinnaiyan)
  09/2025-08/2032
- Status: Pending
  $4,200,000 direct costs / $2,289,224 indirect costs
- Title: Targeting Transcription Factor Neo-Enhanceosomes in Cancer

*Major Goals:* This project aims to functionally characterize and therapeutically target oncogenic transcription factor neo-enhanceosomes. While multiple advanced cancers will be explored, prostate cancer will serve as an exemplary tumor type due to its high prevalence of truncal transcription factor alterations. Both direct and indirect approaches to targeting these neo-enhanceosomes will be investigated.

**Continuation of the Michigan-Vanderbilt EDRN Grant**

- *U2C CA271854 (MPIs: Chinnaiyan; Tosoian)*
  08/15/2022-07/31/2027
- *Status:* Active
  $1,787,691 direct costs / $737,052 indirect costs
- *Title:* Michigan-VUMC Biomarker Characterization Center

*Major Goal(s):* Selectively identify those patients with potentially lethal prostate cancers that stand to benefit from early definitive treatment, while preventing unnecessary testing, overdiagnosis, and subsequent overtreatment in the remaining population.

**Chinnaiyan, Wang, Vaishampayan, Parolia PCF Challenge Award**

- *23CHAL10 (MPIs: Chinnaiyan, Wang, Vaishampayan, Parolia)*
  11/27/2023 – 11/26/2025
- *Prostate Cancer Foundation*
  $1,000,000 direct costs
- *Title:* Development of a CBP/p300 degrader for the treatment of castration-resistant prostate cancer

*Goal(s):* Aim 1: Delineate changes in the chromatin state, transcription factor cistromes, and transcriptome that drive the mechanism of action of CBPD-409 (a CBP/p300 degrader) in androgen receptor-positive prostate cancer cells. Aim 2:

Determine the efficacy of CBPD-409 alone and in combination with enzalutamide in preclinical models of castration-resistant prostate cancer (CRPC). Aim 3: Elucidate biomarkers of response to CBPD-409 in a phase 1/2 clinical trial in metastatic CRPC patients.

**Pitchiaya R35 MIRA Award**

- *1R35GM155432-01 (PI: Pitchiaya)*
  06/25/2024 – 05/31/2029
- *NIH/NIGMS*
  $1,250,000 direct costs / $620,250 indirect costs
- *Status:* Active
- *Title:* Dissecting mechanisms of transcriptional regulation during stress

*Goal(s):* We aim to study two emerging mechanisms of cellular stress response, namely stress-induced transcription factor condensates and stress-associated readthrough transcription. We seek to understand molecular mechanisms driving these processes and identify their impact on fundamental cell fate decisions – to die, live, or thrive - during environmental stress. To this end, we will be using contemporary imaging and omics tools, including single-molecule imaging, nascent RNA sequencing, epigenomics, and spatial omics. Aligning with the mission of the NIGMS, our work has broad implications in understanding the basis of organismal resilience, how misappropriation of these programs induce cancer cell fitness, and how dampening of these programs lead to degenerative diseases, paving the way for unraveling new disease mechanisms, diagnostics, and therapeutics for a range of stress-associated pathologies.

**Parolia V Scholar Award**

- V2024-020 (PI: Parolia)
  10/01/2024 – 10/01/2027
- The V Foundation for Cancer Research
  $600,000 direct costs
- Status: Active
- Title: Co-targeting NSD1/2 paralogs in AR-driven metastatic castration-resistant prostate cancer

*Goal(s):* The objective of our proposal is to understand NSD2 function as an essential AR coactivator in advanced lethal prostate cancer and preclinically evaluate the safety and efficacy of NSD1/2 inhibitory drugs.

**Prensner V Scholar Award**

- *V2024-013 (PI: Prensner)*
  09/15/2024 – 09/15/2027
- *The V Foundation for Cancer Research*
  $600,000 direct costs
- *Status:* Active
- *Title:* Upstream open reading frames as unique cancer targets in childhood medulloblastoma

*Goal(s):* This project aims to develop therapeutic and biomarker strategies for ASNSD1-uORF in medulloblastoma and to map the molecular basis of uORF function in pediatric medulloblastoma.

**Cieslik-Chinnaiyan DOD Rare Cancers Award**

- *RA230317 (PIs: Cieslik, Chinnaiyan)*
  11/2024 – 10/2027
- *Department of Defense*
  $800,000 direct costs / $448,000 indirect costs
- *Status:* Active
- *Title:* Rare-Cancer Commons: a hub for accelerating individualized rare cancer therapy through integration of single-cell and clinical genomics data

*Goal(s):* Develop the Rare Cancer Commons, a resource and community hub to accelerate rare cancer research.

**Chinnaiyan Trailsend Clinical Development Award**

- *(MPIs: Chinnaiyan, Xiao, Qiao)*
  01/15/2024 – 01/14/2027
- *J.C. Kennedy Foundation*
  $4,166,667 direct costs / $833,333 indirect costs

- *Status:* Active
- *Title:* Trailsend Clinical Development of a SWI/SNF Degrader for the Treatment of Advanced Cancers

*Goal(s):* This project will allow U-M to work closely with Aurigene Oncology to develop a lead SWI/SNF degrader compound with the goal of advancing this drug into human clinical trials.

**Robinson R50 Award**

- *R50CA293826 (PI: Robinson)*
  09/03/2024 – 08/31/2029
- *NIH/NCI*
  $102,438 direct costs / $57,365 indirect costs
- *Status:* Active
  *Out year(s) funding dependent on Unit Director's NCI awards
- *Title:* Integrative Multi-omics and Clinical Laboratory Translation for Advanced, Rare, and Pediatric Cancers

*Goal(s):* The project aims to incorporate emerging technologies in genomics, transcriptomics, epigenomics and proteomics for the analyses of advanced, rare, and pediatric cancers. The project has an additional emphasis on translating the results from these new approaches into clinically actionable information through the development of reportable test results in a CLIA clinical testing lab.

**Iyer NCI ESSP Award**

- *3P30CA046592-35S1 (PI: Iyer)*
  06/01/2024-05/31/2027
- *NIH/NCI*
  $375,000 direct costs / $210,000 indirect costs
- *Status:* Active
- *Title:* Early-stage Surgeon Scientist Program (ESSP): Discovery of circulating tumor RNA biomarkers for pancreatic cancer detection and monitoring

*Goal(s):* Early detection of PDAC maximizes the chances at disease eradication through surgery and chemotherapy and is the sole path to long-term survival. Thus, a sensitive PDAC blood test (liquid biopsy) would revolutionize our capacity to prolong the survival and quality of life of our patients. Liquid biopsy based on circulating tumor DNA (ctDNA), which has garnered much attention and proven useful for some cancer types, lacks the sensitivity needed to become clinically relevant for early detection of PDAC. Here, we propose an alternative strategy based on circulating tumor RNA (ctRNA) that offers inherent advantages.

**Chinnaiyan - Xiao Myeloma Solutions Fund Award**

- *MSF-008 (PI: Chinnaiyan/Xiao)*
  07/22/2024 - 07/21/2026
- *Myeloma Solutions Fund*
  $1,035,010 direct costs / $114,990 indirect costs
- *Status:* Active
- *Title:* Targeting SWI/SNF in t(4;14) multiple myeloma

*Goals(s):* We propose to determine if targeting SWI/SNF is a translatable target in multiple myeloma, with a specific focus on t(4;14).

## Clinical/Translational Activities

**MI-ONCOSEQ Lab**

To exploit the rapid advances in high-throughput Next Generation Sequencing (NGS) technologies to realize the goals of "precision cancer medicine," we established the Michigan Oncology Sequencing Program (MI-ONCOSEQ) in 2011 (Roychowdhury et al., 2012). An "integrative sequencing approach" carried out in a CLIA-certified laboratory (#23D0366712) is utilized to provide a comprehensive landscape of the genetic alterations in individual tumor specimens for the purpose of identifying informative and/or actionable aberrations. This approach enables the detection of point mutations, insertions/deletions, gene fusions and rearrangements, amplifications/deletions, and outlier expressed genes. Furthermore, we can identify certain germline alterations that may also be relevant. We continue to develop

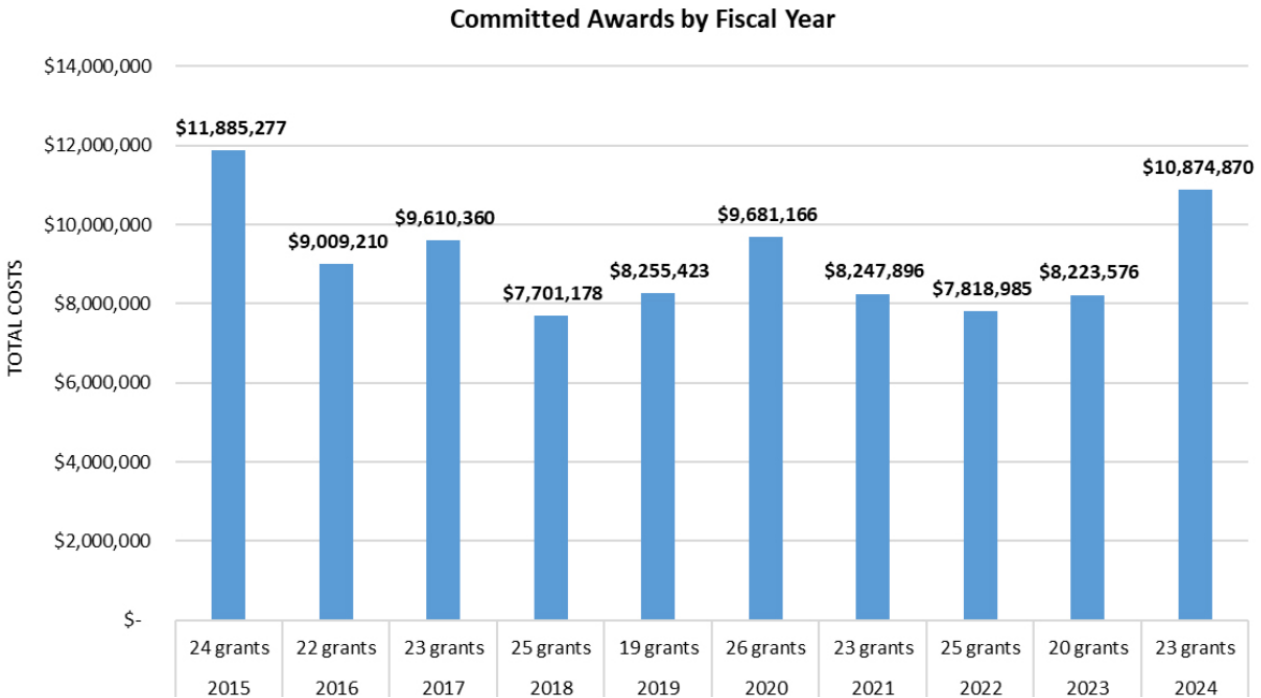



***Chart:*** *The graph above shows the total costs for grants awarded to the Center by year, with 2024 reaching similar funding levels as other recent years.*

novel approaches for clinical sequencing and broadening the application of sequencing data towards predicting response to immunotherapy and determination of epigenetic status. The laboratory is currently powered by multiple applications of NGS technology –Illumina NovaSeq 6000, MiSeq, and NextSeq 500, as well as Nanopore PromethION 24 (A100). The lab is also equipped with a PerkinElmer Sciclone G3 NGS liquid handling workstation, Agilent 2100 Bioanalyzer, Covaris ME220, Covaris S220, Bio-Rad Automated Cell Counter, Thermo Scientific NanoDrop 2000, NanoDrop 8000, and two PippinHT and one BluePippin DNA Size Selection Systems. At the MI-ONCOSEQ Lab, multiple procedures have been established using the Illumina and Nanopore platforms, including transcriptome sequencing, targeted panel sequencing, whole-exome capture sequencing, whole-genome sequencing, ChIP-seq, microRNA sequencing, ATAC sequencing, CRISPR sequencing, cfDNA sequencing, RNA liquid biopsy sequencing, methylation analysis, single-cell sequencing, spatial transcriptomics, and 10x genomics applications. We have been able to successfully analyze data from these pipelines for exon level monitoring, chimera discovery and genomic rearrangements, as well as epigenetic modifications. Thus far, we have sequenced samples from over 7,000 adult and pediatric patients. A breakdown of the major cohorts for whom results are returned in the form of a molecular report is listed in the table below; this table, totaling 5,397 patients, does not include research cohorts that have been sequenced outside of the cohorts listed, such as Stand Up to Cancer.

| Cohort | Total Patients Enrolled | Patients Enrolled FY24 |
|---|---|---|
| MO- (MiOncoseq) | 1,917 | 115 |
| TP- (Tumor Profiling) | 1,030 | 9 |
| PO- (Peds Oncoseq) | 1,075 | 130 |
| MMRF- MyDrug | 925 | 11 |
| VA - (PCF-VA) | 339 | 45 |
| AS – (ASCELPIUS) | 111 | 29 |
| **Total** | **5,397** | **339** |

### Clinical Trials Supported by MI-ONCOSEQ

Additionally, our sequencing facility supports several specialized programs and clinical studies. We have continued our contract with the Multiple Myeloma Research Foundation into the next phase, MyDrug, which selects patients for therapies/trials based on their sequencing results. We also serve as the sequencing center for the Veterans Affairs-Prostate Cancer Foundation Precision Oncology Program for Cancer of the Prostate (VA - PCF POPCAP) program to comprehensively evaluate samples from veterans with metastatic prostate cancer to provide them access to better and less toxic treatments through targeted therapy.

The MI-ONCOSEQ Lab continues to support several clinical trials, with the ongoing studies listed in the table below. The MI-ONCOSEQ Lab continues to support several clinical trials, with the on-going studies listed in the table below.

## MCTP Histopathology Lab

The MCTP Histopathology Lab is housed on the 7th floor of the

Rogel Cancer Center and is powered by two State-of-the-art and fully automated Roche/Ventana DISCOVERY ULTRA, Leica HistoCore Autocut Microtomes, a Leica Autostainer XL ST50510, an Olympus BX41 Bi-head Microscope, a Leica Coversipper CV5030, and a Leica Cryostat CM1860 UV.

The MCTP Histopathology team assists in the processing and evaluation of submitted specimens for frozen and formalin-fixed biopsy samples from metastatic carcinoma at various sites. Slides are processed at a CLIA-certified histology lab. This lab provides exclusive support to the Michigan Prostate SPORE, the MI-ONCOSEQ sequencing program, and over 15 clinical trials; volumes of slides prepared for these translational studies with a heavy focus on prostate cancer are represented below.

The MCTP boasts state-of-the-art capabilities in spatial transcriptomics and multiplex immunofluorescence (IF), among other advanced research technologies. The spatial transcriptomics infrastructure includes the complete 10X Genomics suite, featuring the Chromium Controller, the Chromium Connect and Visium CytAssist for high-throughput single-cell partitioning and automated library preparation. Additionally, the Visium Spatial Gene Expression platform, allows researchers to obtain spatially resolved transcriptomic data, maintaining the spatial context within tissue samples. These facilities enable comprehensive single-cell sequencing analysis, supported by high-throughput sequencers, dedicated bioinformatics servers, and specialized software such as Cell Ranger, Space Ranger and Loupe Browser. This setup ensures efficient and accurate data processing and visualization. The facility also benefits from advanced automation and specialized staff, facilitating robust and high-quality outcomes across a range of research applications.

The MCTP's multiplex IF capabilities are also remarkable, with the latest technology to perform RNA fluorescence in situ hybridization (RNA-FISH), DNA fluorescence in situ hybridization (DNA-FISH), and immunohistochemistry (IHC). These advanced techniques, accompanied by high-resolution confocal and super-resolution microscopes, allow for detailed spatial localization of proteins and nucleic acids within cells and tissues. Automated staining platforms and multiplexing capabilities enable simultaneous detection of multiple targets, providing in-depth insights into cellular processes. Additionally, specialized image analysis software supports quantitative analysis and high-throughput data management, ensuring robust and reproducible results for complex biological studies. Comprehensive support is provided by expert staff from project inception through data interpretation, facilitating pioneering research in molecular and cellular biology. This collaborative environment and access to cutting-edge technology make the MCTP an invaluable resource for advancing cancer research and other related biomedical studies at the University of Michigan.

**MCTP SPORE/EDRN Core**

The MCTP plays a pivotal role in the University of Michigan's efforts to advance prostate cancer research through its involvement in the National Cancer Institute (NCI) Specialized Programs of Research Excellence (SPORE) and the NCI Early Detection Research Network (EDRN). The Michigan SPORE in prostate cancer is a comprehensive initiative designed to translate scientific discoveries into clinical applications to improve patient outcomes. This program brings together a multidisciplinary team of researchers and clinicians who work collaboratively on projects aimed at understanding the mechanisms underlying prostate cancer and developing novel diagnostic and therapeutic strategies. The SPORE includes a Biospecimen/Pathology Core, which processes and banks biospecimens from prostate cancer patients. This core facility is housed in the Rogel Cancer Center and the North Campus Research Center (NCRC) and is equipped with state-of-the-art technology for histology, immunohistochemistry, tissue microarrays, and fluorescence in situ hybridization. The core also manages an extensive biorepository, utilizing Openspecimen software to track and distribute over 419,440 specimens, thereby facilitating translational research studies.

In addition to the SPORE, the MCTP is integrally involved in the EDRN, an initiative of the NCI focused on accelerating the translation of biomarkers into clinical applications for early cancer detection and risk assessment. The University of Michigan previously operated its own EDRN Biomarker Development Laboratory, which was instrumental in the development and clinical validation of the original MyProstateScore (MPS) assay.

This assay combines serum prostate-specific antigen (PSA) levels with urine levels of TMPRSS2:ERG gene fusion and the long non-coding RNA PCA3 to detect aggressive prostate cancer. Building on this foundation, the Michigan-Vanderbilt EDRN Biomarker Characterization Center (BCC) was established in 2022, with Dr. Arul Chinnaiyan at U-M and Dr. Jeffrey Tosoian at Vanderbilt University Medical Center serving as co-principal investigators. The BCC is composed of three synergistic components: the Biomarker Development Laboratory, the Biomarker Reference Laboratory, and the Administrative Core. These components collaboratively identify, develop, and validate biomarkers for prostate cancer, leveraging resources such as the commercial provider Lynx Dx, Inc. The MCTP's involvement in the SPORE and EDRN initiatives underscores its commitment to advancing prostate cancer research and improving early detection and treatment strategies, thereby enhancing the prognosis and quality of life for patients.

In association with MLabs, MCTP's Molecular Testing Lab (MTL) receives orders for and carries out PCA3, Mi-Prostate Score (MPS), and to a smaller extent, Cell Search Circulating Tumor Cell (CTC) assays. Since 2010, MTL has processed a total of 17,205 PCA3, 1,989 MPS, and 1,757 CTC assays for clinical use. Additionally, 3,281 PCA3 and 3,281 MPS assays have been processed for research samples. In July 2022, PCA3 and MPS tests were discontinued by Hologic. Tests were transferred to Lynx Dx for analysis on an OpenArray platform. The lab provided >1,000 samples for validation, and 45 CTC were performed in FY2023.

The MTL also procures biological samples such as urine, blood, and tissue for ongoing clinical and research projects. Since 2010, the MTL has procured 2,835 tissue, 6,644 urine, 5,683 serum, and 6,135 EDTA plasma samples.

The MTL also supports the MI-ONCOSEQ program and works closely with the Michigan Prostate SPORE Biospecimen Core, assisting with the following clinical studies and research projects:

- **HUM00148970:** EDRN Prostate MRI Biomarker Study and Reference Set (13 Sites)
- **HUM00117711:** Targeted Early Detection Program in Men at High Genetic Risk for Prostate Cancer
- **HUM00086525:** Biomarkers and clinical parameters associated with Gleason score upgrading
- **HUM00188437:** Interstitial assessment of architectural heterogeneity in prostate cancer *ex vivo*
- **HUM00197931:** Prospective study to evaluate MPS-NGS urine assay for predicting grade progression in men on active surveillance for prostate cancer
- **UMCC 2021.046:** A phase II randomized trial of moderate versus ultra-hypofractionated post-prostatectomy radiation therapy
- **20CHAL03: PC-REACTR:** A Multidimensional Tumor Atlas to Overcome Prostate Cancer Therapy Resistance
- **P20CA26735-01:** Reducing Cancer Health Disparities in Detroit
- **PC200234:** Integrative molecular profiling of whole urine in African American men with aggressive prostate cancer
- **KCI 2017-110:** Feasibility Study of MicroRNA Biomarkers and MRI Guided Fusion Biopsy in Prostate Cancer
- **ARV-110-mCRPC-101:** A Phase I/II, Open-Label, Dose Escalation of Cohort Expansion Clinical Trial to Evaluated the Safety, Tolerability, Pharmacokinetics, and Pharmacodynamics of ARV-110 in Patients with Metastatic Castration-Resistant Prostate Cancer
- **ARV-766-mCRPC-101:** A Phase I/II Open-Label, Dose-Escalation and Cohort Expansion Clinical Trial to Evaluate the Safety, Tolerability, Pharmacokinetics, and Pharmacodynamics of ARV-766 in Patients with Metastatic Castration-Resistant Prostate Cancer
- **ORIC-944-01:** An Open-Label, Phase 1/1b, Study of ORIC-944 in Patients with Metastatic Prostate Cancer
- **AC176-001:** A Phase I, Open-label, Multi-center, Clinical Study to Evaluate Safety, Tolerability, Pharmacokinetics, Pharmacodynamics, and Preliminary Anti-Tumor Activity of AC176 in Patients with Metastatic Castration-Resistant Prostate Cancer Who Have Progressed on at Least Two Prior Systemic Therapies
- **PETRANHA:** A Multi-arm, Open-label Phase I/IIa Study

to Assess the Safety, Tolerability, Pharmacokinetics, Pharmacodynamics and Preliminary Efficacy of AZD5305 in Combination with New Hormonal Agents in Patients with Metastatic Prostate Cancer

- **CES-0005 SymphonyTM Clinical Trial:** IL-6 for COVID-19 Patients sponsored by Bluejay Diagnostics, Inc.

## UMHS/MLABs

MCTP plays a critical role in advancing cancer research through its strong collaborations with the University of Michigan Health System (UMHS) and the Michigan Medicine Diagnostic Laboratories (MLabs). These partnerships enhance MCTP's ability to translate molecular and cellular research discoveries into clinical applications, thereby improving patient care and outcomes.

UMHS, comprising the U-M Medical School and the U-M Health System, provides an integrated environment that supports MCTP's mission to develop and implement novel cancer diagnostics and therapeutics. MCTP is strategically positioned within the Rogel Cancer Center, a leading NCI-designated comprehensive cancer center. This proximity allows seamless access to UMHS's top-tier clinical resources, including the University Hospital, C.S. Mott Children's Hospital, Von Voigtlander Women's Hospital, and the Frankel Cardiovascular Center. This collaboration ensures that MCTP's translational research benefits from immediate clinical validation and integration. Clinical researchers and staff within UMHS contribute significantly to conducting essential clinical trials, such as the evaluation of novel agents and diagnostics, fostering a robust environment for translational research.

MLabs, the diagnostic laboratory service associated with Michigan Medicine's Department of Pathology, further enhances MCTP's research and clinical capabilities. Foundational support from MLabs, including its CLIA/CAP-accredited Molecular Testing Laboratory (MTL) established by Dr. Arul Chinnaiyan, remains crucial for MCTP. This well-equipped lab provides critical services such as the processing of biopsy tissues, preparation for next-generation sequencing (NGS), and other molecular analyses. MLabs ensures that the highest clinical laboratory standards are upheld, facilitating accurate and reliable diagnostic support for various research projects and clinical trials.

Moreover, MLabs' outreach program extends these capabilities beyond the University, ensuring that external clients and U-M Health System patients benefit from cutting-edge diagnostic tests and pathology services. MCTP leverages these resources extensively. For instance, through collaborative projects like Mi-Oncoseq, researchers can perform comprehensive genomic and transcriptomic profiling of patient samples, crucial for developing personalized medicine strategies.

Through these collaborations, MCTP integrates laboratory science with clinical practice, driving innovations from bench to bedside. The UMHS's clinical excellence and MLabs' diagnostic prowess provide a comprehensive infrastructure that supports MCTP's groundbreaking research, ensuring that new discoveries can quickly translate into clinical interventions to improve patient care and outcomes. This collaborative synergy positions MCTP as a leader in translational cancer research, facilitating continuous advancements in cancer diagnostics and therapeutic strategies.

## MLTP

The Michigan Legacy Tissue Program (MLTP) is a critical initiative that enhances the Center's research capabilities by providing unique and valuable biospecimens for cutting-edge cancer research. This collaboration is essential for driving forward understanding and treatment of advanced prostate cancer and other malignancies.

The MLTP, developed under the direction of Dr. Ken Pienta, is a rapid autopsy program designed to collect metastatic prostate cancer tissue. The program has performed over 75 complete autopsies on prostate cancer and other cancer patients, with a median time of two hours from death to autopsy, ensuring the integrity and quality of the collected tissues. The primary goal of the MLTP is to maximize the sample numbers per patient and the diversity of tissue sites of origin, such as bone, brain, lymph node, liver, and other metastatic sites. This comprehensive collection enables a thorough investigation of cancer's molecular underpinnings across different tissue environments, which is

pivotal for understanding disease progression and resistance.

The collaboration between MCTP and MLTP provides a robust framework for advancing cancer research. MCTP's advanced molecular and cellular biology capabilities are leveraged to analyze these high-quality biospecimens. Collected tissues are utilized for generating tissue organoids, cell lines, and murine xenograft models, as well as for downstream DNA/RNA sequencing and formalin-fixed tissues for various biomarker studies. Additionally, the osseous site protocol developed by Drs. Chinnaiyan and Rohit Mehra allows for the extraction of high-quality DNA/RNA from bone tissues without the degradation typically associated with decalcification, enhancing the scope of genomic studies.

The MLTP also collects peripheral blood, ascitic, pleural, and other peritoneal/pelvic washings for germline DNA extraction and cell line generation. These biospecimens undergo detailed processing and are cataloged meticulously, with digital gross and microscopic images captured for teaching and research purposes. The collection, storage, and annotation of these samples in a research database dedicated to the MLTP facilitate extensive studies on metastatic prostate cancer.

Through MLTP's provision of these high value biospecimens, MCTP is empowered to pursue innovative research projects that require human tissues reflecting the actual disease state of advanced cancers. This collaboration enables MCTP to integrate clinical data with molecular analyses, fostering translational research that can lead to the development of personalized medicine approaches and novel therapeutic strategies.

**Technology Disclosures/Patents for 2024**

- **UM 2024-104:** Diagnostic, Prognostic Markers and Therapeutic Targets for Renal Cell Carcinomas
- **UM 2024-288**: A novel multiplex urine test for high-grade prostate cancer
- **UM 2024-303:** ESK981 treatment for autophagy-dependent cancers
- **UM 2024-339:** ESK440 treatment for neuroblastoma
- **UM 2024-340:** Novel CDK12/13 protein degradation agent and application
- **UM 2024-475:** Development of a class of PIKfyve protein degradation agent and its application
- **UM 2024-552:** Novel NSD2 protein degradation agent and application
- **UM 2024-578:** PIKfyve inhibition upregulates surface expression of MHC class I to augment immunotherapies in cancer

## Personnel

Total number of:

- Faculty: 32 core, 8 affiliate
- Fellows: 9
- Graduate Students: 14

A list of all newly recruited faculty, promotions, and retention:

**Abhijit Parolia, PhD**
**Assistant Professor (tenure-track), Department of Pathology**

Dr. Parolia began his appointment as Assistant Professor (tenure-track) of Pathology and Urology in October 2023 and is a nominated Rogel Cancer Center Fellow. In his previous role, he was a Research Investigator with MCTP after completing his PhD in Molecular & Cellular Pathology and M.Sc. in Bioinformatics under the mentorship of Dr. Chinnaiyan. His independent research primarily focuses on studying non-coding and chromatin-templated transcriptional pathobiology in advanced prostate cancers. He has co-authored over 25 publications, including two first-author articles published in Nature and has held several sponsored-career development and young investigator awards. He most recently was awarded the distinguished V Scholar Award from The V Foundation for Cancer Research where he will aim to understand NSD2 function as an essential AR coactivator in advanced lethal prostate cancer and preclinically evaluate the safety and efficacy of NSD1/2 inhibitory drugs.

**Matthew Iyer, MD, PhD**
**Assistant Professor Pathology and Surgery**

Dr. Iyer began his appointment as Assistant Professor of Pathology and Surgery in October 2024. He completed his fellowship in Complex General Surgical Oncology and Hepatopancreatobiliary Surgery at Duke University before he was recruited to the University of Michigan as a dual appointee in Surgery (clinical) and Pathology (research). His research at MCTP focuses on developing novel RNA-seq based clinical biomarker assays in cancer, as well as develop new bioinformatics methods to synthesize the immense inventory of RNA-seq experiments that has amassed in the public databases for the purpose of characterizing poorly understood aspects of human transcription. He most recently was awarded the NCI Early-Stage Surgeon Scientist Program (ESSP) Award.

**Annette Kim, MD, PhD**
**Clinical Professor, Director, & Henry Clay Bryant Professor of Pathology**

Dr. Kim began her faculty appointment with the Department of Pathology, Division of Molecular Pathology in July 2023 as Clinical Professor and Director of the Division of Molecular and Genomic Pathology. Dr. Kim is a leading expert in hematopathology and molecular diagnostics and is a collaborator with MCTP on several projects, including advancing diagnostic accuracy with next-generation sequencing. She has also been tasked with spearheading recruitment initiatives and collaboration amongst the various pathology divisions and departments within Michigan Medicine. She was most recently named the Henry Clay Bryant Professor of Pathology.

**Marcin Cieslik, PhD**
**Assistant Professor of Pathology and Bioinformatics**

Dr. Cieslik was appointed the Director of Bioinformatics for the Division of Diagnostic Genetics and Genomics. As a Director of Bioinformatics, he is responsible for the development of the bioinformatics infrastructure to support the diagnostic high-throughput assays developed at the division, in support of both cancer and germline testing. He also oversees staff training and recruitment, implementation of customized bioinformatics algorithms, as well as statistical design for assay validation.

**Todd Morgan, MD**
**Professor of Urology, Section Head of Urologic Oncology**

MCTP was pleased to support Dr. Morgan's retainment within the Department of Urology with the goal to expand Dr. Morgans research in clinical application of prostate cancer genomics and biomarkers and to establish an investigative team for this mission.

**Simpa Salami, MD, MPH**
**Associate Professor of Urology**

MCTP enthusiastically supported Dr. Salami's promotion to Associate Professor (tenure) and retention. Dr. Salami was a recipient of an NCI R37 Merit award under the Beau Biden Cancer Moonshot Initiative, providing two additional years of R01 level funding. This promotion will provide resources for Dr. Salami's research in next-generation sequencing, biomarkers, and clinical informatics.

**Rahul Mannan, MD**
**Director of the MCTP Histopathology Lab and Research Investigator**

MCTP has provided leadership support to Dr. Mannan, who has been promoted to the position of Director of the Histology Lab at MCTP by the Department of Pathology. Dr. Mannan will be mentoring and leading the histology core, offering pathology services that include image analysis and capture, in situ molecular assays, tissue preparation, and sample annotations for spatial transcriptomics and digital pathology solutions to the MCTP researchers and collaborators. Additionally, MCTP will assist him in launching a state-of-the-art high-throughput spatial multiplex proteomic platform and support him and his team to implement AI and ML-led research experiments to unlock new avenues of research at MCTP.

# Michigan Medicine Laboratories (MLabs)

**Julia Dahl, MD**
*Director,* MLabs Reference Laboratory

Michigan Medicine Laboratories (MLabs) provides access to the Department of Pathology's Anatomic and Clinical Pathology and Division of Genetics and Genomics laboratories for patients and facilities outside Michigan Medicine. MLabs is a full-service reference laboratory that leverages the combined strengths of our faculty, trainees, staff, and state-of-the-art laboratories. We value our vital role as the conduit that allows worldwide patient access to Michigan Medicine's expertise. With Michigan Medicine advancing our statewide network of care to further strengthen programs with UMH-West and UMH-Sparrow, MLabs leveraged our lengthy relationships with both facilities in support of the department's exploration of laboratory integration as a health system. Whether with our affiliates or clients from around the globe, we strive to be a trusted partner to all, building strong relationships with pathologists, hospital laboratories, skilled nursing facilities, physician offices, and specialty physicians across Michigan and the nation. Our highly effective collaborations put patients' needs at the forefront of all we do, strongly aligning us with Michigan Medicine's mission "To advance health to serve Michigan and the world."

**Transition in MLabs Leadership Director**

FY24 marked a significant milestone in MLabs' journey. Julia Dahl, MD, after several years as MLabs Associate Medical Director, succeeded Dr. Jeffrey L. Myers as the new Division Director.

"The impact I would like to have on the Department of Pathology is to underscore the value that MLabs brings to the department in such a way that the staff, faculty, educators, and even researchers feel a sense of belonging and ownership of MLabs as part of our department's shared vision," says Dr. Dahl.

To provide focused direction for the MLabs Division in FY24, Dr. Dahl worked with Dr. Charles Parkos, Department of Pathology Chair, Brooklyn Khoury, the Chief Department Administrator, and others to clarify three central goals for MLabs in FY24:

1. Maintain services to all current clients, expanding services through improved connectivity solutions
2. Support Michigan Medicine's efforts for system integration
3. Support department investments in the newly formed Division of Genetics and Genomics. Progress in these goals was felt across the department and with our clients.

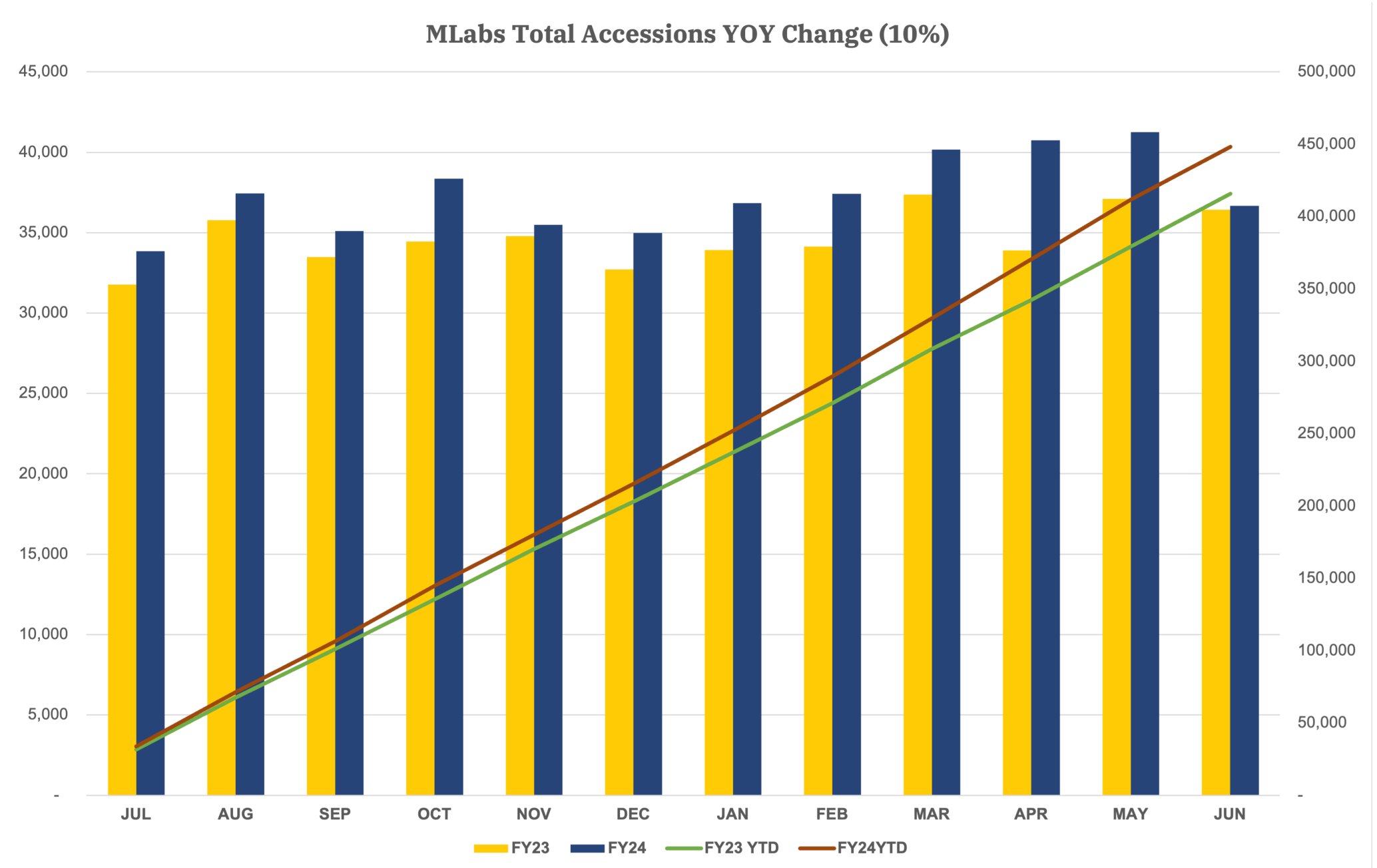
## Improving Service to Our Customers

**Operations FY24**

FY24 was a year of growth for MLabs with the addition of a five-member connectivity team, the transition of three FTEs from Specimen Processing to Consult Accessioning for NLNC coverage, and the addition of a process improvement specialist. Consequently, much time was spent on recruitment, onboarding, and training, resulting in a stellar team committed to the work, collaborating well, and having fun together.

Major achievements this year include:

- Established new ways to sustain FiSH!® Philosophy practices in MLabs: offering daily positive messages at huddle, sharing stories about how we have supported each other, creating a dynamic communication tool in our OneDrive, and committing to monthly strategy meetings to build a more positive and joyful work culture in MLabs.
- Redesigned muscle, nerve, and renal biopsy kits to better manage the temperature of specimens/fixatives during transport and mitigate patient safety risk of specimens arriving at our laboratories frozen.
- MLabs partnered with the Wieser Prostate Center to improve


MLabs Total Accessions YOY Change (10%)
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
-
500,000
450,000
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
-
JUL
AUG
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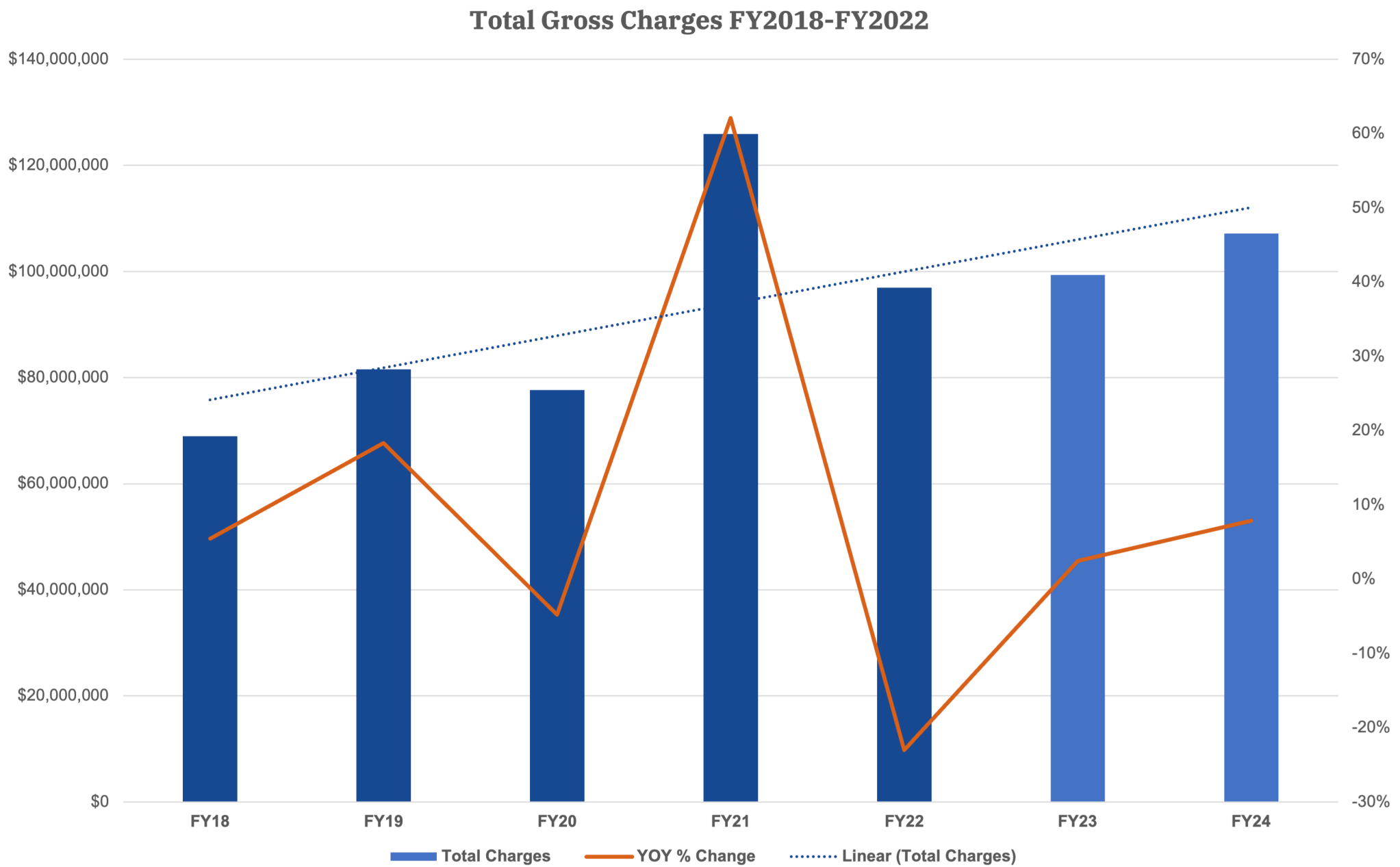
JAN
FEB
MAR
APR
MAY
JUN
FY23
FY24
FY23 YTD
FY24YTD


Total Gross Charges FY2018-FY2022
$140,000,000
$120,000,000
$100,000,000
$80,000,000
$60,000,000
$40,000,000
$20,000,000
$0
70%
60%
50%
40%
30%
20%
10%
0%
-10%
-20%
-30%
FY18
FY19
FY20
FY21
FY22
FY23
FY24
Total Charges
YOY % Change
Linear (Total Charges)

the process of transferring patients to the Prostate Center's care by ensuring the patient's pathology report is available at the initial appointment. Deliverables included: standard fax form utilized across the Rogel Cancer Center, improved communication between MLabs and the Cancer Center schedulers/records staff, the development of an operational dashboard to monitor TAT, and the submission of a quality month poster.

- Together with PI and multiple SMEs across pathology, MLabs led the build, validation, training, and implementation of a business analytics platform, hc1. This tool integrates, normalizes, and enhances siloed data from multiple sources to provide visibility into operational efficiencies, business intelligence, test utilization, and billing/revenue capture.
- Our newly hired Connectivity Team completed a number of new electronic orders, resulting in interface connections with clients, enhancing quality, efficiency, and patient safety.

## Local, Regional, and National Visibility for our Services and Faculty

**Business Development**

Throughout FY24, our sales and marketing team continued to refine and roll out the territory management initiative intended to better serve our clients, whether local, regional, or national. The newly titled Account Manager team completed more than 200 in-person visits, building rapport with key stakeholders and solidifying our base business.

The Account Managers also participated in or exhibited at conferences relevant to reference laboratory medicine and in support of our faculty. During FY24, MLabs exhibited at the Colorado Society of Clinical Pathologists (July 2023), Next Gen Dx Summit (Aug 2023), New Frontiers in Pathology (Oct 2023), Texas Society of Pathologists (Feb 2024), Florida Society of Pathologists (February 2024), United States and Canadian Academy of Pathology (March 2024), Commission on Office Laboratory Accreditation (May 2024), Michigan Society of Pathology (May 2024), PI Summit (May 22024), and American Society of Clinical Oncology (June 2024).

**Volume of Referrals**

Total activity showed a 7.0% year-over-year growth measured as the total number of accessioned cases (448,312) and 7.0% measured as total billable tests (647,766). Total gross charges grew at an annual rate of 7.0% compared to FY23, showing sustained growth over the year. This continues a trend toward positive growth curves over the last five years; from FY20 to FY24, gross charges increased 38.0%.

Anatomic and hematopathology consultations through MLabs exceeded 22,000 referrals of the most complex and challenging cases viewed by pathologists nationwide. This is a 4.0% growth over FY23 and continues to support the robust subspecialty fellowships offered by the Department of Pathology.

## Total Gross Charges by Market Segment

MLabs continues to support a diverse portfolio of clients. Integrated Delivery Network (IDN) Reference Laboratory, Commercial Reference, Anatomic and Hematopathology Consultations to Hospital and other pathology groups, and "Other" clients demonstrated significant growth, which offset the decreased volume and revenue seen in the Physician Office and Skilled Nursing Facility market segments. IDN Reference Laboratory business continued to maintain the largest share of MLabs-related charges (42.0%), followed by Physician Office (27.0%), AP and Hemepath Consultations (18.0%), Other (5.0%), Commercial Reference Laboratories (5.0%), and Skilled Nursing Facilities (3.0%).

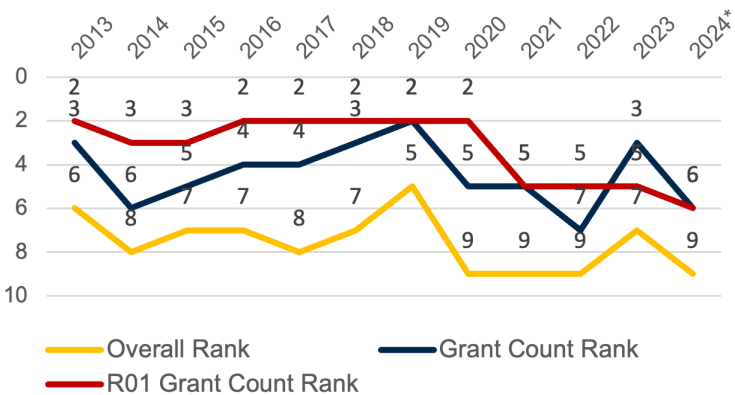
# Research Mission

**Asma Nusrat, MD**
*Director,* Experimental Pathology

Experimental Pathology faculty have enjoyed yet another highly successful year. Experimental faculty occupy ~65,600 sq. ft. of research space in numerous buildings across the medical campus. The research focus is diverse and spans a wide spectrum of cancer biology, inflammation and immune response, genetics, and aging. Results emanating from the Division are at the forefront of cutting-edge research that bridges new basic discoveries with the clinical practice of medicine. Discoveries have been in basic biology, disease pathogenesis, and therapeutics. Outstanding grant funding, high-impact publications, patents, and prestigious faculty awards further evidence the success of this division.

EP faculty have successfully procured substantial research grant funding in the previous academic year, amounting to an impressive $31,785,922. Most of this funding was granted by federal sources which include the National Institutes of Health (NIH) and Department of Defense (DoD), supplemented by funding from foundations and industry (*See Appendix, pg. 100*). This remarkable achievement is demonstrated through awards that include 55 NIH grants (R01 to R37 grants and subcontracts), seven Department of Defense research grants (including subcontracts), and 41 grants awarded by foundations and industry (*See Appendix, pg. 94*). When evaluated nationally, we have the sixth-highest number of R01 grants awarded to experimental pathology faculty. With the inclusion of other federal NIH grant dollar amounts, we have been ranked seventh and are projected to be ranked ninth in the nation for Federal Fiscal Year 2024. These statistics underline the high productivity of our Experimental Pathology faculty, which is commendable considering the rigorous and competitive nature of the national grant funding landscape. Furthermore, our EP faculty continues to demonstrate outstanding mentorship, as evidenced by the research fellowship and career development grants awarded to the trainees. Consequently, the grant indirect costs for our department are high in the overall University of Michigan

**Federal Fiscal Year NIH Rankings University of Michigan Pathology**




Medical School. Given this achievement, EP faculty maintain an impressive average research space dollar density that exceeds $168 per square foot average. AP/CP clinical faculty have collaborated on numerous grant-funded projects; a testament to pathology's cohesive research and clinical environment. Our EP faculty's innovative and research successes are further illustrated by their substantial intellectual properties, including 48 patent applications, nine granted patents, 19 new invention reports, 21 new license/option agreements, and one U-M Startup company (*See Appendix, pgs. 98-99*).

EP faculty research productivity is evidenced by many discoveries and high-impact publications. Pathology faculty published 546 manuscripts in high-impact journals, including *Nature Communications*, *Nature Chemical Biology*, *Journal of Clinical Investigation*, *Cell Host and Microbes*, and *Proceedings of the National Academy of Sciences*. Twenty-nine percent of manuscripts were published in journals with an impact factor greater than 10, and

an additional 26% were accepted in journals with an impact factor of 6-10 (*See pg. 56*).

Among the many outstanding published manuscripts, a few highlights this year include the following:

- **NSD2 is a requisite subunit of the AR/FOXA1 neo-enhanceosome in promoting prostate tumorigenesis.** Parolia A, Eyunni S, Verma BK, Young E, Liu L, George J, Aras S, Das CK, Mannan R, Rasool R, Luo J, Carson SE, Mitchell-Velasquez E, Liu Y, Xiao L, Gajjala PR, Jaber M, He T, Qiao Y, Pang M, Zhang Y, Alhusayan M, Apel IJ, Cao X, Tavana O, Hou C, Wang Z, Ding K, Chinnaiyan AM, Asangani IA. *Nature Genetics* 2024 (In Press; BioRxiv preprint - PMCID: PMC10925163); co-corresponding author.

  In this paper, starting with a CRISPR screen, the authors identified a new protein (called NSD2) that activates androgen receptor (AR) signaling in prostate cancer cells. When bound to NSD2, AR is redistributed on the chromatin to bind new sites on the DNA and activate the expression of genes that fuel prostate cancer initiation, growth, and ability to spread to distant organs. While NSD2 is not expressed in the normal prostate tissue, it is induced upon cancer development. The authors also found a close cousin of this protein, called NSD1, independently enables prostate cancer growth and survival. Notably, a novel degrader compound targeting both NSD1 and NSD2 showed preferential cytotoxicity in AR-driven prostate cancer, without affecting normal and numerous other cancer cells. Overall, this work positions NSD2 as a prostate cancer-specific AR coactivator and NSD-targeting agents as new drugs for cancer therapy.

- **IL-13-induced STAT3-dependent signaling networks regulate esophageal epithelial proliferation in eosinophilic esophagitis.** Marella S, Sharma A, Ganesan V, Ferrer-Torres D, Krempski J, Idelman G, Clark S, Nasiri Z, Vanoniv S, Zeng C, Dlugosz AA, Zhou H, Wang S, Doyle AD, Wright BL, Spence J, Chehade M, Hogan SP. *J Allergy Clin Immunol.* 2023 Aug 29:S0091-6749(23)01100-4.

  This study utilized RNAseq of esophageal biopsies from healthy control and EoE individuals, animal models systems, and primary esophageal cells derived from patients with EoE, to define the role of IL-13-induced transcriptional programs in esophageal epithelial proliferation in EoE. The authors demonstrated that IL-13-induced STAT3 and STAT6 phosphorylation, SFRP1 mRNA expression, and esophageal epithelial proliferation. Further, that IL-13-induced esophageal epithelial proliferation was STAT3-dependent and regulated by the STAT3 target SFRP1. Finally, an esophageal suprabasal epithelial cell subpopulation that uniquely expressed SFRP1 and the core EoE proinflammatory transcriptome was identified. These studies identify SFRP1 as a key regulator of IL-13-induced and STAT3-dependent esophageal proliferation and BZH in EoE and link SFRP1+ esophageal epithelial cells with the proinflammatory and epithelial remodeling response in EoE.

- **Claudin 23 strengthens the epithelial barrier function by stabilizing claudins 3 and 4, and computational modeling of the paracellular pore.** Raya-Sandino A, Lozado K, Luissint AC, Garcia-Hernandez V, Rajagopal N, Parkos CA, Nangia S, Nusrat A. *Nature Communications.* 2023 5;14(1):6214. PMID: 37798277

  This study reveals that claudin-23 (CLDN23) enhances intestinal barrier function by interacting with CLDN3 and CLDN4, reshaping tight junction architecture. Computational modeling suggests that CLDN23 forms unique pore structures with these claudins, altering paracellular permeability to ions and macromolecules. This research provides new insights into how claudin combinations modify epithelial barrier properties through structural changes in tight junctions.

- **Klebsiella pneumoniae causes bacteremia using factors that mediate tissue-specific fitness and resistance to oxidative stress.** Holmes CL, Wilcox AE, Forsyth V, Smith SN, Moricz BS, Unverdorben LV, Mason S, Wu W, Zhao L, Mobley HLT, Bachman MA. *PLoS Pathol.* 2023 Jul 18;19(7):e1011233. doi: 10.1371/journal.ppat.1011233. eCollection 2023 Jul. PMID: 37463183

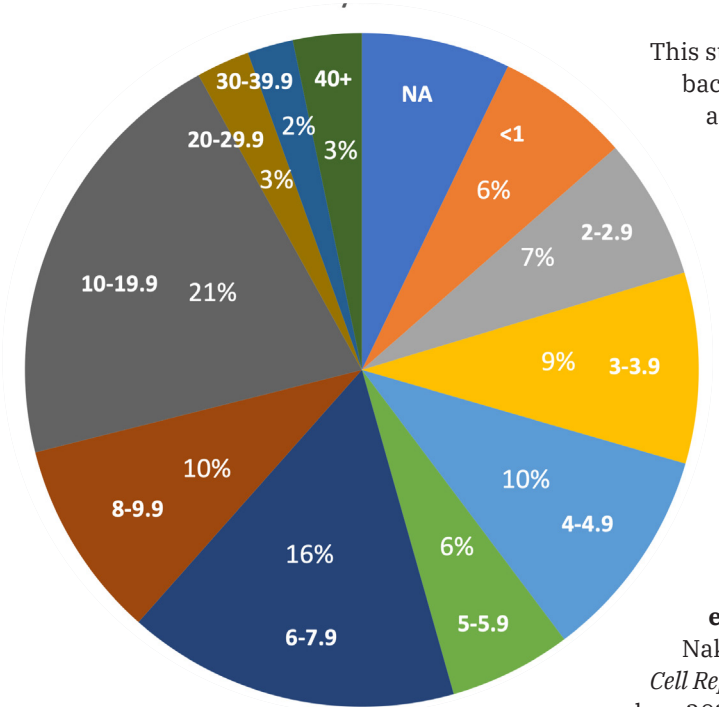



**Chart:** Manuscripts published in FY24 by journal impact factor.

This study used a large genetic screen to identify bacterial fitness factors that enable the healthcare-associated pathogen Klebsiella pneumoniae to cause bacteremia. Resistance to oxidative stress was critical, and K. pneumoniae had one resistance mechanism that specifically counteracted the phagocyte oxidase Nox2 and a second that resisted Nox2-independent oxidative stress. Furthermore, the factors required for infection varied between the lung, spleen, and liver. This study demonstrates that K. pneumoniae requires a diverse set of tools to disseminate across organs and cause bacteremia.

- **Pseudomonas aeruginosa hijacks the murine nitric oxide metabolic pathway to evade killing by neutrophils in the lung.**
Nakatsuka Y, Matsumoto M, Inohara N, Núñez G. *Cell Rep* 2023 Aug 29; 42(8):112973. doi: 10.1016/j.celrep.2023.112973. Epub 2023 Aug 9. PMID 37561628

In this work, Nuñez and colleagues identified the nitrite reductase nirD of Pseudomonas aeruginosa as a critical factor for the pathogen's ability to evade neutrophil-mediated killing in the lung. NirD is required for ammonia production from nitrite, a metabolite derived from nitrogen oxide generated by inducible NO synthetase in phagocytes. Mechanistically, nirD enhances *P. aeruginosa* survival in neutrophils by inhibiting the localization of the pathogen in late phagosomes.

- **A hybrid breast cancer/mesenchymal stem cell population enhances chemoresistance and metastasis.**
Augimeri G, Gonzalez ME, Paolì A, Eido A, Choi Y, Burman B, Djomehri S, Karthikeyan SK, Varambally S, Buschhaus JM, Chen Y-C, Mauro L, Bonofiglio D, Nesvizhskii AI, Luker GD, Andò S, Yoon E, Kleer CG: *JCI Insight.*2023 Sep 22; 8(18) e164216. PMCID 10561721

The Kleer lab has discovered a new breast cancer population that has hybrid features of breast cancer cells and mesenchymal stem cells and is responsible, at least in part, for the chemoresistant properties of triple-negative breast cancer. Their studies identify the mechanism by which hybrid cells form in tumors, which may lead to a novel strategy to overcome breast cancer drug resistance.

- **Stem cell factor inhibition reduces Th2 inflammation and cellular infiltration in a mouse model of eosinophilic esophagitis.**
Ptaschinski C, Zhu D, Fonseca W, Lukacs NW. *Mucosal Immunol.* 2023 Oct;16(5):727-739. PMCID 37557983.

One of the areas that we have focused upon in the food allergy center is understanding how to alter the effector phase of food-induced allergic responses in susceptible patients. This recent publication from our center focused on targeting mast cells, the primary effector cell that causes food allergy-induced disease. By targeting the mast cell growth and differentiation factor, Stem Cell Factor (SCF), we were able to show that its inhibition attenuated food allergen-induced eosinophilic esophagitis that afflicts a growing number of children and adults.

- **AI: Unraveling the glycosylated immunopeptidome with HLA-Glyco.**
Bedran G, Polasky DA, Hsiao Y, Yu F, da Veiga Leprevost F, Alfaro JA, Cieslik M, Nesvizhskii. *Nat Commun.* 14(1): 3461, 06/2023. PMCID 10258777.

Post-translational modifications increase the diversity of the immunopeptidome and may provide new targets for the immune system to recognize tumor cells or respond to pathogens. Glycosylation is a key PTM that remains understudied in the context of MHC presentation due to computational challenges. Dr. Nesvizhskii and his lab have introduced an innovative computational workflow for rapid, comprehensive glycopeptide characterization from mass spectrometry-based immunopeptidome data. They also developed a substantial resource with over 3,400 HLA class II N-glycopeptides from 1,049 protein glycosylation sites. This

study offers a cutting-edge bioinformatics tool and a publicly available resource to support the emerging field of glyco-immunopeptidomics.

- **Targeting SWI/SNF ATPases in H3.3K27M diffuse intrinsic pontine gliomas.**
  Mota M, Sweha SR, Pun M, Natarajan SK, Ding Y, Chung C, Hawes D, Yang F, Judkins AR, Samajdar S, Cao X, Xiao L, Parolia A, Chinnaiyan AM, Venneti S. *Proc Natl Acad Sci USA*. 2023 May2; 120(18):e2221175120. doi: 10.1073/pnas.221175120. Epub 2023 Apr 24. PMCID 10161095.

  In a collaborative effort, three pathology faculty including Drs. Venneti, Parolia, and Chinnaiyan, discovered that the H3K27M mutation rewires SWI/SNF complex proteins, particularly by upregulating SMARCA4 and SMARCA2, which are crucial for chromatin remodeling. The PROTAC AU-15330 effectively targets both SMARCA4 and SMARCA2 and results in cell death, specifically in H3.3K27M cells. Targeting SWI/SNF ATPases may, therefore, offer a promising therapeutic strategy for treating these diffuse midline gliomas (DMGs), which are deadly childhood brain cancers.

- **The cholesterol transporter NPC1 is essential for epigenetic regulation and maturation of oligodendrocyte lineage cells.**
  Kunkel TJ, Townsend A, Sullivan KA, Marlet J, Schuchman EH, Jacobson DA, Lieberman AP. *Nat Commun.* 2023 Jul 5; 14(1):3964. doi: 10.1038/s41467-023-39733-6. PMCID 10322873.

  The intracellular cholesterol transporter NPC1 functions in late endosomes and lysosomes to efflux unesterified cholesterol, and its deficiency causes Niemann-Pick disease Type C, an autosomal recessive lysosomal disorder characterized by progressive neurodegeneration and early death. Single-nucleus RNA-seq on the forebrain of Npc1-/- mice at postnatal day 16 was performed to identify cell types and pathways that are affected early in pathogenesis. Significant transcriptional changes were identified in the oligodendrocyte lineage that were accompanied by diminished maturation of myelinating oligodendrocytes. Upregulation of genes associated with neurogenesis and synapse formation in Npc1-/- oligodendrocyte lineage cells was observed, reflecting diminished gene silencing by H3K27me3. Npc1-/- oligodendrocyte progenitor cells reproduced impaired maturation *in vitro*, and this phenotype was rescued by treatment with GSK-J4, a small molecule inhibitor of H3K27 demethylases. Moreover, mobilizing stored cholesterol in Npc1-/- mice by a single administration of 2-hydroxypropyl-β-cyclodextrin at postnatal day 7 rescued myelination, epigenetic marks, and oligodendrocyte gene expression. These findings highlight an important role for NPC1 in oligodendrocyte lineage maturation and epigenetic regulation and identified potential targets for therapeutic intervention.

- **Distinct mutational processes shape selection of MHC class I and class II mutations across primary and metastatic tumors.**
  Mumphrey, M.B., Hosseini, N., Parolia, A., Geng, J., Zou, W., Raghavan, M., Chinnaiyan, A., Cieslik, M. *Cell Rep*. 2023 Aug 29;42(8):112965. doi: 10.1016/jcelrep.2023.112965. Epub 2023 Aug 21. PMID 37597185.

  Utilizing a novel state-of-the-art algorithm to detect mutations in MHC (HLA) genes and one of the largest cancer genomic datasets, this study demonstrates that mutations in both MHC class I and class II genes are among the most recurrent in cancer and are enriched in truncating and deleterious alterations. Due to the impact of MHC loss on antigen presentation, identification of MHC alterations is critical for immunotherapies, including immune checkpoint blockade and neoantigen vaccines.

- **Blocking an inflammatory protein slows the pace of ageing.**
  Miller, R. A. *Nature* 2024 Aug; 632 (8023): 35 – 36. doi: 10.1038/d41586-024-02300-0. PMID: 39075214.

  This short Nature News and Views commentary discusses the implications for aging and pathophysiology of a recent Nature paper showing that aging in mice can be postponed by any of three interventions that diminish action of the cytokine IL11. The commentary presents the IL11 paper as an example of

how and why medical researchers can move beyond the vague generalization that age-dependent increases in "inflammation" are a key element in the aging process.

Continuing their excellence across academic responsibilities, EP faculty members contributed to educating medical and graduate students and participated in and led institutional, national, and international committees and seminars. These outstanding contributions included EP faculty participation in research grant review panels, scientific seminars, editorial boards, and national/international meetings, and are a testament to faculty dedication to academics.

Our department chair, Dr. Charles Parkos, continues his dedicated service as a board member for the Federation of American Societies for Experimental Biology (FASEB) member societies. As part of his role, he has continued to advocate for the importance of scientific funding to congressional members in Washington, DC. Dr. Gabriel Nuñez is a member of the Biomedical Scholar Program committee and has played an essential role in recruiting highly talented and promising young researchers to the University of Michigan Medical School. Dr. Thomas Wilson, faculty director of the Advanced Genomics Core, plays a vital role in securing and facilitating cutting-edge genomics and single-cell sequencing technology for medical school researchers. In the Rogel Cancer Center, Dr. Kathleen Cho co-leads the Cancer Genetics Program, and Dr. Jolanta Grembecka jointly oversees the Development Therapeutics. These respected roles contribute significantly to the advancement of research and treatment discovery efforts at our institution. EP faculty have received many prestigious institutional/national and international awards, some of which are highlighted below:

In addition to numerous EP faculty leadership roles, new appointments have included the following:

- Dr. Celina Kleer was elected to AAP and appointed Deputy Editor for Breast Cancer Research.
- Dr. Sriram Venneti was elected to the prestigious ASCI. He also delivered the Gontas Memorial Lecture at the University of Pennsylvania and received the Deborah M. Ritchman lectureship award from MD Anderson Cancer Center.
- Dr. Simon Hogan was elected to the AGA Institute Cellular & Molecular Gastroenterology Council and appointed as a Crohn's & Colitis National Scientific Advisory Committee member.
- Dr. Abhijit Parolia was awarded the AACR NextGen Star and received the V Foundation Research Scholar Award in Cancer Research.
- Dr. Jiaqi Shi was invited to serve as a full member of the BDA MCTC NIH Study Section, NIH.
- Five newly recruited tenure track assistant professors in pathology, including Drs. Jennifer Brazil, Catherine Ptaschinski, Roberta Caruso, Navin Mahadevan, and Yang Xiao.

We extend our gratitude and acknowledgment to Dr. Sriram Venneti and the EP Faculty Recruitment Committee, composed of Drs. Andrew Lieberman, Anuska Andjelkovic-Zochowski, Simon Hogan, and Asma Nusrat for their tireless efforts in successfully recruiting the five outstanding tenure track assistant professors in Experimental Pathology from the University of Michigan and other prestigious institutions, including Harvard and Columbia. These newly recruited tenure-track faculty members are a vital addition to our department, and we are excited to see them develop their research program,

The new Assistant Professor in Experimental Pathology are as follows:

- Dr. Jennifer Brazil's research focuses on elucidating the mechanisms through which neutrophils and epithelial glycans regulate inflammatory response and can be targeted to mitigate neutrophil migration across epithelial cells during mucosal inflammation. Her studies will identify the effector function that contributes to pathological mucosal damage in inflammatory diseases such as inflammatory bowel disease.
- Dr. Catherine Ptaschinski has a joint appointment in Experimental Pathology and the Mary H. Weiser Food Allergy Center at the University of Michigan. She is pioneering a research program focused on the development of allergic

diseases, neonatal immune maturation, and the pathogenesis of food allergy.

- Dr. Roberta Caruso's research program is dedicated to investigating the crosstalk between immune cells and microbiota and the role of these processes in the pathogenesis of inflammatory bowel disease. Her studies aim to examine the impact of dietary interventions on the gut microbiome and mucosal immune responses in the gut.
- Dr. Navin R. Mahadevan, a physician-scientist recruited from the Brigham and Women's Hospital/Harvard Medical School, will contribute to both Experimental Pathology and Molecular Pathology programs. He will establish research focused on the epigenetically regulated immunogenicity of small-cell lung cancer, with an emphasis on targeting the immunologic vulnerabilities of small-cell lung carcinoma.
- Dr. Yang Xiao in Experimental Pathology will have a secondary appointment in Biomedical Engineering. She was recruited from Columbia University through a collaborative effort with the Single Cell Spatial Analysis Program (SCSAP) at the University of Michigan. Her research focuses on the functional genomics of the human brain, particularly in the context of neuropsychiatric disorders and cancer. She aims to establish an interdisciplinary research program that translates omics findings with clinical problems, employing data-driven analytic approaches.

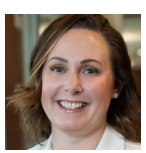
Pathology faculty Drs. Nicholas Lukacs, Simon Hogan, Chang Kim, and Catherine Ptaschinski are members of the Mary H. Weiser Food Allergy Center (MHWFAC) with Dr. Lukacs serving as the scientific director for this Center. The Center was established in 2014 with robust research and outstanding researchers to contribute to the next phase of discovery and clinical therapies for food-allergic patients. The MHWFAC had an outstanding year with the Center extending food allergy investigations into novel areas of translational discovery and patient-oriented research. Evidence of the Center's productivity is illustrated by the high-impact studies that the faculty and their labs have published in top-tier journals, including the Journal of Clinical Investigation, Journal of Allergy and Clinical Immunology, Science Advances, Mucosal Immunology, Allergy, etc. One of the areas of focus in the food allergy center is understanding how to alter the effector phase of food-induced allergic responses in susceptible patients. A recent publication from the Center demonstrated the beneficial effects of targeting mast cells, which are the primary effector cell that causes food allergy-induced disease. By targeting the mast cell growth and differentiation factor, Stem Cell Factor (SCF), the authors demonstrated attenuated food allergen response in eosinophilic esophagitis, which afflicts a growing number of children and adults. Another important goal of the MHWFAC is acquiring external funding through NIH, Foundation, and Industry grants to conduct cutting-edge research. Center faculty have had another very successful year with Wendy Fonseca receiving an R56 award and Drs. O'Konek, O'Shea, and Hogan receiving funding from pharmaceutical partners to perform cutting-edge research to help develop products that may eventually be used as treatments for food allergy patients. Along with existing funding in numerous faculty labs, these newly funded projects indicate that the MHWFAC has built an exceptional research program through their outstanding faculty laboratories. The Center is planning its 5th Michigan Food Allergy Research Accelerator (M-FARA) Research Symposium for April 7th and 8th, 2025, entitled "Mechanisms of Immunotolerance for Treating Food Allergy." The invited speakers include scientists from leading academic centers and pharmaceutical and biotech companies working on cures for food allergy. The Center leadership is excited to host an audience of local, national, and international researchers in food allergy.

Dr. Steven Kunkel continues to serve as Michigan Medicine's chief scientific officer. In this prominent leadership position, he plays an important role in developing and implementing robust strategic research plans that have facilitated novel directions for many research programs across Michigan Medicine.

# Education Mission

**Kamran Mirza, MBBS, PhD**
*Director,* Division of Education Programs

**Shih-Hon 'Sean' Li, MD, PhD**
*Director*, Residency Training Program



**Sara Abbott, MD**
*Associate Program Director*, Residency Training Program

**Davi Manthei, MD, PhD**
*Associate Program Director*, Residency Training Program

As the newly appointed Director of the Division of Training Programs and Communication, I am both humbled and deeply honored to step into this role at such a pivotal time for our department. The legacy of educational excellence at the University of Michigan is truly remarkable, and I am continually inspired by the resources, vision, and innovation that permeate every aspect of our work. It is a privilege to guide our outstanding faculty, staff, and trainees, all of whom are committed to nurturing the next generation of pathologists and healthcare leaders. The collective expertise and spirit of collaboration within our department, coupled with the forward-thinking ethos that defines Michigan Medicine, position us to make groundbreaking strides in pathology education across the entire continuum of UGME, GME, CME, PhD, and Allied Health learners.

One of the most significant recent changes has been the renaming of our division from the Division of Education Programs to the Division of Training Programs and Communication. This reflects our evolving mission to integrate not only rigorous academic training but also the essential role of marketing, social media, and communication in today's medical landscape. As the field of pathology continues to advance, the ability to communicate complex ideas with clarity and empathy becomes increasingly vital for leadership and collaboration. Our division's new name embodies this forward-looking vision, reinforcing our commitment to developing expertise and fostering the communication skills that will shape the future of healthcare.

### Graduate Medical Education

In FY24, The University of Michigan Pathology Residency Program continued its tradition of excellence, remaining the #1 program in the Midwest, the #1 program among academic institutions, and #3 overall program nationally, according to the Doximity Residency Navigator. The program maintained a 5-year 97% first-attempt primary certification pass rate per the American Board of Pathology. The Residency Program graduated seven AP/CP trainees. Six of these graduates are continuing their training in pathology subspecialty programs at Michigan Medicine, including hematopathology, forensic pathology, surgical pathology, and gastrointestinal pathology. One graduate embarked on pathology subspecialty training in Women's Pathology at NYU Langone Health.

We launched a new 2-week Pathology Informatics rotation, led by Drs. Ulysses Balis and Jerome Cheng, as a required component of all residency pathways (AP/CP, AP-only, CP-only, and AP/NP) This rotation equips our trainees with the skills to navigate the increasingly digital landscape of pathology, ensuring they are at the forefront of technological advancements. A Wellness and Professional Development conference series continued in collaboration with the Trainee Wellness Committee and their advisor, Dr. Maria Westerhoff, drawing in speakers from around the country and was well attended by trainees and faculty. Dr. Rouba Ali-Fehmi led a 1-on-1 program to help residents improve their presentation skills, using the AP case conference series as a model. The spectrum of these improvements would not be possible without the passion and commitment of our trainees, faculty, and staff.

Our residents continued to represent our department well with their strong academic productivity and diligent service work in FY24. Seventeen peer-reviewed articles were published in 17 journals, with six journals having an impact factor of 6 or greater. In addition, our residents published several articles in online medicine and pathology magazines and newsletters. Furthermore, 28 abstracts were presented at 12 national or regional meetings. Our residents served on 24 departmental, institutional, and national/international committees and were active members in 29 professional societies.

For the FY24 recruiting season, the Residency Program received

619 ERAS applications for six H0-1 positions and interviewed 73 candidates. The Program filled in The Match and welcomed the following excellent new trainees:

- Nikki Chiang, MD / University of Michigan Medical School
- Jared Neeley, MD / University of Texas Southwestern Medical School
- Benjamin Telford, DO / Michigan State University College of Osteopathic Medicine
- Chia-Ming (Jimmy) Lee, DO / Des Moines University College of Osteopathic Medicine
- Zemplen Pataki, MD, PhD / Tufts University School of Medicine
- Camille Van Neste, MD, PhD / Icahn School of Medicine at Mount Sinai

In 2023, the Department of Pathology had 10 ACGME-accredited fellowship programs with 18 approved positions plus nine clinical fellowship programs with 13 potential positions.

On July 1, 2023, we welcomed the following clinical fellows:

- Breast Pathology – Sundis Mahmood, DO
- Bone and Soft Tissue Pathology – Douglas Rottmann, MD
- Cytopathology - Xiaobing Jin, MD, PhD and Mohammed Saad, MBBS
- Dermatopathology – Michael Huang, MD and Behzad Salari, MD
- Forensic Pathology – Eleftherios Vouyoukas, MD
- Genitourinary Pathology – Alexander Taylor, MD
- Gynecologic Pathology – Lucy Ma, MD
- Hematopathology – Kathryn Gibbons, MD and Ania Owczarczyk, MD, PhD
- Laboratory Genetics and Genomics – Benjamin Kang, PhD
- Molecular Genetic Pathology – Erica Vormittag-Nocito, MD
- Neuropathology – Emile Pinarbasi, MD, PhD
- Surgical Pathology – Ashley Bradt, MD, Fernanda Carolina Cordeiro-Rudnisky, MD, Cisley Hines, MD
- Thoracic Pathology - Chaehwa Kim, MD

**Undergraduate Medical Education**

The Department of Pathology has a long history of playing an integral role in pre-clinical medical student education. In Foundations of Medicine 2, one of the first sequences encountered by medical students in the Scientific Trunk, we introduce the foundational principles of pathology—Cell Injury & Death, Inflammation, and Neoplasia. These topics lay the groundwork upon which students build during subsequent organ-based blocks.

Lectures and laboratories are led by many dedicated faculty members, including Drs. Madelyn Lew, Kamran Mirza, Scott Owens, Evan Farkash, Scott Bresler, Alexandra Hristov, Allecia Wilson, Tao Huang, Paul Killen, Aaron Udager, Karen Choi, Jiaqi Shi, Shula Schecter, Angela Wu, Thomas Giordano, Richard Cantley, Sara Abbott, David Chapel, Caroline (Libby) Simon, May Chan, Steven Pipe, Laura Cooling, Kyle Conway, Sean Ferris, Stephanie Skala, and Paul Harms. Under the direction of Dr. Madelyn Lew, Director of Medical Student Education for the Department of Pathology, our faculty continues to integrate pathology content with clinical and basic science elements while incorporating new, interactive methods for delivering educational material.

In the Surgery & Applied Sciences Clerkship, students participate in a week-long pathology rotation that exposes them to various aspects of the field. The curriculum includes grossing and microscopic sessions specifically designed for medical students. Through these sessions, alongside case-based small group discussions focused on clinical pathology and supplemental electronic resources, students reinforce the foundational principles learned in the Scientific Trunk, deepen their understanding of clinicopathologic correlations, and improve lab stewardship.

In their third and fourth years, students enroll in the Branches curriculum, where pathology faculty serve as mentors and career advisors within the Diagnostics & Therapeutics Branch. Faculty also act as science consultants for students preparing their Patient-Based Scientific Inquiry (PBSI) projects. Branch

Nathan McCammon, MD
Co-Chief / HO IV

Corey Post, MD
Co-Chief / HO IV

Ashley Brent, MD
Assistant Chief / HO III

Haley Amoth, MD
HO IV

Thomas Herb, MD
HO IV

Vincent Laufer, MD, PhD
HO IV

Fysal Shennib, MD
HO IV

Nicole Tomm, MD
HO IV

Maxwell Wang, MD
HO III

Ryan Cecchi, MD
HO III

Elaina Daniels, MD
HO III

Elizabeth Higginson, MD
HO III

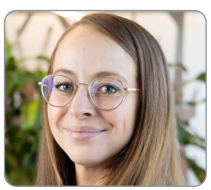
Amber Holtz, MD
HO III

Michael Olp, MD
HO III

Eric Chang, MD
HO II

Jang Cho, MD
HO II

Timothy Dinh, MD, PhD
HO II



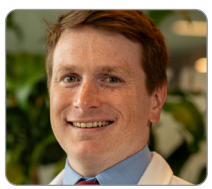
Isabella Holmes, DO
HO II

Sarah Farran, MD, MPH
HO II

Lauren Miller, MD, MJ
HO II

Mark Rudolf, MD, PhD
HO II

Daniel Alt, MD, PhD
HO I



Chris Henderson, MD, PhD
HO I

Meredith Herman, DO
HO I

Jenelle Lee, MD
HO I

Nicole Patel, MD
HO I

Orlando Quincoces, MD
HO I

Jacob Sorenson, MD
HO I

Andrew Valesano, MD, PhD
HO I

Nikki Chiang, MD
*Incoming* HO I

Chia-Ming Lee, DO
*Incoming* HO I

Jared Neeley, MD
*Incoming* HO I

Zemplen Pataki, MD, PhD
*Incoming* HO I

Benjamin Telford, DO
*Incoming* HO I

Camille Van Neste, MD, PhD
*Incoming* HO I

# 2023-2024

## Pathology Residents

**Madelyn Lew, MD**
*Director*, Medical School Pathology Education Curriculum

students can participate in a variety of integrated electives that span multiple disciplines, enhancing their understanding of disease processes, presentations, and management within the pathology department. The **General Pathology Elective**, under the direction of Dr. Madelyn Lew, offers students an in-depth look at the daily practice of academic pathologists across multiple subspecialties. In 2022, Dr. Lew and her team redesigned the elective into the highly successful **Pathology Passport**. This approach allows students to tailor their experience based on personal interests, completing required and optional rotation-specific activities. These activities are assigned point values based on difficulty and effort, accumulating toward Pass, High Pass, or Honor grades.

Activities include observing and participating in the macroscopic evaluation of specimens, independently previewing active clinical cases, and leading group discussions on case-related ancillary studies and clinicopathologic correlations. While many students in the elective may ultimately pursue other fields, a distinct subset uses this experience to evaluate pathology as a potential career choice. Our faculty provides individualized mentoring for these students to guide them through their decision-making process.

Additionally, subspecialty electives in **Dermatopathology** and **Neuropathology** offer further learning opportunities for those interested in specific fields of pathology.

## Molecular & Cellular Pathology Graduate Program

**Simon P. Hogan, PhD**
*Co-Director*, Molecular and Cellular Pathology Graduate Program

**Jean-Francois Rual, PhD**
*Co-Director*, Molecular and Cellular Pathology Graduate Program

The mission of the Molecular and Cellular Pathology (MCP) Graduate Program is to train the next generation of "Bench-to-Bedside" scientists, focusing on the molecular and cellular mechanisms underlying the pathogenesis of human diseases. Established in 1992, the MCP program is hosted by the Department of Pathology and is uniquely positioned to bridge basic and clinical sciences, fostering interdisciplinary projects and interdepartmental collaboration.

The 23 students currently enrolled in the MCP program conduct transformative research, ranging from basic to translational studies, in more than 35 MCP research labs. The program promotes interdisciplinary, translational research that advances the application of scientific discoveries, offering an enhanced educational experience and training in "Bench-to-Bedside" approaches. Our goal is to recruit a diverse group of talented students and provide them with the optimal environment to prepare for careers in academia, the biotech/pharma industry, teaching, scientific publishing, clinical research, or governmental/regulatory agencies.

In March 2023, Drs. Simon Hogan and Jean-Francois (Jeff) Rual were named the new MCP Program Co-Directors following the appointment of Dr. Zaneta Nikolovska-Coleska as the Associate Dean of Graduate and Postdoctoral Studies. The MCP community honored Dr. Nikolovska-Coleska's ten years of service as MCP Director (2013–2023) during the 22nd Annual Pathology Symposium in November 2023.

Students join the MCP program through the Program in Biomedical Sciences (PIBS) for PhD students or the Medical Scientist Training Program (MSTP) for MD/PhD students. Four first-year students joined the program through PIBS in FY24: Bretton Badenoch, Paula Reichel, Thandiwe-Kesi Robins, and Neil Zhao. As of the end of the 2023-2024 academic year, 23 students were enrolled in the MCP program, including 22 PhD students and 1 MD/PhD student.

The preliminary examination ("prelim") tests the student's ability to identify a novel scientific hypothesis and develop a research plan to test it. In December 2023, six students successfully passed their preliminary examination and advanced to candidacy, allowing them to focus on their thesis research: Franchesca Fonseca-Lanza (Muntean lab), Max Keller (Z. Wang lab), Grace McIntyre (DiFeo lab), Sydney Musser (Grembecka lab), Charukesi Sivakumar (Rao lab), and Madeline Sykes (Leiser lab).

Four MCP students graduated in FY24:

- Mohamad Mire – Postdoctoral Fellow, FDA
- Michael Pitter – Senior Scientist, Pfizer
- Derek Dang – Laboratory Leadership Fellow, CDC
- Sahiti Marella – Postdoctoral Fellow, University of Michigan

Matthew Bayes, MD, PhD
Molecular Genetic Pathology Fellow

Nicole Becker, MD
Neuropathology Fellow

Heather Chen-Yost, MD
Pathology Faculty

Sabina Desar, MBBS
Assistant Professor

Efrain Gutierrez-Lanz, MD

Geoffrey Halling, MD
Clincal Instructor

Hans Magne Hamnvag, MD
Surg. Pathology Fellow

Anup Jnawali, MD
Hematopathology Fellow

Ryan Landvater, MD
Neuropathology Fellow

Vincent Laufer, MD, PhD
Informatics Fellow

Suguna Narayan, MD
Pathology Faculty

William Perry, MD, MPH
Pathology Faculty

Jaclyn Plotzke, MD
Pathology Faculty

Arjun Reddy, MD
Molecular Pathologist

Andrew Schuler, MD
Dermatologist & Dermatopathologist

Julianne Szczepanski, MD
Molecular Genetic Pathology Fellow

Kriti Tiwari, MD

Mary Torrez, MD
Cytopathology Fellow

Katelyn Zebrowski, MD
Surgical Pathologist

| Graduating Fellows | Institution |
|---|---|
| Matthew Bayes, MD, MPH | John Hopkins |
| Nicole Becker, MD | Michigan Medicine |
| Hans Magne Hamnvag, MD | Mayo Clinic, Rochester, MN |
| Anup Jnawali, MD | Beth Israel Deaconess Medical Center |
| Ryan Landvater, MD | Michigan Medicine |
| Vincent Laufer, MD, PhD | Michigan Medicine |
| Jaclyn Plotzke, MD | Michigan Medicine |
| Arjun Reddy, MD | Tempus, Chicago, IL |
| Andrew Schuler, MD | UM Health West |

| Graduating Clinical Instructors | Institution |
|---|---|
| Heather Chen-Yost, MD | Michigan Medicine |
| Sabina Desar, MBBS | Virginia Commonwealth University |
| Efrain Gutierrez-Lanz, MD | -- |
| Geoffrey Halling, MD | Michigan Medicine |
| Suguna Narayan, MD | Michigan Medicine |
| William Perry, MD, MPH | Michigan Medicine |
| Julianne Szczepanski, MD | Michigan Medicine |
| Kriti Tiwari, MD | -- |
| Mary Torrez, MD | University of Mexico |
| Katelyn Zebrowski, MD | Michigan Medicine, Grand Rapids |

As of June 2024, a total of 89 students have graduated from the MCP program.

One of the marquee events in the Department of Pathology is the Annual Pathology Research Symposium. Organized by third-year MCP students, the symposium showcases our faculty and trainees' oral and poster presentations, highlighting the department's innovative research. A featured career panel offers insights into career pathways for PhD and MD/PhD graduates. The event concludes with an awards ceremony, presenting the MCP Outstanding Research and Service Awards and recognition for the best oral and poster presentations.

The symposium provides numerous opportunities for stimulating interactions between students and faculty, fostering discussions, idea sharing, and collaboration.

**Peer-Reviewed Publications by MCP Students**

First or co-first authorship papers:

- Alexander Monovich – *Adv Exp Med Biol* (IF: 11.4) – PMID: 39017849
- Sahiti Marella – *J Allergy Clin Immunol* (IF: 14 ) – PMID 37652141
- Michael Pitter – *Cell Rep* (IF: 9) – PMID 38489266
- Rodolfo Cabrera Silva – *FASEB J* (IF: 5) – PMID 39139033
- Kristen Lozada-Soto – *Nature Communications J* (IF: 17) – PMID 37798277
- Mohamed Mire - *Viruses* (IF: 4) - PMID 38932202

Other co-author papers:

- Koral Campbell – *Hum Mol Genet* (IF: ) – PMID 38888340
- Alec Chu – *JCO Precis Oncol* (IF: ) – PMID 38579192; *Prostate Cancer Prostatic Dis* (IF: ) – PMID 39019980
- Derek Dang – *Acta Neurpathol* (IF: ) – PMID 37851269
- Sanjana Eyunni – *Cancer Cell* (IF: ) – PMID 39029462; *J Med Chem* (IF: ) – PMID 38687638; *bioRxiv* – PMID 38328238, 38464251, 38586029; *Nat Genet* (IF: ) – PMID39251788; *Nature* (IF: ) – PMID 38649489; *Cell Rep Med* (IF: ) – 39368479
- Sahiti Marella – *J allergy Clin Immunol* (IF: ) PMID38777155; *Mucosal Immunol* (IF: ) PMID 39038754
- Alexander Monovich – *Cell Genom* PMID: 38116118, *bioRxiv* PMID38798454
- Sydney Musser – *Neurosci Biobehav Rev* (IF: ) – PMID 37925091
- Siva Kumar Natarajan, Derek Dang, Joanna Lum – *Cancer Cell* (IF:) – PMID: 38039965
- Christian Rizza – *Mucosal Immunol* (IF: ) – PMID 39038754
- Agamjot Sangotra – *Stem Cell Res* (IF: ) – PMID 39353357
- Charukesi Sivakumar – *Biochem Biophys Res Commun* (IF: ) – PMID 39278095
- Jessica Teitel – *Res Sq* (IF: ) – PMID 38585734; *Cell Death Differ* (IF: ) PMID 39349971

**Financial Support and Awards**

Students in good standing receive full tuition support, healthcare benefits, and a stipend throughout their graduate studies (current stipend: $41,308). MCP students also have access to numerous grant opportunities, fellowship awards, and financial aid from MCP or the Department of Pathology, the U-M Rackham Graduate School, the U-M Office of Graduate & Postdoctoral Studies (OGPS), and external institutions.

The MCP program further supports graduate students through the MCP Student Research Grant, a competitive internal award designed to fund student-initiated research projects and advance their progress toward their degrees. This $3,000 grant encourages independent research by providing support for novel or high-risk ideas, offering proof of concept for feasibility and further study.

**Extramural Awards**

- MCP students continue to be successful in obtaining prestigious extramural research awards and fellowships during their graduate studies. External fellowships or awards supported fourteen MCP students during the 2023-2024

academic year:

- Koral Campbell (Li/Muntean Labs): Rogel Cancer Center Student Scholarship (2023-2024)
- Sahiti Marella (Hogan Lab): NIH F31 Fellowship (2023-2024)
- Jessica McAnulty (DiFeo Lab): NIH F31 Fellowship (2022-2024)
- Kristen Lozada Soto (Parkos-Nusrat Lab): NIH F30 Fellowship (2022-2024)
- Grace McIntyre (DiFeo Lab): National Science Foundation (NSF) Graduate Research Fellowship (2022-2025)
- Joanna Lum (Venneti Lab): Training Program in Translational Research, NIH T32 Predoctoral Fellowship (July 2023 – December 2023)
- Joanna Lum (Venneti Lab): ChadTough Defeat DIPG Fellowship Award (January 2024-December 2026)
- Noah Puleo (DiFeo Lab): TPTR, NIH T32 Predoctoral Fellowship (2022-2024)
- Sydney Musser (Cierpicki/Grembecka Lab): Training Program in Translational Research, NIH T32 Predoctoral Fellowship (2023–2025)
- Shih-Chun Chu (Cieslik Lab): Proteogenomics of Cancer Training Program, NIH T32 Predoctoral Fellowship (2023-2024)
- Gabrielle Rozumek (Prasov/Lieberman Labs): Vision Research Training Program, NIH T32 Predoctoral Fellowship (2023-2024)
- Franchesca Franzen (Muntean Lab): Michigan Institute for Clinical & Health Research Training Program, NIH T32 Predoctoral Fellowship (2024-2025)
- Sanjanna Eyunni (Chinnaiyan/Parolia Labs): AACR Scholar in Training Award (April 2024)
- Charukesi Sivakumar (Rao Lab): ARVO Science Communication Training Fellowship (June 2024)
- Grace McIntyre (DiFeo Lab): Barbra Ann Robson Ovarian Cancer Research Fellow (June 2024)
- Internal U-M awards and fellowships (e.g., from Rackham or OGPS, not including MCP-sponsored awards) supporting MCP students in 2023 include:
- Joanna Lum (Venneti Lab): Rackham Merit Fellowship (2021-2025)
- Mohamed Mire (Lukacs Lab): Rackham Merit Fellowship (2019-2023)
- Alexander Monovich (Ryan Lab): Rackham Predoctoral Fellowship (2023-2024)
- Charukesi Sivakumar (Rao Lab): Rackham Graduate Student Research Grant (January 2024)
- Gabrielle Rozumek (Prasov/Lieberman Labs): Rackham International Travel Grant (April 2024)
- Gabrielle Rozumek (Prasov/Lieberman Labs): OGPS Service Award (April 2024)
- Grace McIntyre (DiFeo Lab): Rackham Conference Travel Grant (April 2024)
- Mohamed Mire (Lukacs Lab): Rackham Conference Travel Grant (May 2024)
- Franchesca Franzen (Muntean Lab): Rackham Conference Travel Grant (May 2024)
- Koral Campbell (Li/Muntean Labs): Rackham Conference Travel Grant (May 2024)
- Neil Zhao (Sexton/Keller Labs): Rackham International Travel Grant (June 2024)
- Thandiwe-Kesi Robins (Fisher/Nusrat Labs): Rackham Merit Fellowship (2023-2027)

**Community Service, Outreach and Social Events**

Many MCP students give back to the community through educational and outreach programs, and they have a long history of being impactful benefactors in their communities. The selfless dedication of our students to service is recognized annually, with one student receiving the MCP Outstanding Service Award at the Annual MCP Research Symposium. At the 22nd symposium, Gabrielle Rozumek (Prasov Lab) was honored with the 2023 MCP Outstanding Service Award for her work in supporting

**Karen Barron**
*Program Manager,* Allied Health Education

first-generation college students and engaging them in science research.

Several MCP students also serve as instructors for the Developing Future Biologists (DFB) program. This educational outreach initiative trains the next generation of biologists, regardless of race, gender, or socioeconomic background. In May 2023, the Department of Pathology and MCP jointly committed to contributing $2,000 per year for five years to support the DFB program (totaling $10,000). MCP is grateful for the department's support in advancing our students' outreach efforts.

Furthermore, MCP students are actively involved in various student organizations, including F.E.M.M.E.S and SACNAS (focused on diversity, equity, and inclusion), SEEK (K-12 education), ESPA and BGSG (professional development), MISciWriters (science communication), and miLEAD (business consulting). These organizations provide students with opportunities to engage in campus issues, connect with like-minded peers, and develop leadership and mentoring skills.

MCP student Gabrielle Rozumek was the recipient of the 2024 Phyllis M. Wise Biomedical Sciences Graduate Student Award for Excellence in Service (April 2024). This makes two years in a row that MCP students have been the recipients of the OGPS Excellence in Service Award: Derek Dang (2023) and Gabrielle Rozumek (2024). This success demonstrates the commitment and value MCP graduate students place on community services and outreach and is one way our students positively impact our local community and beyond. This academic year, once again, the MCP team continues to be truly impressed by the high level of commitment to service demonstrated by Gabbi and so many of our MCP students.

### Social Events

The MCP community meets regularly to socialize. Latest events in 2023/2024 include introduction to the French game of pétanque at Gallup Park (July 2023), ice-cream social to welcome first-year MCP students into our community (August 2023), happy hour at Casa Dominick's (October 2023), upscale dinner at the Gandy Dancer restaurant to kick off the 22nd Annual MCP Research Symposium (November 2023), the taste of global flavors at the multicultural potluck to celebrate our culinary differences before the holiday season (December 2023), bowling social event with trainees in Clinical Pathology (May 2024).

## Allied Health Education

In FY24, the Allied Health Education program, led by manager Karen Barron, expanded its offerings to support Pathology employees, educate interns, and raise awareness of medical laboratory professions within the community. Barron coordinated the return of in-person New Employee Orientation, including NCRC and UH tours. Additionally, an Allied Health Continuing Education webpage was created, providing employees with resources and links for professional development and free continuing education opportunities

The Department also expanded its internship programs to include internships for technologists in microbiology and histotechnology and an externship for phlebotomists. These additions complemented the existing Medical Laboratory Scientist internship program, which graduated 14 students in FY24. The new internship programs each graduated their first students, and five students completed the phlebotomy externship during the same period.

Outreach efforts included visits to high schools in Washtenaw and Wayne counties, where hundreds of students were introduced to medical laboratory professions and job opportunities at Michigan Medicine Pathology. Ann Arbor High School Health Occupations students also participated in job shadowing within our Core Lab, providing them with a firsthand look at careers in pathology. Participation in special events, such as the Youth Summit at the Big House and the Parkridge Community Festival, further reached students and adults from underrepresented groups in medical laboratory careers, supporting the department's DEI efforts to recruit a diverse workforce.

### Conferences and Symposia

*22nd Annual Pathology Research Symposium November 3, 2023*

This symposium featured lectures from Molecular and Cellular Pathology doctoral candidates, Michigan Medicine faculty, and

visiting professors to offer attendees a broad view of molecular and cellular pathology research. Keynote speaker Dr. Charles Mullighan, from the Department of Pathology at St. Jude Children's Research Hospital, gave the audience a fascinating lecture on "Acute leukemia at the intersection of genomics and cell of origin" where he described the research his lab is doing by leveraging genomic technologies to help discover advances in cancer diagnosis and therapy.

Several students received awards at the Symposium including:

- Outstanding Research Award - awarded to an MCP graduate student for their creativity and outstanding research achievements. This year, Sahiti Marella (Hogan Lab) was the recipient of this award for her research accomplishments and her work on IL-13-induced STAT3 dependent signaling networks regulate esophageal epithelial proliferation in eosinophilic esophagitis.
- Outstanding Service Award - awarded to a student who helps serve not only the U-M community but local communities as well. This year, the second annual Outstanding Service Award went to Gabrielle Rozumek for her work with students who will be first-generation college students and getting them involved in science research.
- Best Oral Presentation Award - Gabrielle Rozumek (Prasov Lab) was also awarded the Best Oral Presentation Award for her talk on "Unlocking the Secrets of Small Eyes: Using a Humanized Mouse Model Eye Size Disorders."
- Best Undergraduate Poster - Varun Ponnusamy (Shah lab), Mineralocorticoid Receptor: A Novel Tumor Suppressor in Colorectal Cancer
- Best Postdoc Poster - Aishwarya Gurumurthy (Cieslik/Ryab labs), Functional Profiling identifies Selective Enhancer Dependencies in MYC-Intact and MYC-Rearranged Diffuse Large B-Cell Lymphoma
- Best Non-MCP Graduate Student Poster - Caleb Cheng (Lyssiotis/Chinnaiyan labs), Targeting PIKfyve to leverage metabolic vulnerabilities for pancreatic ductal adenocarcinoma therapy
- Best MCP Graduate Student Poster - Derek Dang (Venneti lab), Investigating Metabolic Dependencies of Group 3 Medulloblastoma

*The Clinical Pathology Symposium April 16, 2024, "Meet the Future of Pathology"*

The CP Symposium energized about 150 attendees with three featured speakers and a bone marrow donation drive. Cherie Petersen, Distance Education Program Coordinator from ARUP Laboratories Institute for Learning presented "Communicating When There is Potential for Conflict." Participants explored an easy three-part strategy to instill greater confidence and facilitate more satisfying outcomes when managing conversations where there's the potential for conflict. This was followed by a B-ALL Case Study: Connecting the Patient Experience, Laboratory Diagnostics, and Stem Cell Transplant, with Drs. Riccardo Valdez, Mark Girton, and Jensyn Cone Sullivan. This presentation followed the clinical care and diagnostic process from the perspective of the patient and direct-care provider experience. Laboratory technologies such as routine microscopy, flow cytometry, and molecular diagnostics were discussed and topics relevant to the care of patients with hematopoietic disease such as blood product support and transplant registries were reviewed. Participants also had the opportunity to sign up for the Bone Marrow Registry with NMDP. The final session of the day, "AI and Data Analytics in Support of Laboratory Medicine at Michigan Medicine – Current Capabilities and Future Directions" was presented by Drs. Ul Balis and Lee Schroeder. Drs. Balis and Schroeder discussed the general classes of AI tools and methodologies that enable data analytics and machine learning and examined what is currently available and what is coming to the Department of Pathology. Throughout the presentation, several examples of interactive web-deployed tools were showcased.

*7th Annual T32 TPTR Retreat June 26, 2024*

At this event, the trainees presented their translational research projects. The keynote speaker was Shuibing Chen, PhD, Professor of Chemical Biology in Surgery and Biochemistry, Kilts Family Professor of Surgery, Weill Cornell Medical College, who

presented a lecture entitled “Human Pluripotent Stem Cells, Organoids, and Disease Modeling.” In addition, three alumni presented their research, including Joanna Lum (MCP Graduate Student), Padma Kadiyala, PhD (Immunology graduate), and Brian Basinski (MCP Graduate Student), as did one current trainee, Lwar Naing. The symposium’s agenda was rounded out with a presentation by Dr. Bradley Martin, Director of the Fast Forward Medical Innovation program, who discussed resources for technology commercialization.

The TPTR holds a weekly research seminar series and highlights research from our own faculty and trainees as well as research conducted by invited guest lecturers. The T32 TPTR holds monthly workshops covering topics of relevance to translational research and showcases the work being done by our trainees.

## Communications

**Lynn McCain, MHSA, PMP**
*Director*, Communications

The communications team within the Division of Training Programs and Communications, led by Dr. Kamran Mirza, serves as the internal and external communicator for Michigan Medicine’s Department of Pathology. The team consists of two full-time staff members, Director of Communications Lynn McCain, MHSA; Communications Specialist Anastazia Hartman, MS, MBA; and one fractional team member, Brent Temple, Web Developer and Graphic Designer from the Division of Pathology Informatics. During FY24, two work-study students (Zoe Shafiezadeh and Bailey Fraker) interned with the team to support video, graphic design, and archival of historical photos.

The team’s work includes major publications, news articles, feature stories, social media, photography, videography, graphic design, web development, symposia promotion, podcasts, posters, and event collateral. These mediums are utilized to support each division within the department and meet its specific needs. In addition, the Director supports departmental presentations and correspondence for the Chair and Director of Experimental Pathology.

### Education

The University of Michigan is known for its teaching, research, and education expertise. In FY24, the communications team supported four Department of Pathology-led symposia: New Frontiers in Pathology, Pathology Research Symposium, Clinical Pathology Symposium, and the Advances in Forensic Medicine and Pathology conference. Support for these events included registration creation, digital and print flyers, save-the-dates, programs, poster printing, social media and email marketing campaigns, photography and videography, and event recap articles.

In FY24 the Department of Pathology provided funds and communication support to the Association of Pathology Informatics Annual PI Summit held at Eagle Crest Resort in Ypsilanti, MI. Communications support began with utilizing the U-M Pathology and Michigan Medicine Laboratory (MLabs) social media channels for pre-event promotion. During the week of the summit (five days), the communications team photographed 37 presentations, multiple exhibitor events, three poster sessions, and multiple networking events. The team also published a recap article about the meeting to enhance its visibility for future years.

Our website and social media platforms highlight trainees’ educational achievements and feature stories to enhance awareness of our training programs. Special events, such as the Youth Summit at the Big House, which aims to reach the next generation of biomedical scientists, are also photographed and highlighted on our website and social media platforms.

Alongside our educational mission, the communications division supports continuing education and training through poster printing for faculty, trainees, and staff attending national and international conferences such as USCAP and ASCP.

### Photography

Photography is an important focus for the communications team. Our communications specialist supports headshots, passport photos, group photography, symposia photography, event photography, candid photography for articles, and other photography needs as necessary. In FY24, our communications specialist captured over 11,000 photos, including over 250

headshot and passport photos, 3,981 symposia photos, 4,643 event photos, 2,771 candid/article photos, 15 group photos, and over 200 other photos.

### Publications

The communications division writes, designs, and publishes two large pieces, *Inside Pathology* Magazine and the Department of Pathology's Annual Report, annually.

The externally shared *Inside Pathology* magazine, released every June, features dynamic stories from within our department, providing an up-close and personal look at our department's labs, faculty, trainees, and staff. To date, 10 magazines have been published. The FY24 edition focused on new technology to help advance diagnosis and patient care, discussing specifically Dr. Arul Chinnaiyan's MiOncoSeq, Dr. Annette Kim's Division of Diagnostic Genetics and Genomics, Dr. Carmen Gherasim's automation to enhance laboratory efficiency, and Dr. Mustafa Yousif's integration of digital pathology. Magazines from 2014 to the present can be found *here* under the *Inside Pathology* tab in the upper right-hand corner of the website.

The team also creates and publishes the department's Annual Report. This report combines data, advancements, and important milestones from all divisions in the department. Through text, photography, graphs, and graphics, key information is highlighted providing an easily digestible document for a comprehensive overview of the year. Annual Reports from 1980-present can be found, *here*.

The departmental website keeps our internal and external audience updated with the latest news and events happening around the labs and campus. FY24 has provided the opportunity to write and share 91 articles covering topics ranging from event recaps to career pathway stories to research updates.

### Social Media

The Department of Pathology utilizes multiple social media platforms to communicate with external audiences. U-M Pathology can be found on X (formerly Twitter), Instagram, Facebook, and YouTube. The communications team also supports the Michigan Medicine Laboratory's X and LinkedIn accounts. The UMichPath channels share a wide array of content, including news and feature articles, Cases of the Week, event photos, and other pathology-related content, while the MLabs platforms share product updates, conferences, and other relevant information for their clients.

*UMich Path — X*
For the Department of Pathology, X is the largest platform utilized. With almost 12,000 followers, X provides the department a gateway to external audiences to share news, research updates, cases, events, and more. In FY24, the team posted 330 times, gaining 29,125 total engagements (34.8% increase from FY23), 4,430 total likes (23.3% increase from FY23), and 1,074 new followers.

*UMich Path — Facebook*
In FY24, the communications team shared 134 pieces of content, gathering 17,830 total engagements (53% increase from FY23), 3,348 total likes (67.3% increase from FY23), and gained 251 new followers, an increase from FY23.

*UMich Path — Instagram*
In FY24, 24 static posts, 6 reels, and 55 stories have been shared to our external audiences. Our IG posts gained 1,200 total engagements, (8% increase from FY23), 1,103 total likes, (1% increase from FY23), and gained 148 new followers. Creating IG Reels was a new strategic step the communications team took to increase interest in pathology. In FY24, our Reels gained 4,294 views. In January 2024, the team began increasing our IG stories usage, however, our engagement with stories was low (76 total engagements).

*UMich Path — YouTube*

The Department of Pathology YouTube allows the department to highlight different aspects of our department through video. In FY24, the department shared seven videos gaining 256 views, a decrease from FY23. While followers increased by 231 in FY24,


**Above Image:**

The 2024 issue of the annually published, *Inside Pathology*.

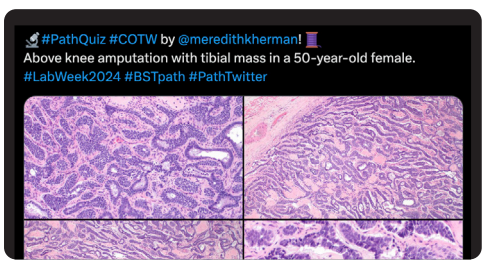
this was a smaller gain compared to the 398 followers gained in FY23.

As I reflect on the immense opportunities before us, I am filled with a deep sense of gratitude for the chance to lead such an extraordinary team at the University of Michigan. The remarkable resources, talent, and shared vision within this department make it clear that we are on the cusp of even greater achievements. The complete digitization of our department, the integration of novel technologies, and our expanding global footprint signal that the future of pathology education at Michigan Medicine is bright and full of possibility.

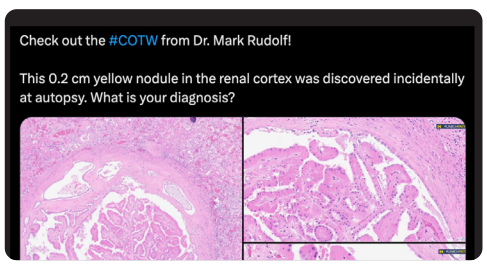
Looking to the future, I am excited to build upon this foundation as we fully embrace the complete digitization of our department. This transformation opens the door to visionary changes in pedagogy and curricular execution. We are exploring innovative ways to expand our global pathology footprint, with a focus on reaching junior learners and those in low-resource settings. By leveraging UM resources like the Center for Academic Innovation and integrating novel technologies such as virtual reality (VR) and 3D printing, we aim to revolutionize the way we assess and teach competence in pathology. These technologies hold the potential to enhance interactive learning and bring previously unimaginable educational experiences to our trainees. Stay tuned for more exciting developments as we continue to push the boundaries of what's possible in pathology education.

I am confident that our collective efforts will continue to inspire, innovate, and lead the way forward. Together, we are redefining pathology education and pushing the boundaries of

## Top Posts




X **COTW:** Meredith Herman



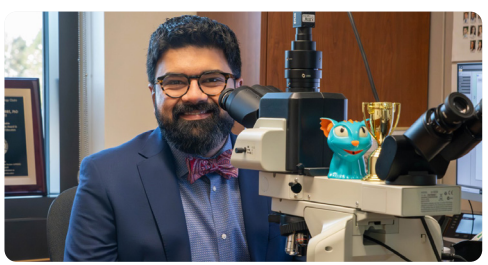

X **COTW:** Mark Rudolf

f Trainee Picnic 2023


Match Day 2024


X Welcoming Dr. Kamran Mirza


X Resident & Fellow Event



f Mirza Welcome

what is possible in healthcare. It is an honor to be part of this transformative journey, and I look forward to working alongside each of you as we chart new territory, inspire future generations, and expand our reach across the globe. Our shared dedication to excellence and innovation will ensure that Michigan Pathology remains a leader in shaping the future of medicine for years to come.

Chief Residents

MCP Symposium


Youth Summit

Youth Summit

# Pathology Informatics

**Ulysses Balis, MD**
*Director,* Pathology Informatics

The Division of Pathology Informatics (PI), which serves as one of the functional units of the overall Pathology Department, serves the tripartite missions of the department, including clinical operations support, original research, and education. As an informatics division, it is somewhat unique among contemporary academic pathology departments in that it maintains both its own embedded teams of technical staff IT specialists and associated IT infrastructure while still maintaining active dialog and alignment with the Health Enterprise's central IT group. This unique governance model allows the division to maintain its critically needed self-autonomy for project oversight and prioritization while at the same time leveraging consistent best-practice IT standards and methodologies as determined by the health system at large. It affords the division both the ability to carry out internal prioritization of the department's many projects, as well as the ability to carry out original IT development efforts independently.

In addition, the division hosts its own active thrusts in fundamental areas of information technology, machine vision, and deep learning research, including computational imaging of Whole Slide Imaging (WSI) subject matter, asset tracking solutions, computational pathology, natural language processing, and medical information interoperability. Fundamentally, PI operates as a service unit within the greater department, covering a wide range of operational, strategic, and educational functions, with these various missions tied together by a centrally governed team of superbly trained information technology specialists who, at the same time, possess substantial familiarity with the clinical lab and its associated workflows.

The division is comprised of two full-time faculty, three adjunct faculty (with primary appointments in Anatomic, Molecular Pathology, and Clinical Pathology), two informatics fellows, and 47 full- or part-time staff. Of specific note is Dr. Mustafa Yousif's continued leadership role in Digital Pathology, with activation planned for late 2024. This project has represented a substantial investment of time and resources by many members of the division, with significant expertise applied from far-ranging areas, including site preparation and furniture casework, human-computer-interaction, electronic interface optimization, display monitor color calibration and normalization, whole slide scanner non-inferiority study design and implementation, and workflow optimization. Staffing of the new scanning section within anatomic pathology is now complete, with the team being trained for the anticipated large volume of case growth as incremental subspecialty services are activated through the 2024 and 2025 calendar years. Specific coverage of key aspects of the digital pathology activation are further covered in the Digital Pathology section of this report.

Drs. Mustafa Yousif and Jerome Cheng continue as primary appointment faculty members of the Informatics Division, with Drs. Lee Schroeder and Robert Bell serving as adjunct members. These added appointments continue to provide continuity with the collective clinical laboratories at large and the recently created Division of Diagnostic Genomics and Genetics (DGG). All current faculty in the division hold subspecialty boards in Clinical Informatics, thus making Pathology's PI faculty team at Michigan one of the largest pathologist-led informatics groups in the nation.

In consonance with the division's growing number of full-time and adjunct informatics faculty, the added number of the division's highly skilled IT specialists brings the total division staffing to one of the largest stand-alone pathology informatics academic units in the US.

The FY24 witnessed the continued evolution and growth of the Division's expansive portfolio of web-accessible dashboards and analytics tools. Many of the newer data products and associated displays are based on a comprehensive, underlying

data analytics/machine learning architecture. Examples of new performance metrics now available include real-time whole slide scanning lab section turn-around time, consult case volume statistics, and real-time geospatial tracking of specimens in transport, just to name a few.

**Major Divisional Thrusts**

Digital Pathology: Without question, the deployment of digital pathology for primary diagnosis has been one of the singular thrusts for the division over the past year, with much effort expended on a staged deployment plan that was respectful of the Anatomic Pathology Division's need to stay fully operational during the deployment process. This logically equated to identifying the optimal sequence to activate subspecialty services, with the Renal Pathology, Pediatric Pathology, and Cardiovascular Pathology services identified as being appropriate in case volume and complexity to serve as the first adopters.

In preparation for the transition to digital workflow for these initial services, the Informatics Division also carried out extensive configuration exercises and enhancements of the Sectra-based Image Management Solution (IMS). Sectra was ultimately selected to serve as the core workflow engine for Digital Pathology. This solution carried several critical strategic advantages, including its already established presence in the Michigan Medicine health enterprise as the solution serving Radiology and Cardiology. As such, the activation of Sectra's Pathology IMS represented a significantly reduced integration effort compared to the effort that would have been needed had a de novo vendor been selected instead.

In tandem, the Informatics Division partnered with AP to specify a suitably scaled scanning team to oversee the day-to-day operation of the anticipated clinical scanning lab section, identifying an optimal staffing model for 24/7 coverage. Also, recognizing that the scanning lab would be addressing the need to scan 100% of histology's current workload (approximately 2,000-2,500 slides per day), a detailed time-motion study was conducted to identify typical and peak volumes throughout the day and across all days of the week. This revealed that seven high-capacity scanners (Leica-Aperio GT-450s) would be needed to address the current departmental case and slide volume with a suitable excess capacity safety margin.

A formal LEAN-based approach was taken to identify the most efficient way to incorporate an added digital scanning step into histology's clinical workflow. Conveyance analysis and spaghetti diagrams revealed that the current placement of major instruments in histology, namely the HE600 slide stainer/coverslipping machines, was suboptimal. These machines were relocated, creating the necessary bench space for the GT-450s and allowing the HE600s to be only a few steps away from the scanners. When completed, the focused remodeling of one section of the histology lab allowed for a scanning workflow that was essentially seamless to the slide preparation process and fully aligned with the long-term goal of allowing for slides to be expeditiously shuttled to the slide file room after scanning, thus minimizing the likelihood of asset loss or misplacement. The Department of Radiology, which already had extensive experience with the general operation of the Sectra software framework, provided significant technical assistance and expertise with the Pathology module's initial installation, thus freeing up Pathology Informatics to focus on the actual workflow model to be utilized by departmental faculty, residents, fellows, and staff. Much preparative effort was expended in the workflow analysis, including multiple Gemba walks and focus group sessions that targeted specific tasks.

The resultant workflow specifications gained from these efforts allowed for the placement of a significant number of enhancements in the Sectra Pathology IMS. Sectra agreed to integrate key changes in their software as enhancements and not mere customizations; these features will become intrinsic to their core application permanently.

Examples of workflow innovations developed as a result of this partnership include:

- Automated linkage of cases in Sectra and the host lab information system (SCC-Soft), such that opening a case in either system triggers the opening of the same case in the other system – a significant patient safety issue.

- Modification of the core Sectra preanalytical lab workflow, such that 100% of all scanned slides will be reviewed by scanning lab staff for acceptable image quality and full scanner coverage of all the available tissue sections (a known vulnerability of whole slide scanning workflow).
- Synchronized viewing of multiple slides simultaneously, linking both slide position and magnification, with this feature allowing for simplified evaluation of immunostained slides against reference H&E-stained sections.
- Extraction of clinical data from SCC-Soft such that users of the IMS do not have to carry out time-consuming context switching between the two systems. Rather, the workflow in Sectra was envisioned and then constructed as an immersive environment where most activities can be carried out in the IMS alone, greatly simplifying workflow.
- Additional architectural features in the Sectra software, such that case signout and special stain ordering can be shifted to actions taking place in the IMS itself, similarly reducing the cognitive burden of context switching between disparate information systems. These features will be activated in the near future following the stabilization of the initial Sectra platform.
- Notification panels integral to the IMS, where the department's own internal website content, including newsworthy items, departmental announcements, as well as well-health notices (e.g. eye fatigue interval notifications) can be displayed within the signout cockpit.

**Pathology Renovation and Relocation (PRR)**

Pathology Informatics continued its role in supporting the ongoing PRR effort. This included participation in multiple technical reviews of the audio-visual (AV) installations at University Hospital and supporting the installation of myriad devices and network connections throughout the new lab areas. As a consequence of these interactions, the Informatics Division identified multiple instances where more economical and ergonomically favorable solutions were available. Additionally, a core set of standardized configurations was selected for AV deployments, which will promote consistency of operation and support throughout the many laboratory locations at University Hospital currently supported by Pathology Informatics.

**Research**

The ongoing U01 NIDDK grant (Balis: Co-PI) in partnership with Aga Khan University in Nairobi has progressed very quickly and on schedule, with this global health educational project now entering the deployment phase for its core imaging technology. Currently, AI-based whole slide imaging tools are being placed in the cloud to educate pathologists in training in low and middle-income countries (LMICs). The long-term vision for this effort centers on empowering local pathology departments to more effectively train residents and fellows in anatomic pathology diagnostic skills – a critically needed resource. Moreover, this project has catalyzed further global health initiatives, including an educational partnership with the Department of Pathology at the American University of Beirut.

Similarly, the U2C-funded NIDDK grant, in partnership with UM Urology, continues to make solid progress in generating autonomous AI image-based pipelines that can assist in identifying histological hallmarks closely coupled with the development of pelvic floor incontinence with advancing age—a poorly understood process at the ultrastructural level.

**Education**

The Pathology Informatics Resident Lecture Series was restructured as a two-week rotation offered in Spring. It includes didactic content and interactive exercises using contemporary data sciences tools, such as the Python and R languages, along with large language model tools like ChatGPT and Llama. During this rotation, residents and fellows are encouraged to explore algorithmic and programmatic approaches that accelerate the application development process, emphasizing code quality and accuracy.

The Division of Pathology Informatics again served this year as the convenor and secretariat for the Association of Pathology

Informatics' (API) national meeting, known as the Pathology Informatics Summit. This meeting was for the first time held locally in Ypsilanti, MI, at the Eagle Crest Resort, and co-branded as a University of Michigan/Michigan Medicine educational event (another first), with attendance hitting a record level for the Summit's 16-year history, with 465 registrants and 32 vendor exhibitors. The PI division will again host this meeting in 2025 as a local event in Ypsilanti at the same venue.

Finally, one member of the Division (Balis) continues in his role as Co-Chair of the Longitudinal Assessment Program (LAP) of the Clinical Informatics Boards, which is administered jointly by the American Board of Pathology and the American Board of Preventive Medicine.

**Future Directions**

The Division of Pathology Informatics will continue to build on its robust foundation to further enhance digital pathology workflow, streamline clinical operations, and foster innovative research. Key future directions include the expansion of digital pathology's deployment, enhancement of data analytics capabilities, and continuous collaboration with Michigan Medicine's Health Information IT Services group to maintain cutting-edge standards. With a dedicated team and clear strategic goals, the division is poised to lead pivotal advancements in the field of pathology informatics.

# Division of Quality & Health Improvement

**Scott Owens, MD**
*Director,* Division of Quality and Health Improvement

During FY24, the Division of Quality and Health Improvement (DQHI) continued to make significant contributions in support of clinical operations and innovative practice developments with partners inside and outside of the Department of Pathology. DQHI's guiding principles continue to include an emphasis on practice efficiency and high-reliability principles, the expectation that changes and results will be solidly focused on adding value and as generalizable as possible throughout the department and institution, a commitment to scoping projects for achievable results, and a focus on obtaining a mixture of subjective and objective measurements that allow for both assessment of impact and sharing of results in an academic format. Highlights of these efforts are provided below.

### Operational Support and Process Improvement

DQHI personnel continue to focus on several important support and improvement projects throughout the department. DQHI is in an ideal position to cross boundaries between clinical labs and other clinical divisions – allowing for the creation and support of cross-functional teams sustained by our project managers, process improvement specialist, and data scientist – and to provide the appropriate staff bandwidth and expertise to shoulder this type of effort, allowing laboratory leadership and personnel to concentrate on their clinical work. In addition, our connections with like-minded people and groups in other departments throughout the institution provide crucial networks for broad and far-reaching impacts on patient care.

#### *Inpatient Phlebotomy*

Over the past year, a significant portion of DQHI's work focused on operational improvements in our departmental inpatient phlebotomy services. Beginning in FY23 and partially in response to increased institutional attention on a perceived impact of delayed blood draws on patients' length of hospital stay, DQHI personnel worked with leadership and staff from inpatient phlebotomy to understand phlebotomy workflow from a systems-based standpoint and to identify intervention points to improve the process. As a background, turnaround time (TAT) metrics tracked by phlebotomy services have a target service level of 90% of blood-draw orders being fulfilled within a specified timeframe (≤ 4 hours for routine orders, ≤ 1 hour for STAT, and time-critical orders). The state prior to DQHI's partnership (and post-COVID pandemic) was defined by numbers of blood draws meeting the established service level as low as 30% on some days and averaging 60-75% on most days. Through a combination of interviews, data available in patient safety reports (which are typically used by caregiver personnel to document delayed blood draws that are perceived to impact patient care), policy review, and onsite observation, DQHI's process improvement specialist was able to create a systems-based map of the inpatient phlebotomy service, including its various inputs and outputs.

Through this work, several key points of potential intervention were identified. First, it became clear that TAT data alone was not sufficient to provide a full picture of "first-time quality" for inpatient phlebotomy, because it did not identify issues with specimen quality (e.g. when draws needed to be repeated due to a problem with the specimen such as hemolysis). In addition, phlebotomists were operating in a relative vacuum from the standpoint of much patient information, such as whether the patient would be in the room (or away for a study or procedure) when the phlebotomist arrived and whether the phlebotomist who came to perform the draw was qualified to perform it (since not all phlebotomists are certified to perform draws from indwelling central catheters). Third, the inpatient phlebotomy staffing model was based on historical data that did not include information on the variable level of demand for phlebotomy services in a 24-hour pe-

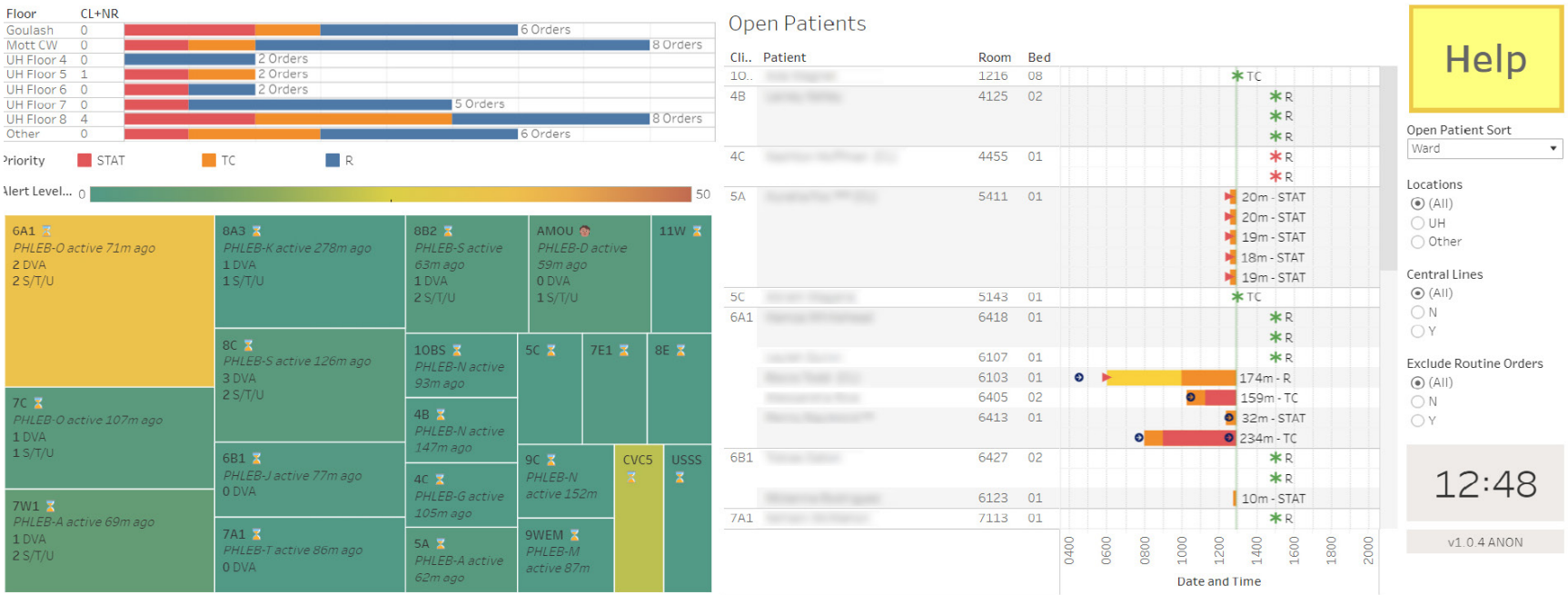



**Figure 1:** *Anonymized version of the Flight Board for phlebotomy services. The multicolored panel at lower left indicates overall "health" for different hospital units/floors, based on number of open orders and other metrics such as number of open STAT orders, with deeper yellow and red boxes having more open orders. At right, individual patient data is visible with longer bars indicating longer delays; for this anonymized version, the patient names are randomly generated to provide a faithful recapitulation of the "live" version of the tool. Note the inclusion of patients who have indwelling catheters (denoted by "CL"), a situation which requires a phlebotomist with additional training. The upper left panel indicates "at-a-glance" data for the number of open orders by floor, and whether they are STAT (red), time critical (orange) or routine (blue).*

riod. Finally, the service was relying on a paper-based scheduling system that did not enable supervisory staff to easily determine staffing levels and monitor deployment.

With these insights available, DQHI personnel were able to work with our clinical partners to help institute several interventions. First, DQHI's data scientist and process-improvement specialist constructed a data warehouse that feeds a suite of visual management tools, which provide real-time information in an "air traffic control-like" fashion, allowing managers of the inpatient phlebotomy team to understand the current demand for blood draws, how the phlebotomy team is responding to those demands, and how best to deploy and redeploy resources to positively impact patient care. Termed the Flight Board (Figure 1), this tool draws from data in the electronic medical record (MiChart) and the laboratory information system (Soft) and is now fully deployed and being used daily. In addition, DQHI worked with inpatient phlebotomy management to standardize the use of the Flight Board and develop a standard operating procedure facilitating the role of a dispatcher (analogous to an air traffic controller) who serves to deploy phlebotomists to pending orders with increased efficiency. With input from the DQHI team, this role has been approved and was filled in very early FY25. Finally, DQHI supported phlebotomy management in identifying and deploying an electronic staff scheduling system that interfaces with the Flight

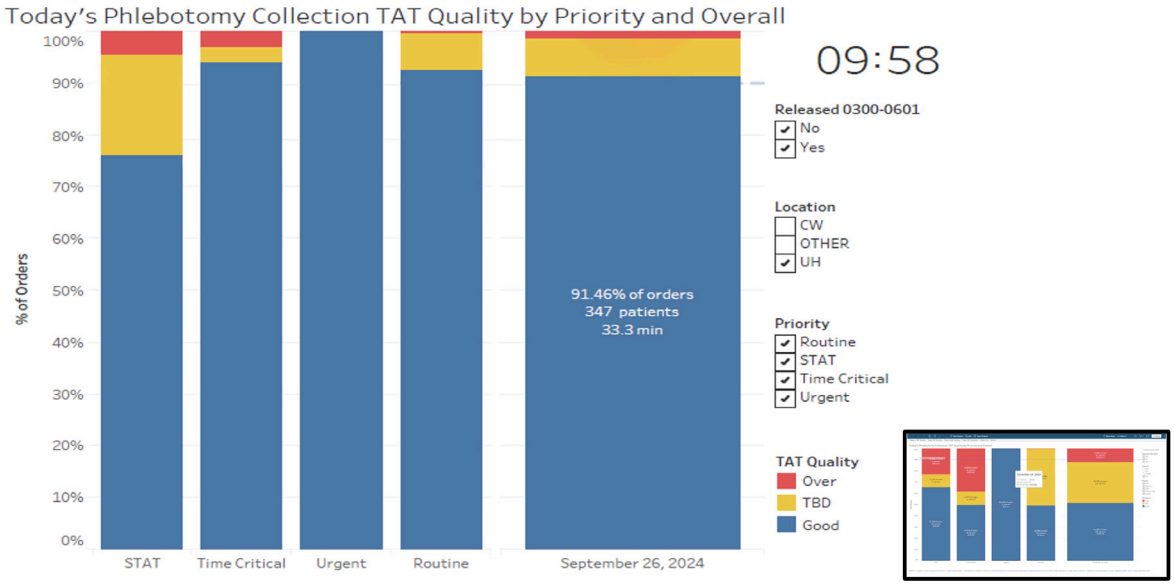



**Figure 2:** *Dashboard view of phlebotomy services performance, which is distributed to key stakeholders daily. The x-axis indicates subsets of draw type. For each draw type, the proportion of blood draws collected within allotted time (blue), outside of allotted time (red), and still pending/TBD (yellow). The inset on the right is the same dashboard from a date in November 2023. Note the much large red and yellow zones in most columns, indicating fewer orders completed within target TAT at that time.*

Board and allows efficient deployment of available phlebotomists to patients who are in-room and whose phlebotomy needs match the skill level of the practitioner.

These systems-based and targeted interventions, in addition to an institutional investment in increased phlebotomy staffing, have resulted in improved inpatient phlebotomy TAT, which now routinely meets the 90% service level threshold (Figure 2). In addition, preliminary data indicate a steady decline in blood-draw TAT over the course of implementation (Figure 3). An additional study is underway to understand the relative contribution of each intervention, along with the additional personnel, to the observed improvement in service, and a manuscript is in preparation to report these findings.

*Other Operational and Patient Safety Improvements*

In addition to the significant work with phlebotomy services, DQHI personnel have continued their work with operational colleagues throughout the department. Additional projects over FY24 in this vein include:

- Continued partnership with Phlebotomy Services and Specimen Processing to streamline hospital specimen pick-up and delivery. This work is aimed at providing more phlebotomist bandwidth for blood draws by reducing the burden of specimen transport currently handled by phlebotomists.
- Partner with phlebotomy to ensure efficient and integrated documentation of blood draws from indwelling ports and catheters to ensure patient safety and streamline blood draws.
- Continued partnership with laboratory managers to design and implement an integrated information and data solution to assist with efficient practice assessment and management decisions. This work is underway with partners in the Microbiology laboratory and is planned for others.
- Design a comprehensive data analytics platform for Core Laboratory management based on interviews with laboratory personnel and leadership.
- Upgrading and streamlining "canned comments" in Soft to document and track the various reasons for delays in blood draws. This work aims to make the comments more valuable, specific, and leverageable for identification of further improvement projects in our phlebotomy services.
- Continued work on improving the utilization of the information gleaned from patient safety incident reports entered by and about the clinical laboratories in the institutional patient safety reporting system with the goal of better identifying and using the most beneficial data available in these reports that could potentially be utilized for process analysis and improvement projects.
- Continued monitoring of daily data on lost pathology specimens to identify patterns that may help minimize the loss or misplacement of specimens in the future.

**Laboratory Utilization**

A key, ongoing project for FY24 continues a collaboration with colleagues in the Cardiology division of Internal Medicine, aimed at helping leadership in that group understand how their prac-

titioners are using laboratory testing in the context of analytic and treatment protocols for patients with clinically significant heart failure. This collaborative quality initiative-like project has allowed DQHI personnel to provide project management, data science, data visualization, and clinical expertise, resulting in the development of a provider dashboard that is in early use to monitor provider behavior and ordering patterns in comparison to published and local care guidelines. The aim of this part of the project is to provide Cardiology leadership with the tools needed to provide direct feedback to practitioners and encourage standard practice. This platform is generalizable across clinical practices and could easily serve a similar purpose throughout the institution. The project's second phase has centered on the use of laboratory testing and data science to provide practitioners with ongoing information about the optimal titration of medications to treat heart failure. Providing a "medication optimization score" (MOS) to clinical caregivers will give up-to-date therapeutic and patient health data that will allow more focused medication adjustments and, it is anticipated, better patient outcomes. Demonstrating this type of direct connection between optimal laboratory studies and patient outcomes has been a goal of DQHI since its inception, and the product is currently ready for full deployment. Much of the work over FY24 has centered on working with our partners in Cardiology and the Michigan Institute for Clinical and Health Research (MICHR), to structure a prospective, stepped-wedge approach trial of the tool with sufficient statistical power to assess the impact on patient outcomes, including the time to achievement of optimized treatment goals (based on MOS), number and length of hospitalizations, and optimization of laboratory utilization (reduced inappropriate testing) for heart failure patients. This trial should commence in FY25 and result in a publication.

**Future Directions**

During late FY24, DQHI leadership engaged leadership from each of the clinical divisions in the department to provide an opportunity to identify projects that could be undertaken during FY25. This exercise identified several areas of interest:

- Analysis of the ordering system for the Division of Genetics and Genomics, aiming to map and analyze the current state for ordering molecular diagnostics testing on anatomic pathology specimens to identify opportunities for process improvement.
- Assessment of departmental needs for data centered on test pre-authorization and reimbursement to develop a data analytics tool to leverage data in the Clarity (MiChart) database for optimizing these aspects of testing.
- Development and implementation of an inventory management system for shared inventory space at University Hospital and to gather information on requirements for a unified department-wide inventory management system.

In addition to these opportunities, DQHI leadership and personnel have discussed the development of a pathology data "gateway" that could serve to provide easier and comprehensive access to data and analytics for process improvement, as well as the facilitation of a departmental quality management system supporting standardized quality assurance, patient safety, and process improvement activities throughout the department. These discussions are ongoing, including with the Pathology Quality Council and other stakeholders.

# Well-Being

**Maria Westerhoff, MD**
*Assistant Chair*, Well-Being

Well-being is a priority in the Department of Pathology as evidenced by the naming of Dr. Maria Westerhoff as Assistant Chair for Well-Being. She is supported in this role by her Well-Being Committee for faculty and staff comprised of Yvonne Beadle, Regina Ferguson, Dr. Nora Joseph, Tracey Rocco, and Anastazia Hartman.

In FY24, several initiatives were undertaken to encourage well-being across the department. A faculty caretaker luncheon was launched, and Dr. Helen Morgan, professor of obstetrics and gynecology and learning health systems, shared her experience of balancing caretaking responsibilities with her professional life. Several resources were assembled and made available in a shared drive.

Additionally, as many had expressed interest in managing their kids' video gaming, social media, and phone, Dr. Liz Kolb, a professor from the University of Michigan Family School of Education, was also invited to join one of the faculty caretaker luncheons to discuss children's use of digital devices, with an emphasis on youth digital well-being and mental health.

The department contracted with two local farms and provided weekly fresh vegetable distributions at the NCRC and the University Hospital. These vegetables were eagerly received by members of the Pathology community as recipes and photos were shared by recipients.

A $5,000 Well-being Influencer grant resulted in the recognition of approximately 100 staff members, whose contributions were named by nominating staff and were awarded for their well-being efforts in the department.

Dr. Charles Parkos, chair of the Department of Pathology, secured two sets of season tickets for football and men's basketball games. Members of Pathology entered their names in the drawings, then enthusiastically awaited the ticket winners to be drawn. Winners of these tickets included front line clinical staff at University Hospital, Canton, and Northville to Researchers from various labs.

Leadership-led walks take place weekly on Fridays, and are led by various departmental administrative and faculty leaders accompanied by multiple staff and faculty from within the department.

FiSH! Philosophy training was made available to the Department to bring about culture change. These were led by our in-house certified FiSH! Philosophy trainers: Melina Adler, Gloria Barkley, Karen Barron, Chris Distelrath, Lynn McCain, and Julene Pummill, and supported by a $5,000 Michigan Medicine Well-Being Grant. In addition, FiSH! Philosophy training was added to our New Employee Orientation to instill our culture as people join our department. A total of 169 faculty and staff participated in this training in FY24.

Weekly Yoga sessions, arranged through MHealthy and led by Christine Baker, were offered to faculty and staff of the department to relax, stretch, and improve focus.

In FY24, the Well-Being Committee executed an art competition and awarded staff winners with gift cards. The artwork will be displayed digitally and is planned to be exhibited on rotation at UH and NCRC. Additionally, Dr. Ul Balis implemented a software pilot to automate specimen designation in SOFT diagnostic reports, to reduce typing required by faculty and trainees, which is planned to be distributed by FY25.

# Diversity, Equity, and Inclusion

**Angela Wu, MD**
*Assistant Chair*, Diversity, Equity, and Inclusion (DEI)

The Department of Pathology established the office of the Assistant Chair for Diversity, Equity, and Inclusion to provide ongoing efforts to improve DEI for all department employees. Our DEI initiatives aim to raise awareness, overcome biases, and incorporate DEI-centric initiatives into our recruitment and retention efforts.

In FY24, the DEI office had two major goals; the first was to engage our faculty and staff. We held our fifth annual Equality Walk on June 19th. Numerous department members (including departmental leadership) participated, taking time from their busy days to reflect on social justice and to remember those who have lost their lives due to racial injustice. The week of Juneteenth, we also hosted Dr. Ebbin Dotson, formerly a professor at the School of Public Health, who gave a departmental lecture, "Juneteenth and Modern Medicine—There is a Connection." We held several "lunch and learns" utilizing multi-media presentations to promote discussions of our journeys with race and culture. Sample topics included the "Color Blind or Color Brave?" TED talk and handling microaggressions in the workplace. Finally, we piloted a "community inclusion board" in our laboratories, which is a board highlighting a DEI-centric topic or holiday, to raise awareness and promote community discussion.

Our second goal was to incorporate DEI initiatives in our recruitment and retention efforts. Several department members participated in residency recruitment events, such as the SimFest event at the SNMA Annual Meeting. To reach younger students who may be interested in a career in Pathology, Karen Barron, pathology allied health education manager, spearheaded departmental participation in events such as the Youth Summit at the Big House as well as other community outreach events, including the College and Career Fair at Saline High School and the Parkridge Festival, geared towards high school students. The department also hosted a field trip for Wayne Memorial High School Students to visit our laboratories to raise awareness about medical laboratory professions. Finally, Drs. David Gordon and Julia Dahl are spearheading the creation and execution of innovative plans to better incorporate DEI-centric initiatives into our residency recruitment and education.


# Faculty & Staff Development

**Laura Lamps, MD**
*Assistant Chair*, Faculty & Staff Development

The Assistant Chair for Faculty Development is responsible for the ongoing professional development of faculty in the Department of Pathology and for managing faculty appointments, promotions, and tenure.

In FY24, the promotions committee made up of Drs. Laura Lamps (Chair), Doug Fullen, and Nick Lukacs, met with junior faculty to discuss their goals and to help them prepare for and better understand the promotion and tenure process. Ten faculty *(see right)* were identified as meeting the criteria for promotion and approved by the medical school, effective September 1, 2024. In addition, 15 faculty members were identified for the FY25 cycle and their promotion packets are currently being completed and submitted to the medical school for review.

Additional activities included creating a junior faculty mentoring catalog, partnering with the Assistant Chair for Education to raise money for an endowed fellowship program, working with the HR staff to support faculty in completing their Elements CVs and launching the PRICE (Program for Learning, Innovation, and Career Enhancement) program with Dr. Lew and Dr. Mirza. The PRICE objectives are to provide mentorship and guidance to medical educators, create a learning plan for educators at all levels, and provide faculty development opportunities around medical education and other topics such as leadership, quality/safety, and career development.

**Faculty Promoted effective September 1, 2024:**

- **Scott Bresler, MD, PhD**
  Clinical Associate Professor
- **Karen Choi, MD**
  Clinical Associate Professor
- **Analisa DiFeo, PhD**
  Professor, with tenure
- **Carmen Gherasim, PhD**
  Clinical Associate Professor
- **Tao Huang, PhD**
  Clinical Associate Professor
- **Madelyn Lew, MD**
  Clinical Professor
- **Xinna Li, MD, PhD**
  Associate Research Scientist
- **Stephanie Skala, MD**
  Clinical Associate Professor
- **Sriram Venneti, MD, PhD**
  Professor, with tenure
- **Chisa Yamada, MD**
  Clinical Professor

# Veterans Affairs Pathology & Lab Medicine

**Darius Amjadi, MD, JD**
*Chief of Pathology and Laboratory Services,*
Veteran's Administration Hospital Laboratories, VA

**Accreditation**
The Joint Commission surveyed PALMS' clinical and anatomical pathology departments from 5/18/23 to 5/19/23 and inspected the Toledo CBOC. All non-conformities were addressed and resolved within 60 days post-inspection, and accreditation was awarded, valid 9/1/2023-8/31/2025.

AABB surveyed PALMS' blood bank transfusion department on 8/21/23-8/22/23, with only one non-conformity identified. That non-conformity was addressed, and PALMS Transfusion was awarded AABB accreditation, valid 10/1/2023-9/30/20

***Hematology Department***
New Sysmex UN-3000 Urinalysis System went live on March 2023

***Molecular Department***
In-House testing brought on-board: Full HPV, Trichomonas, and Neisseria gonorrhea done in the Molecular department

Ann Arbor's Molecular department also performs testing of the above-mentioned tests for Battle Creek, Toledo, Detroit, and Saginaw locations.

Agreement of frozen section diagnosis with permanent section diagnosis. Target >95%:

**VA Ann Arbor Health System**

| Service | Accessions | Target | % Meeting Target |
|---|---|---|---|
| Surgical Pathology | 12,343 | 95% reported < 2d | 97.68% |
| Non-GYN Cytology | 2,194 | 95% reported < 2d | 99.19% |
| GYN Cytology | 1,231 | 95% reported < 14d | 100.00% |
| Frozen Section | 160 | 95% reported <20 min | 94.42% |
| Autopsy | 11 | 100% completed <30d | 100.00% |

**CP CAP Proficiency**

| Department | % Success |
|---|---|
| Blood Bank | 100.00% |
| Chemistry | 98.67% |
| Hematology | 99.44% |
| Microbiology | 98.73% |
| Ancillary Test Sites | 98.33% |
| Molecular | 100.00% |

**Phlebotomy Wait Times: Goal 90%< 10 Min**

| | |
|---|---|
| Total Patients Seen | 54,485 |
| Total Patients Seen within 10 minutes | 26,859 |
| **% of Patients Seen in <10 Minutes** | **49.29%** |

**Aspect of Care: Accuracy of Anatomic Pathology Diagnosis**

| Case | FY22 | FY23 |
|---|---|---|
| Total number of cases with frozen sections | 130 | 92 |
| Total number of frozen sections | 284 | 259 |
| Frozen sections in agreement with permanent sections | 264 | 237 |
| Frozen sections in disagreement with permanent sections | 2 | 2 |
| % Concordance | 99.24% | 99.15% |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FISH!
WELCOME!
To The
ISH! Philosophy


PATHOLOGY


PATHOLOGY


Kimberly Giles
Denise Flannery
Microbiology
Teresa Cooper (Mom)

# Finance & Administration

**Brooklyn Khoury, MBA, MHSA, MS**
*Director,* Finance & Administration

The Division of Finance and Administration, under the auspices of the Office of the Chair, is responsible for the business, operational, and fiscal affairs of the Department of Pathology, as mandated by the policies of the Chair, Michigan Medicine, and the University. In this section, key achievements of the Finance and Administration team are highlighted as well as the supporting services provided by this division led by Ms. Brooklyn Khoury, MS, MHA, MBA, who administratively oversees a combined annual expense budget of $260 Million and over $1.1 Billion in annual gross charges.

Some key divisional highlights for this academic year include:

- Execute the financial commitment for digital pathology, including acquiring and installing 8 digital slide scanners and hiring a team of slide scanning technologists
- Labor market adjustments for phlebotomy staff
- Pathologists' Assistant labor market adjustments (first in 14 years)
- Implement a new position request workflow, including a live, electronic position tracker
- Reclassify Pathology Informatics staff to appropriate positions aligned with MM HITS
- Integrate Pathology Informatics administrative structure with MM HITS by creating a dotted line reporting relationship between the PI administrative director and HITS leadership
- Overhaul clinical administrative assistant support services, including equity adjustments, market adjustments, and approval of 2 incremental FTEs and 1 incremental supervisor, resulting in a vacancy rate reduction from 35% to 0%
- Reorganize the administrative structure in the Division of Clinical Pathology by creating an incremental Associate Operations Director
- Achieve FY24 budget targets for Medical School and Hospital budgets
- Establish a formal Pathology Space Committee

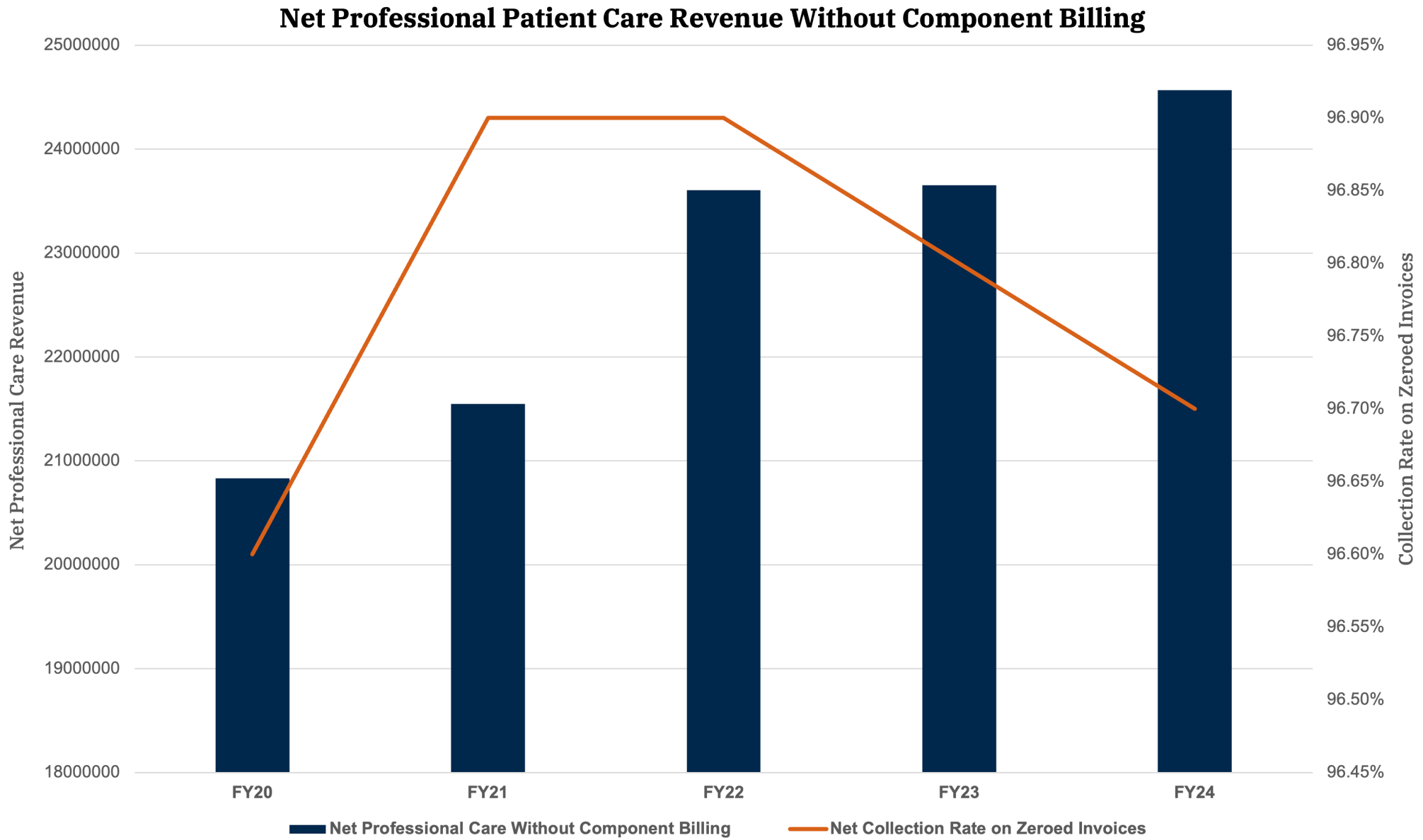
The Division of Finance and Administration is divided into support services for the pathology laboratories; academic and business affairs; and human resources, faculty affairs, and education.

**Pathology Laboratories**

The administrative support center team for Pathology is responsible for preparing and monitoring all hospital laboratories' revenue, expense, capital budgets, and personnel and payroll systems. During this period, total laboratory operating expenditures were $195 million. Staffing levels in the laboratories remained largely flat at 858 paid FTES. In part, this is a result of the nationwide trend in technical staffing shortages. We developed several incentives to attract new hires and retain existing staff during the year. We are also looking at ways to develop staffing pipelines by partnering with local schools. Pathology is responsible for 9.0% of total hospital gross revenue and 3.7% of total expense. Gross revenue was up 4.1% when compared to FY23. Billed tests in FY24 were 7.5 million vs. 7.3 million in FY23, an increase of 2.3%. (See pgs. 73 & 77)

The administrative support center team worked diligently in FY24 as we remodeled the University Hospital clinical laboratories. Throughout FY24, our facilities managers and the PRR team successfully completed the final portions of the renovations while actively addressing issues as they arose.

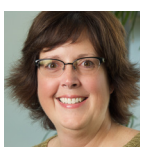
The administrative support center team members served as departmental liaisons with nursing, the office of clinical affairs,


Net Professional Patient Care Revenue Without Component Billing
25000000
24000000
23000000
22000000
21000000
20000000
19000000
18000000
Net Professional Care Revenue
96.95%
96.90%
96.85%
96.80%
96.75%
96.70%
96.65%
96.60%
96.55%
96.50%
96.45%
Collection Rate on Zeroed Invoices
FY20
FY21
FY22
FY23
FY24
Net Professional Care Without Component Billing
Net Collection Rate on Zeroed Invoices

**Mike McVicker**
*Administrative Manager*, Clinical Operations

**David Golden**
*Financial Director*, Healthcare

**Kristina Andoni**
*Financial Analyst Senior*, Medical School



**Christine Shaneyfelt**
*Financial Analyst Senior*, Hospital

the office of clinical safety, biomedical engineering, and hospital finance. They served on the quality month committee, pathology diversity, equity, and inclusion committee, pathology patient and family advisory council, pathology social media committee, pathology space committee, and others. The team addressed patient safety issues and cooperated on process improvement initiatives with partners such as the Rogel Cancer Center, UH operating rooms, and various medical procedure units.

### Office of Academic and Business Affairs – Medical School

The Office of Academic and Business Affairs – Medical School, is responsible for all administrative and academic operations associated with the Department, including management of department finances (budgets, contracts, research grants, forecasts, and analyses), as well as clinical billing (professional and technical front-end operations). In collaboration with the Chair, Ms. Brooklyn Khoury implemented and directed strategic goals for Medical School operations including the development of policy and business plans, management of faculty compensation and departmental funds, and use of departmental facilities, including modifications, renovations, and reassignment of department space.

The office also manages the Michigan Medicine and All Funds expenditures and forecast processes. Key departmental metrics include:

- Total Medical School All Funds expenditures including the MCTP for FY24 were $84 million and Hospital expenditures were $195 million.
- Hospital technical gross revenue for FY24 was $1.04 billion, compared to $1.04 billion in FY23, an increase of 3.7%.
- Professional fee gross charges were $95.3 million in FY24 compared to $95.3 million in FY23, an increase of 4.6% ($4.2 million).

In FY24, our faculty received 59 awards from the NIH and ranked 9th in the nation in funding by the NIH, down from our 7th place in FY23, and 6th in the nation when considering the number of awards received. Total committed grants in FY24 was $31.8 million, an increase of 2.0% over FY23. Our total sponsored research spending in FY24 was $34.6 million, up from $30.9 million in FY23, a 12.0% increase.

### Business Affairs

Business Affairs is responsible for oversight of all accounting and financial transactions for the Department as well as ensuring appropriate hospital and medical school funds flows. Our billing office handles all send-out, component, and Michigan Medicine Laboratories (MLabs) billing, and any interdepartmental, MLabs, or Hospital patient billing error corrections. The grants management office handles the day-to-day management of research funds to ensure compliance with funder requirements and to ensure the funds are distributed appropriately both within Pathology as well as across internal and external research groups. Business Affairs is also responsible for Hospital and Medical School financial reporting and budget preparation for the Department as well as administering numerous contracts. As part of the budgeting process, they develop and maintain the capital equipment process, prepare financial analyses, and produce numerous ad hoc reports. They also oversee the Pathology Renovation and Relocation project to ensure contract terms are met, budgets are managed, capital investments are approved according to Michigan Medicine and Pathology procedures, and facilities are prepared for the renovation of University Hospital spaces that occurred in FY24. In addition, all faculty and staff effort and funding changes are processed through this unit.

### Finance

The Department of Pathology is in a strong financial position and continues to thrive under the leadership of Dr. Charles Parkos, Ms. Brooklyn Khoury, and Mr. David Golden, with endowments and FFAE to support our clinical, research, and educational missions exceeding $139.5 million. In FY24, we experienced a larger gap between our revenues and expenses, with Revenues at $70.1 million, up 11.3% from FY23 and expenses at $87.3 million, up 17.8% from FY23, mostly due to investments in our strategic priorities. This resulted in an operating loss of $17.2 million. The loss was offset by non-operating income (investments, dean's contributions, and other institutional support payments). Including our non-operating income, FY24

ended with a net loss of $861,154. In contrast, in FY23, we experienced a gain of $132,175.

Michigan Medicine has long-range expansion and upgrades planned, including Pathology's Renovation and Relocation Project, that require greater-than-average net budget increases as compared to those seen over the past decade. As a result, there is significant pressure on Departments to reduce expenses and increase revenues. Our professional patient care revenues continue to be stable as evidenced by our FY24 collection rate at 24.8% of gross charges as compared to 25.1% in FY23. Our group practice net collection rate on zeroed balances remains strong at 96.7%. Pathology faculty and staff paid FTEs have grown slightly to 1,216.0 in FY24 versus 1,203.67 in FY23. The combination of the pandemic and the economic constraints has forced us to do more with less staffing. As a result, filling vacant staff positions has become more difficult. We are grateful to our staff, who have stepped up to the plate to take on additional duties to ensure the missions of Pathology continue to meet and exceed expectations.

We have outstanding faculty and staff who continue to support exceptional scholarship and clinical care. Our clinical services continue to grow and maintain the highest quality. New educational opportunities continue to attract top trainees, and our future looks bright as we move forward into our newest facilities, designed for the future. Overall, FY24 has been a tremendous year for our department.

### Human Resources, Faculty Affairs, and Education

Our Staff Human Resources Team provides support for Pathology's hospital laboratories (approximately 857.8 FTEs) and Medical School support staff, including our research programs (approximately 214.4 FTEs). This includes processing all new hires, promotions, merit increases, orientations, as well as transfers when staff move to other departments, or terminations for those who leave our institution. They also help to coordinate employee recognition events and awards.

Faculty Affairs is responsible for coordinating appointments, reappointments, and promotions for our 189 active faculty and the 22 supplemental appointments in the Department. In FY24, twelve new faculty joined the Department of Pathology while we bid farewell to ten faculty members. Eleven of our faculty successfully completed the promotion process (see pg. 84).

Our faculty received numerous awards in recognition of their achievements in academics, research, and clinical service. (See Appendix on pg. 98)

The Education Office includes the Residency and Fellowship Training Programs (28 residents and 23 fellows in 10 ACGME and 8 non-ACGME programs), the Medical Student Education Teaching Programs for the M1 and M2 laboratories, and the M4 Clerkship Program, as well as the Molecular and Cellular Pathology PhD program with 25 students actively pursuing their doctoral degrees. Management responsibilities are focused on curriculum management (including the Research Seminar Series), academic records, budget planning and financial operations, recruitment, and program activities, such as the annual departmental research symposium. The department also holds two NIH training grants (PIs Nicholas Lukacs, PhD; Andrew Lieberman, MD, PhD, Zaneta Nikolovska-Coleska, PhD) which support four pre- and six postdoctoral trainees.

### Office of the Chair

The staff in the Office of the Chair coordinates the Advances in Forensic Medicine and Pathology conference, which was held in the spring of 2024. They also reconcile departmental procurement cards, renew medical licenses, and process CME requests for faculty. In addition, they provide support to the Chair and Chief Department Administrator, including scheduling, travel arrangements, data collection, event planning, correspondence, committee support, and faculty recruitment. The Communications unit transitioned to the Division of Training Programs and Communications in FY24. This team coordinates and develops departmental communications including the Inside Pathology magazine and the annual report, social media and other external communications, and prepares numerous reports and presentations for various meetings.

### Community Service

In support of our mission as a non-profit healthcare provider, our faculty and staff engage in numerous service activities

**John Harris**
*Manager,* Research Administration

**Catherine Berrigan**
*Manager*, Faculty Affairs

| FY24 Pathology Income Statement | | |
|---|---|---|
| **Revenue** | **FY23** | **FY24** |
| Patient Care Revenues | $25,388,388 | $27,655,238 |
| UMHS Service Payments | $10,572,996 | $10,330,701 |
| Net Total Research (Directs & Indirects) | $21,380,199 | $21,986,938 |
| Gifts and Other Income (Wayne/Washtenaw ME, etc.) | $5,612,117 | $3,110,525 |
| **Total Revenue** | **$62,953,700** | **$63,083,402** |
| **Expenses** | | |
| Total Salaries | $55,736,127 | $56,644,181 |
| Total Non-Payroll Expense | $18,337,528 | $18,291,993 |
| Total Operating Expenses | $74,073,655 | $74,936,174 |
| **Operating Margin (Loss)** | **$(11,119,955)** | **($11,852,772)** |
| Non-Operating Income and Expense | $11,252,130 | $10,991,618 |
| (Includes Investment Income, UMHS Margin Sharing, Departmental Commitments, etc.) | | |
| **Total Margin** | **$132,175** | **($861,154)** |

throughout the year. Some of the activities our faculty and staff engaged in this year included:

*Local Activities (UM, Ann Arbor, Michigan)*

- Relay for Life Teams to raise funds for cancer treatment
- Assisted MetroHealth in validating the Verify-Now assay for aspirin and Plavix-specific platelet aggregation
- Gift of Life Michigan board and committee memberships
- Patient and Families Advocacy Committee (PFAC)
- Numerous Medical School and Health System committee leadership/membership (see our list of new leadership positions)
- High school genetics, ethics, Doctors of the Future and other programs, as well as volunteering to coach or direct athletic programs
- High School Ethics Bowl judge
- Service on multiple non-profit boards of directors

*National*

- Assisted in multiple inspections for College of American Pathologists (CAP), American Association of Blood Banks (AABB), American Society for Histocompatibility and Immunogenetics (ASHI)
- Serving on multiple national and international professional organization boards and committees (*See new leadership positions in the Appendix pg. 110*)

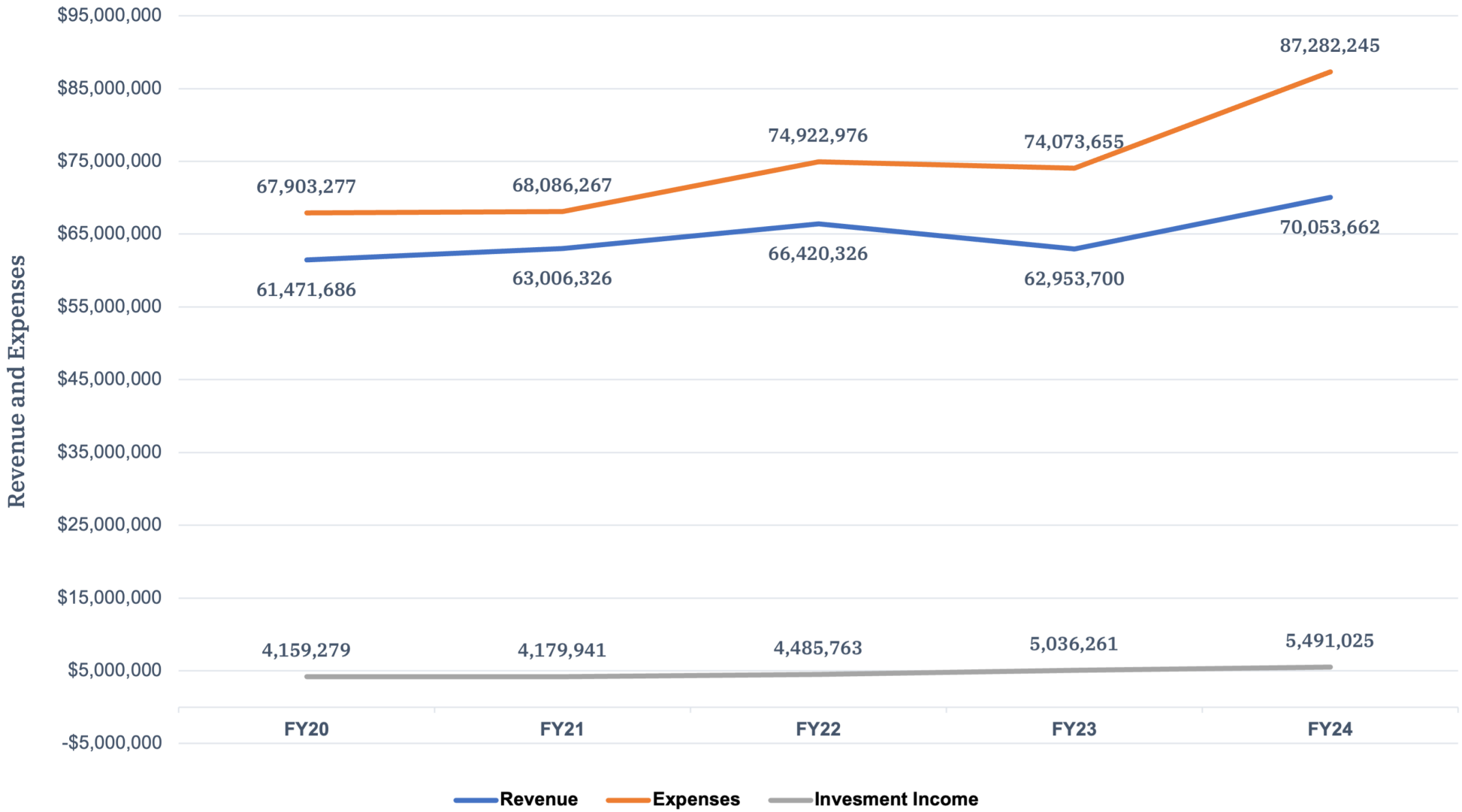
*International*

- Exploring transport solutions for patient samples in remote African villages to laboratory testing facilities
- Developing Essential Diagnostic Test List for low resource settings
- Implementing comprehensive 8-marker flow cytometry to accurately diagnose acute pediatric and adult leukemia patients in low-middle income countries, implementing it in Addis Ababa, Ethiopia
- Cervical cancer screening initiative in India

### Employee Recognition

The Department of Pathology recognizes the valuable contributions made by our faculty and staff alike. In FY24, we recognized the years of service for faculty and staff who have served for 10, 20, 30, and even 40 years, as well as those who received Above and Beyond Awards, as nominated by their peers. (*Appendix pg. 118*) The number of employees who have been in the department for over 20 years speaks to the dedication of the employees as well as to the collegial atmosphere of our Pathology Department. This year we also honored our retirees. (*Appendix pg. 119*)

# Pathology Only Revenue and Expense Trend



# Pathology Relocation & Renovation Project

**Christine Baker**
*Project Manager,* Pathology Relocation & Renovation Project (PRR)

The Pathology Relocation and Renovation (PRR) Project is a multi-year, multi-phase project embracing the opportunities to relocate a large sector of the department into an offsite facility at the North Campus Research Complex (NCRC) and to renovate and right-size critical functions within University Hospital (UH). Christine Baker led this 10-year project to its completion at the end of FY24. She facilitated and managed the tasks needed to design and activate the new spaces and served as the liaison to colleagues within Michigan Medicine Facilities and Operations and the construction teams led by the Architecture, Engineering, and Construction group.

Construction for Phase 1 of the PRR, over 140,000 square feet of newly renovated space at NCRC, finished in FY18. The activation of the new space started during the summer months and was completed in November 2018. This included several major clinical laboratories as well as key administrative divisions.

Phase 2, the renovation of the laboratory and support spaces at UH, had five unique and distinct construction phases, with each construction phase followed by a period of activation. FY24 saw the completion and activation of the fifth and final construction phase. This milestone included opening the new Apheresis Patient Care Unit and the FNA Team Room. We activated new offices, swing space, and a microscope room in University Hospital South (UHS). Additionally, new Education Program space was created, and other employee support areas, including a lactation room, were completed. The final artwork for Phase 2 was hung in the main hallways and other areas within UH and UHS.

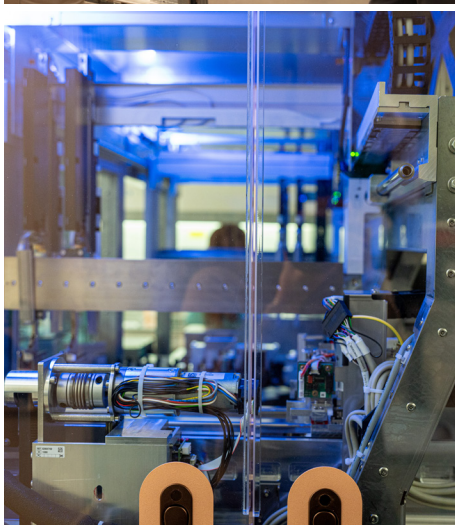
During the past year, the faculty and staff within the Department of Pathology at University Hospital and UH South continued to work alongside major construction, shutdowns, sounds, and interruptions while maintaining continuous operations and providing outstanding service. It is a testament to their adaptability and sense of purpose that the Clinical Laboratory and patient care activities have not faltered or been interrupted.

Completing these final phases marks the end of a 10-year endeavor to update, relocate, and renovate many areas within our department. Together, we celebrate the successful completion of one of the largest facilities projects within our department and Michigan Medicine and will enjoy these new facilities for years to come.









| Anatomic Pathology Case Volumes | FY19 | FY20 | FY21 | FY22 | FY23 | FY24 | 1-YR | 5-YR |
|---|---|---|---|---|---|---|---|---|
| **Cytopathology** | | | | | | | | |
| FNA by Pathologist with ROSE[1] | 183 | 142 | 134 | 114 | 138 | 161 | 16.67% | 13.38% |
| FNA, No ROSE[1] | 842 | 767 | 871 | 837 | 727 | 724 | -0.41% | -5.61% |
| FNA, with ROSE[1] | 2,102 | 1,788 | 2,048 | 2,243 | 2,509 | 2,733 | 8.93% | 52.85% |
| Gyn Case1 | 23,580 | 18,608 | 24,384 | 24,630 | 23,810 | 22,164 | -6.91% | 19.11% |
| Non-Gyn Case | 8,128 | 7,432 | 7,868 | 8,118 | 8,207 | 8,163 | -0.54% | 9.84% |
| **Total /** 1 ROSE is Rapid On-Site Assessment | **34,835** | **28,737** | **35,305** | **35,942** | **35,391** | **33,945** | **-4.09%** | **18.12%** |
| **Dermatopathology** | | | | | | | | |
| Derm In-House | 15,979 | 13,449 | 15,715 | 15,016 | 15,594 | 15,225 | -2.37% | 13.21% |
| Derm Outside | 7,400 | 6,512 | 6,377 | 6,757 | 6,421 | 6,568 | 2.29% | 0.86% |
| MLabs Derm | 9,748 | 7,544 | 7,971 | 8,636 | 8,291 | 6,653 | -19.76% | -11.81% |
| **Total** | **33,127** | **27,505** | **30,063** | **30,409** | **30,306** | **28,446** | **-6.14%** | **3.42%** |
| **Hematopathology** | | | | | | | | |
| Hemepath In-House | 2,301 | 2,659 | 3,674 | 3,598 | 3,647 | 3,842 | 5.35% | 44.49% |
| Hemepath Outside | 2,707 | 2,347 | 2,400 | 2,713 | 2,783 | 2,821 | 1.37% | 20.20% |
| **Total** | **5,008** | **5,006** | **6,074** | **6,311** | **6,430** | **6,663** | **3.62%** | **33.10%** |
| **Neuropathology** | | | | | | | | |
| MLabs Muscle | 233 | 189 | 167 | 162 | 138 | 167 | 21.01% | -11.64% |
| Muscle In-House | 86 | 77 | 98 | 102 | 94 | 101 | 7.45% | 31.17% |
| Muscle Outside | 36 | 29 | 22 | 34 | 25 | 17 | -32.00% | -41.38% |
| Neuro In-House | 834 | 739 | 785 | 761 | 817 | 1,072 | 31.21% | 45.06% |
| Neuro Outside | 527 | 597 | 879 | 1,144 | 1,539 | 1,342 | -12.80% | 124.79% |
| **Total** | **1,716** | **1,631** | **1,951** | **2,203** | **2,613** | **2,699** | **3.29%** | **65.48%** |
| **Ophthalmic** | | | | | | | | |
| Ophthalmic In-House | 1,455 | 1,367 | 1,397 | 1,462 | 1,451 | 1,604 | 10.54% | 17.34% |
| Ophthalmic Outside | 52 | 73 | 75 | 83 | 92 | 93 | 1.09% | 27.40% |
| **Total** | **1,507** | **1,440** | **1,472** | **1,545** | **1,543** | **1,697** | **9.98%** | **17.85%** |
| **Pediatric and Perinatal Pathology** | | | | | | | | |
| Fetal Exams | 230 | 215 | 256 | 257 | 240 | 280 | 16.67% | 30.23% |
| Peds Autopsy | 27 | 24 | 24 | 28 | 23 | 31 | 34.78% | 29.17% |
| Peds In-House | 3,747 | 3,307 | 3,677 | 3,615 | 3,971 | 4,072 | 2.54% | 23.13% |
| Peds Outside | 477 | 407 | 408 | 456 | 445 | 648 | 45.62% | 59.21% |
| Placentas | 2,148 | 1,894 | 1,825 | 2,149 | 2,066 | 2,319 | 12.25% | 22.44% |
| **Total** | **6,629** | **5,847** | **6,190** | **6,505** | **6,745** | **7,350** | **8.97%** | **25.71%** |

| *Anatomic Pathology Case Volumes Continued...* | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Renal** | | | | | | | | |
| Renal In-House | 1,413 | 941 | 809 | 856 | 1,167 | 1,155 | -1.03% | 22.74% |
| Renal Outside | 59 | 43 | 34 | 52 | 87 | 38 | -56.32% | -11.63% |
| **Total** | **1,472** | **984** | **843** | **908** | **1,254** | **1,193** | **-4.86%** | **21.24%** |
| **Technical Only** | | | | | | | | |
| Technical Only | 2,004 | 1,071 | 817 | 1,838 | 1,755 | 2,227 | 26.89% | 107.94% |
| Technical with Interpretation | 160 | 460 | 399 | 285 | 334 | 343 | 2.69% | -25.43% |
| **Total** | **2,164** | **1,531** | **1,216** | **2,123** | **2,089** | **2,570** | **23.03%** | **67.86%** |
| **Outside** | | | | | | | | |
| Breast | 1,737 | 1,541 | 1,508 | 1,768 | 1,911 | 1,891 | -1.05% | 22.71% |
| Cardiac | 20 | 21 | 24 | 15 | 39 | 41 | 5.13% | 95.24% |
| Cytology | 1,196 | 1,192 | 1,076 | 1,223 | 1,192 | 1,409 | 18.20% | 18.20% |
| Dermatopathology | 7,400 | 6,512 | 6,377 | 6,757 | 6,421 | 6,568 | 2.29% | 0.86% |
| Endocrinology | 613 | 551 | 539 | 655 | 788 | 810 | 2.79% | 47.01% |
| Gastrointestinal | 5,220 | 5,043 | 5,108 | 5,548 | 5,873 | 5,866 | -0.12% | 16.32% |
| Genitourinary | 2,148 | 1,959 | 1,845 | 2,252 | 2,346 | 2,342 | -0.17% | 19.55% |
| Gynecologic | 1,696 | 1,571 | 1,520 | 1,735 | 1,914 | 1,968 | 2.82% | 25.27% |
| Head & Neck | 1,366 | 1,255 | 1,303 | 1,403 | 1,552 | 1,624 | 4.64% | 29.40% |
| Hematopathology | 2,707 | 2,347 | 2,400 | 2,713 | 2,783 | 2,821 | 1.37% | 20.20% |
| InterDepartmental Consult | 635 | 356 | 608 | 296 | 394 | 278 | -29.44% | -21.91% |
| Misc. Outside Case | 22 | 9 | 6 | 1 | 5 | 4 | -20.00% | -55.56% |
| Muscle | 33 | 29 | 22 | 34 | 25 | 16 | -36.00% | -44.83% |
| Neuropathology | 522 | 597 | 879 | 1,144 | 1,536 | 1,327 | -13.61% | 122.28% |
| Ophthalmic | 52 | 73 | 75 | 83 | 92 | 92 | 0.00% | 26.03% |
| Pediatric | 477 | 407 | 408 | 456 | 445 | 648 | 45.62% | 59.21% |
| Pulmonary | 3,184 | 2,712 | 2,563 | 2,961 | 2,960 | 3,082 | 4.12% | 13.64% |
| Renal | 59 | 43 | 34 | 52 | 87 | 38 | -56.32% | -11.63% |
| Soft Tissue | 1,630 | 1,481 | 1,696 | 1,827 | 2,109 | 2,003 | -5.03% | 35.25% |
| **Total** | **30,717** | **27,699** | **27,991** | **30,923** | **32,472** | **32,828** | **1.10%** | **18.52%** |

***Table 1:*** *Anatomic Pathology Case Volumes 2019-2024 (From pg. 10)*

| Clinical Pathology Billed Test Volumes | FY19 | FY20 | FY21 | FY22 | FY23 | FY24 | 1-YR | 5-YR |
|---|---|---|---|---|---|---|---|---|
| **Clinical Chemistry and Toxicology** | | | | | | | | |
| Chemical Pathology | 3,165,847 | 2,985,204 | 3,277,102 | 3,177,933 | 3,297,181 | 3,425,770 | 3.90% | 14.76% |
| Special Chemistry | 714,738 | 649,436 | 771,761 | 771,761 | 855,411 | 931,522 | 8.90% | 43.44% |
| **Total** | **3,880,585** | **3,634,640** | **4,048,863** | **3,949,694** | **4,152,592** | **4,357,292** | **4.93%** | **19.88%** |
| **Transfusion Medicine** | | | | | | | | |
| Blood Bank Bone Marrow | 1,034 | 1,490 | 1,353 | 1,426 | 1,609 | 1,304 | -18.96% | -12.48% |
| MM Pathology Blood Bank | 327,245 | 326,459 | 335,100 | 323,820 | 330,983 | 367,958 | 11.17% | 12.71% |
| Blood Procurement | 66,414 | 59,056 | 66,279 | 60,800 | 59,254 | 61,940 | 4.53% | 4.88% |
| Transfusion/Apheresis | 2,008 | 2,132 | 1,238 | 2,015 | 2,057 | 2,018 | -1.90% | -5.35% |
| **Total** | **396,701** | **389,137** | **403,970** | **388,061** | **393,903** | **433,220** | **9.98%** | **11.33%** |
| **Other Clinical Laboratories** | | | | | | | | |
| Path Heme/Coag Unit UH | 1,268,568 | 1,227,916 | 1,293,850 | 1,319,143 | 1,348,313 | 1,293,549 | -4.06% | 5.35% |
| Flow Cytometry Lab | 105,598 | 99,902 | 101,981 | 101,563 | 103,741 | 110,751 | 6.76% | 10.86% |
| Cytogenetics Lab | 12,313 | 11,709 | 14,249 | 16,315 | 16,192 | 19,777 | 22.14% | 68.90% |
| Histocompatibility | 23,480 | 19,157 | 22,209 | 22,209 | 30,039 | 32,304 | 7.54% | 68.63% |
| Microbiology & Virology | 571,808 | 566,888 | 963,936 | 752,319 | 624,378 | 591,523 | -5.26% | 4.35% |
| Molecular Diagnostics | 20,106 | 17,860 | 19,169 | 19,098 | 20,458 | 23,079 | 12.81% | 29.22% |
| Path Reference Tests | 151,392 | 141,665 | 145,234 | 164,397 | 172,953 | 203,431 | 17.62% | 43.60% |
| Michigan Medical Genetics | | | | | 4,548 | 5,419 | 19.15% | |
| MCTP | 393 | 248 | 283 | 549 | 27 | 5 | -81.48% | -97.98% |
| **Total** | **2,153,658** | **2,085,345** | **2,560,911** | **2,395,593** | **2,320,649** | **2,279,838** | **-1.76%** | **9.33%** |

***Table 2 (Above):*** *Clinical Pathology Billed Test Volumes from 2019-2024 (From pg. 20)*
***Table 3 (Right):*** *Transfusion Medicine data from 2019-2024 (From pg. 25)*

| Tranfusion Medicine | FY19 | FY20 | FY21 | FY22 | FY23 | FY24 | 1-YR | 5-YR |
|---|---|---|---|---|---|---|---|---|
| **Blood Bank Main Laboratory** | | | | | | | | |
| Red Blood Cells | 33,065 | 31,040 | 34,340 | 31,838 | 32,248 | 30,992 | -3.89% | -0.15% |
| Whole Blood | | | | | | 125 | 0.00% | 0.00% |
| Random/Pooled Platelets | 5,880 | 51 | - | - | - | - | #DIV/0! | -100.00% |
| Apheresis Platelets | 11,000 | 13,640 | 16,193 | 15,992 | 15,984 | 16,428 | 2.78% | 20.44% |
| Plasma | 7,073 | 6,676 | 8,144 | 5,974 | 5,275 | 6,031 | 14.33% | -9.66% |
| Cryoprecipitate | 7,840 | 6,676 | 4,504 | 7,090 | 7,205 | 7,886 | 9.45% | 18.12% |
| **Total Components Transfused** | **64,858** | **58,083** | **63,181** | **60,894** | **60,712** | **61,462** | **1.24%** | **5.82%** |
| **Immunohematology Reference Lab** | | | | | | | | |
| Antibody Identifications | 1,153 | 1,516 | 1,685 | 1,613 | 1,520 | 1,652 | -100.00% | -100.00% |
| ABO Resolution | 233 | 312 | 258 | 262 | 301 | 290 | -100.00% | -100.00% |
| BMT | 319 | 284 | 298 | 246 | 615 | 883 | -100.00% | -100.00% |
| Eulates | 255 | 265 | 326 | 226 | 258 | 237 | -100.00% | -100.00% |
| Adsorptions | 402 | 547 | 318 | 388 | 252 | 293 | -100.00% | -100.00% |
| Titers | 477 | 484 | 616 | 568 | 616 | 726 | -100.00% | -100.00% |
| Special Antigen Typing | 6,137 | 6,384 | 7,097 | 6,948 | 6,420 | 7,121 | -100.00% | -100.00% |
| **Total Activity** / *Includes procedures not listed above | **10,624** | **11,402** | **12,619** | **11,920** | **12,647** | **13,416** | **-100.00%** | **-100.00%** |
| **Cellular Therapies Laboratory** | | | | | | | | |
| Collections Processed | 454 | 464 | 482 | 487 | 538 | 461 | -14.31% | -0.65% |
| Bags Frozen | 608 | 703 | 813 | 807 | 997 | 769 | -22.87% | 9.39% |
| Transplants, Autologous | 124 | 112 | 130 | 116 | 138 | 134 | -2.90% | 19.64% |
| Transplants, Allogeneic | 54 | 45 | 51 | 48 | 46 | 43 | -6.52% | -4.44% |
| Transplants, Unrelated | 75 | 71 | 58 | 57 | 46 | 85 | 84.78% | 19.72% |
| CAR-T Products | 34 | 30 | 38 | 44 | 51 | 47 | -7.84% | 56.67% |
| **Total Transplants** | **253** | **228** | **239** | **221** | **230** | **262** | **13.91%** | **14.91%** |
| **Apheresis Service** | | | | | | | | |
| Therapeutic Plasmapheresis | 1,310 | 1,416 | 1,334 | 1,302 | 1,324 | 1,332 | 0.60% | -5.93% |
| HPC Collections | 308 | 346 | 347 | 331 | 410 | 301 | -26.59% | -13.01% |
| Donor Pre-Evaluations | 308 | 236 | 202 | 253 | 298 | 302 | 1.34% | 27.97% |
| LDL Apheresis | 94 | 95 | 62 | 76 | 52 | 55 | 5.77% | -42.11% |
| RBC Exchange | 170 | 175 | 199 | 244 | 243 | 257 | 5.76% | 46.86% |
| CAR-T Collections | 33 | 20 | 40 | 44 | 52 | 62 | 19.23% | 210.00% |
| **Total Procedures** | **2,223** | **2,288** | **2,184** | **2,250** | **2,379** | **2,309** | **-2.94%** | **0.92%** |

## Faculty Awards FY24

| Faculty | Award Name | Organization |
|---|---|---|
| Rouba Ali-Fehmi | Merit Medal Award, Arab Division | International Academy of Pathology |
| Thomas Annesley | Outstanding Lifetime Achievement Award in Chemistry | Association for Diagnostics and Laboratory Medicine |
| Uysses Balis | • Distinguished Service Award<br>• Outstanding Service Award | • Association for Pathology Informatics<br>• American Board of Preventive Medicine |
| Arul Chinnaiyan | • HHMI Investigator Appointment Renewal<br>• Elected Member<br>• Meritorious Achievement Award<br>• Sternlicht Lecturer<br>• Chung Lee Lecturer | • HHMI<br>• American Academy of Arts and Sciences<br>• Society of Basic Urologic Research<br>• Case Western Reserve University<br>• Lurie Cancer Center |
| Laura Cooling | Undergraduate Medical Educator in Clinical Pathology Award | Univerity of Michigan Medical School |
| Julia Dahl | ELAM/ELH Fellow | Drexel University |
| Victor Elner | Richard K. Dortzbach Lecture and Teaching Awards | North American Society of Academic Orbital Surgeons and the American Society for Ophthalmic Plastic and Reconstructive Surgery |
| Tao Huang | Undergraduate Medical Educator in Anatomic Pathology Award | Univerity of Michigan Medical School |
| Matthew Iyer | Top-Rated Oral Abstract, Annual Meeting | Society of Surgical Oncology |
| Celina Kleer | Fellow | Association of American Physicians |
| Paul Lephart | Fellow | Michigan Medicine Leadership Academy |
| Rohit Mehra | • Certificate for Exemplary Service<br>• Cancer Research Award | • Genitourinary Pathology Society<br>• Society of American Asian Scientists Engaged in Cancer Research |
| Kamran Mirza | • Keitges Grant for Medical Ethics | • College of American Pathologists Foundation |
| Jeffrey Myers | • Lifetime Achievement Award<br>• Vernie A. Stembridge Lecturer, 103rd Annual Meeting | • Pulmonary Pathology Society<br>• Texas Society of Pathologists |
| Abhijit Parolia | • NextGen Star<br>• V Foundation Award | • American Association for Cancer Research<br>• V Foundation |
| Sethu Pitchiaya | • Early Career Service Award<br>• Keynote Lecture, Medical Research Council Laboratory of Molecular Biology | • Michigan Medicine<br>• Cambridge |
| Rajesh Rao | • Achievement Award | • American Academy of Ophthalmology |

## New National Leadership Positions FY24

| Faculty | Role | Organization |
|---|---|---|
| Sara Abbott | Surgical Pathology Committee | College of American Pathologists |
| Ulysses Balis | • Co-Chair, Longitudinal Assessment Committee<br>• Co-Chair, Longitudinal Assesssment Committee | • Clinical Informatics Board<br>• Project Sante Fe Foundation |
| Robert Bell | Informatics Representative, Training and Education Committee | Association for Molecular Pathology |
| Thomas Brenn | Chair, Membership Committee | United States and Canadian Academy of Pathology |
| Noah Brown | Chair, Molecular Genetics Program | Association for Molecular Pathology |
| Sandra Camelo-Piragua | • Vice President<br>• Committee Member, ABT Test Development and Advisory Committee, Neuropathology | • American Association of Neuropathologists<br>• American Board of Pathology |
| May Chan | Committee Member, ABT Test Development and Advisory Committee, Dermatopathology | American Board of Pathology |
| Arul Chinnaiyan | • Sjoberg Prize Committee<br>• Chair, Executive Committee<br>• Member, Pathology in Cancer Research Working Group Steering Committee | • The Royal Swedish Academy of Sciences<br>• Early Detection Research Network<br>• American Association for Cancer Research |
| Kathleen Cho | Appointed Vice Chair, Membership Committee, Section 4 | National Academy of Medicine |
| Marcin Cieslik | Co-Leader, Young Investigator Network Genomics Working Group | Prostate Cancer Foundation |
| Evan Farkash | Past Chair, Diagnostics Community of Practice Executive Committee | American Society of Transplantation |
| Thomas Giordano | Chair, Adrenal Cancer | International Collaboration on Cancer Reporting |
| Paul Harms | Program Director | Dermatopathology Fellowship Program |
| Simon Hogan | • Member, Cellular and Molecular Gastroenterology Council<br>• Member, National Scientific Advisory Committee | • AGA Institute<br>• Crohn's & Colitis Foundation |
| Alexandra Hristov | Member, Program Committee and Lead, Lymphoproliferative subgroup, Appropriate Use Committee | American Society of Dermatopathology |

| | | |
|---|---|---|
| Guang Huang | Invited Editorial Board Member | Discover Oncology, Discover Chemistry |
| Matthew Iyer | Sarcoma Disease Committee | Society of Surgical Oncology |
| Annette Kim | • Incoming Program Chair, Board of Directors<br>• Vice Chair | • Association for Molecular Pathology<br>• American Society of Hematolog Precision Medicine |
| Celina Kleer | • External Advisory Board, Breast Cancer SPORE<br>• Deputy Editor | • Mayo Clinic<br>• *Breast Cancer Research* |
| L. Priya Kunju | Member, Ramzi S. Cotran Young Investigator Award Committee | United States and Canadian Academy of Pathology |
| Rohit Mehra | Standing Member, Kidney Cancer Analysis Working Group and Prostate Cancer Analysis Working Group | NCI Clinical Proteomic Tumor Analysis Consortium (CPTAC) |
| Aiko Otsubo | Co-Chair, Communications Committee | Cancer Genomics Consortium |
| Abhijit Parolia | Planning Committee | Coffey-Holden Prostate Cancer Academy Meeting |
| Lina Shao | Vice Chair, Laboratory Quality Assurance Committee | American College of Molecular Genetics |
| Jiaqi Shi | • Standing Member, Mechanisms of Cancer Therapeutics Study Section<br>• Special Emphasis Panel Review Group<br>• Chair and Invited Speaker, Diagnosis and Clinical Therapeutics Section<br>• Session Chair and Moderator, Gastrointestinal and Pancreas Pathology<br>• Expert Reviewer | • National Institutes of Health<br>• National Institutes of Health<br>• 56th Annual Meeting for the Society for Leukocyte Biology<br>• United States and Canadian Academy of Pathology<br>• UK Research and Innovation |
| Maria Westerhoff | • Chair, Nominations Committee and Past President<br>• Board of Directors | • Rodger Haggitt GI Pathology Society<br>• United States and Canadian Academy of Pathology |
| Lanbo Xiao | Scientific Reviewer, Prostate Cancer Research Program | Department of Defense |

## New Department/Institutional Leadership Appointments

| Faculty | Role | Area/Specialty |
|---|---|---|
| Scott Bresler | Director | Dermatopathology Fellowship Program |
| May Chan | Interim Section Head | Dermatopathology |
| Marcin Cieslik | Director of Bioninformatics | Division of Diagnostic Genetics and Genomics |
| Jensyn Cone Sullivan | • Director<br>• Director | • Blood Bank<br>• Transfusion Medicine Fellowship Program |
| Julia Dahl | Division Director | MLabs |
| Paul Harms | Program Director | Dermatopathology Fellowship Program |
| Simon Hogan | Co-Director | Molecular and Cellular Pathology Graduate Program |
| Xin Jing | Member of CLINACAPS | U-M Medical School |
| Evan Keller | Director of Research Cores | Office of the Vice President of Research, UMMS |
| Annette Kim | Division Director | Division of Diagnostic Genetics and Genomics |
| Kristine Konopka | Service Director | Thoracic Pathology |
| L. Priya Kunju | Division Director | Division of Anatomic Pathology |
| Sean Li | Interim Section Head | Transfusion Medicine |
| Rahul Mannan | Director | MCTP Histopathology Lab |
| Rohit Mehra | Co-Director | Biospecimen Core |
| Kamran Mirza | • Division Director<br>• Assistant Chair | • Division of Training & Communications<br>• Education |
| Sethu Pitchiaya | • Assistant Director of Shared Resources<br>• Chair of Graduate Admissions | • Rogel Cancer Center<br>• Program in Cell and Molecular Biology |
| Rajesh Rao | Executive Committee | Taubman Research Institute |
| Jeff Rual | Co-Director | Molecular and Cellular Pathology Graduate Program |
| Lee Schroeder | Clinical Practice Committee | Michigan Medicine |
| Stephanie Skala | Director | Surgical Pathology and Histology and Frozen Section Laboratories |
| Lauren Smith | • Committee on Oversight of Administrative Action, Faculty Senate<br>• GME Special Review Committee | • Michigan Medicine<br>• Michigan Medicine |
| Riccardo Valdez | • Voting Member, Ambulatory Care Oversight Committee<br>• Voting Member, Executive Committee on Clinical Affairs | • Michigan Medicine<br>• U-M Medical School |

***Table 4-5 (Left):*** *Faculty Awards FY24; New National Leadeship Positions FY24 from pg. 89.*
***Table 6 (Right):*** *New Department Leadership Appointments FY24 from pg. 89.*

## National Institute of Health (NIH)

| Type of Grant | Faculty Name |
|---|---|
| R01 | Andjelkovic-Zochowska, Anuska; Stamatovic, Svetlana |
| R21 | Bachman, Michael |
| R01 | Cierpicki, Tomasz |
| R01 | Cierpicki, Tomasz |
| R01 | Hodgin, Jeffrey; Marianai, Laura |
| R01 | Venneti, Sriram |
| R21 | Wilson, Thomas |
| NIH - Sub | Lew, Madelyn |
| NIH - Sub | Lieberman, Andrew |
| NIH - Sub | Nesvizhskii, Alexey |

## Trainee & Career Development

| Sponsor | Faculty Name |
|---|---|
| F31 | Etheridge, Alexander (Lukacs) |
| F31 | Haggerty-Skeans, James (Venneti) |
| K99 | Holmes, Caitlyn (Bachman) |
| ChadTough Foundation | Lum, Joanna (Venneti) |
| Prostate Cancer Foundation | Luo, Jie (Chinnaiyan) |
| Michael Mosier Defeat DIPG Foundation | Natarajan, Siva Kumar (Venneti) |

## Industry & Nonprofits

| | |
|---|---|
| Graviton Bioscience Corporatio | Andjelkovic-Zochowska, Anuska |
| Prostate Cancer Foundation | Chinnaiyan, Arul |
| Trailsend Foundation | Chinnaiyan, Arul; Qiao, Yuanyuan;Xiao, Lanbo |
| Sun Pharma Advanced Research C | DiFeo, Analisa |
| Hevolution Foundation TO American Federation for Aging Research | Endicott, Joseph |
| Alex's Lemonade Stand | Grembecka, Jolanta |
| Talaristx Therapeutics | Harms, Paul |
| Lupus Research Alliance (LRA) TO University of Colorado | Hodgin, Jeffrey |
| SciTech Development L.L.C. | Hrycaj, Steven |
| Ara Parseghian Medical Research Foundation | Lieberman, Andrew |
| Ara Parseghian Medical Research Foundation TO University of Iowa | Lieberman, Andrew |
| Sontag Foundation, The | Venneti, Sriram |
| The Mark Foundation for Cancer Research | Venneti, Sriram |
| Miltenyi Biotec GmbH | Yamada, Chisa |

## Other Government Granting Agencies

| | |
|---|---|
| DoD | Iyer, Matthew |
| DoD | Qiao, Yuanyuan |

***Table 7-9:*** *Funding granted by federal sources which include the National Institutes of Health (NIH), Trainee and Career Development, Industry and Nonprofits, and Other Government Granting Agencies (DoD), from pg. 54.*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## Inventions FY24

| Invention Title | Inventors |
|---|---|
| PIKfyve inhibition upregulates surface expression of MHC class I to augment immunotherapies in cancer | Arul Chinnaiyan, Yi Bao, Yuanyuan Qiao |
| MSFragger-Labile | Aleksey Nesvizhskiy, Daniel Polasky, Fengchao Yu |
| Conditional Pax2 mutant mice | Gregory Dressler |
| Combination targeting of sLeA and TNFalpha for human diseases | Asma Nusrat, Charles Parkos, Jennifer Brazil, Miguel Quiros Quesada |
| A class of degrading agents with monocycloaryl substitution hroup fro cyclin-dependent kinase 12/12, preparation method therefor, pharmaceutical composition thereof, and use thereof. | Arul Chinnaiyan, Xiaoju Wang, Yu Chang |
| HPV-Associated Cancer Detection Based On Trans-Renal HPV Cell-free Tumor DNA In Urine | Daniel Hovelson |
| Orally active CBP/p300 degraders | Arul Chinnaiyan, Yuanyuan Qiao, Yuanyuan Qiao |
| Targeting p300/CBP degradation and H2BTac in enhancer-driven cancers | Abhijit Parolia, Arul Chinnaiyan, Yuanyuan Qiao, Jie Luo |
| CDK12-13 Inhibitors | Arul Chinnaiyan, Xiaoju Wang, Yu Chang |
| Targeting lipid metabolism in pancreatic cancer | Arul Chinnaiyan, Yuanyuan Qiao |
| Posttranslational Modification Targeting Compounds Used as SIRT5 Inhibitors for the Treatment of Cancer and Associated Diseases | David Lombard |
| diaTracer | Aleksey Nesvizhskiy, Fengchao Yu |
| ASH1L spiro inhibitors | Guang Huang, Jiho Song, Jolanta Grembecka, Rhiannon Stevens, Shuangjiang Li, Tomasz Cierpicki |
| Development and Validation of an 18-Gene Urine Test for Clinically Significant Prostate Cancer | Arul Chinnaiyan, Lanbo Xiao, Yuping Zhang |
| CD34+ Immune cell derived IL-9 in Allergy | Simon Hogan |
| U Michigan Astra-Zeneca joint Drug Development for Chronic Kidney Disease | Jeffrey Hodgin |
| A simplified MyProstateScore2.0 for high-grade prostate cancer | Arul Chinnaiyan, Yuping Zhang |
| FLI1 and MEK2 reprogrammed cells reperfuse ischemic limbs | Max Keller |
| UBA1 in cancer immune escape and resistance to checkpoint blockade | Arul Chinnaiyan, Yi Bao |

***Table 7 (Above):*** *List of Inventions from pg. 46.*

## Comm Agreement FY24

| Agreement Type | Organization Name | UM Start Up | Inventors |
|---|---|---|---|
| EULA(>$5000)-Non-Exclusive | GSK plc (formerly GlaxoSmithKline plc) | No | Aleksey Nesvizhskiy, Daniel Polasky, Fengchao Yu |
| EULA(>$5000)-Non-Exclusive | GSK plc (formerly GlaxoSmithKline plc) | No | Aleksey Nesvizhskiy, Daniel Polasky, Fengchao Yu |
| License Amendment>w/ Technology | Tocris Cookson Ltd. d/b/a Tocris Bioscience | No | Felicia Gray, Jolanta Grembecka, Qingjie Zhao, Tomasz Cierpicki, Weijiang Ying, Yiwu Yao |
| EULA(>$5000)-Non-Exclusive | Sanofi | No | Aleksey Nesvizhskiy, Daniel Polasky, Fengchao Yu |
| Bio Mat>Non-Exclusive | Agilent Technologies, Inc. | No | Xuhong Cao, Arul Chinnaiyan, Marcin Cieslik |
| EULA(>$5000)-Non-Exclusive | Johnson & Johnson Services, Inc. | No | Aleksey Nesvizhskiy, Daniel Polasky, Fengchao Yu |
| EULA(>$5000)-Non-Exclusive | Arcus Biosciences, Inc. | No | Aleksey Nesvizhskiy, Daniel Polasky, Fengchao Yu |
| EULA(>$5000)-Non-Exclusive | Amphista Therapeutics Limited | No | Aleksey Nesvizhskiy, Daniel Polasky, Fengchao Yu |
| EULA(>$5000)-Non-Exclusive | Mnemo Therapeutics SAS | No | Aleksey Nesvizhskiy, Daniel Polasky, Fengchao Yu |
| EULA(>$5000)-Non-Exclusive | Gritstone bio, Inc | No | Aleksey Nesvizhskiy, Daniel Polasky, Fengchao Yu |
| EULA(>$5000)-Non-Exclusive | Emtherapro, Inc. | No | Aleksey Nesvizhskiy, Daniel Polasky, Fengchao Yu |
| SRA>Option | Oncopia Therapeutics, Inc. dba Proteovant Therapeutics, Inc. | Yes | Jie Luo, Arul Chinnaiyan |
| License Amendment>w/ Technology | Oncopia Therapeutics, Inc. dba Proteovant Therapeutics, Inc. | Yes | Jie Luo, Arul Chinnaiyan |
| License Amendment>w/ Technology | PTM Therapeutics | Yes | Asma Nusrat, Charles Parkos, Jennifer Brazil, Matthias Kelm, Miguel Quiros Quesada |
| Copyright>Non-Exclusive | Bruker Switzerland AG | No | Aleksey Nesvizhskiy, Daniel Polasky, Fengchao Yu |
| EULA(>$5000)-Non-Exclusive | Thermo Fisher Scientific, Inc. | No | Aleksey Nesvizhskiy, Daniel Polasky, Fengchao Yu |
| License Amendment>w/ Technology | LynxDx | Yes | Arul Chinnaiyan, Lanbo Xiao, Yuping Zhang, Arul Chinnaiyan, Daniel Rhodes, Rohit Mehra, Scott Tomlins |
| Copyright>Exclusive | Informed Medical Decisions, Inc (dba InformedDNA) | No | Amanda Cook, David Keren, Lee Schroeder, Lynn McCain |
| EULA(>$5000)-Non-Exclusive | Novo Nordisk A/S | No | Aleksey Nesvizhskiy, Daniel Polasky, Fengchao Yu |

| | | | |
|---|---|---|---|
| Patents>Exclusive | NuLynx Therapeutics LLC | Yes | Jean Tien, Xiaoju Wang, Yu Chang, Arul Chinnaiyan |
| Patents>Exclusive | NuLynx Therapeutics LLC | Yes | Arul Chinnaiyan, Xiaoju Wang, Yu Chang, Arul Chinnaiyan |

## Start Ups

| Organization | Type | Year | Location | Inventions | Inventors |
|---|---|---|---|---|---|
| NuLynx Therapeutics LLC | UM Start-Up | 2024 | Northville, MI United States | • 2022-439<br>• 2023-290<br>• 2024-339 | Arul Chinnaiyan, Jean Tien, Xiaoju Wang, Yu Chang |

## Ongoing Clinical Trials/Studies Supported by MI-ONCOSEQ / 2024

| NCT ID | Clinical Trial | PI | Total Patients | Sites |
|---|---|---|---|---|
| NCT05038332 | UMCC 2021.046 | Jackson | - | University of Michigan |
| NCT04140162 | UMCC 2018.056 | Ye | 11 | University of Michigan, Karmanos, University of Rochester, University of Texas Southwestern |
| NCT00261456 | UMCC 2018.050 | Alva | 56 | University of Michigan, Memorial Sloan Kettering, Johns Hopkins, Washington University St Louis, UCSF |
| NCT03456804 | UMCC 2019.031 | Heath | 10 | Karmanos |
| NCT03287050 | UMCC 2017.069 | Alva | 6 | University of Michigan |

Dr. Michael Pitter, one of recent graduate students to complete his thesis defense in 2024.

## Graduate Student Thesis Defense and Current Positions

| Name | Defense Date | Thesis Title | Mentor | Position | Company |
|---|---|---|---|---|---|
| Mohamad Mire | *June 28, 2024* | *RSV induced metabolic perturbations suppress dendritic cell antiviral properties and promote pulmonary pathology* | Nick Lukacs, PhD | Exploring career options | |
| Michael Pitter | *March 15, 2024* | *The Role of Peptidyl Arginine Deiminases in Regulating Anti-tumor Responses in Immune Cells* | Weiping Zou | Senior Scientist | Pfizer |
| Derek Dang | *January 19, 2024* | *Beyond the Warburg Effect: A study of metabolic alterations in malignancies of the posterior fossa* | Sriram Venneti | Laboratory Leadership Service Fellow | Centers for Disease Control and Prevention |
| Sahiti Marella | *November 10, 2023* | *Regulatory Networks that Govern the Esophageal Epithelial Proliferative Response in Eosinophilic Esophagitis Endotypes* | Simon Hogan | Postdoctoral Fellow | University of Michigan Medical School, Hogan Lab |

***Table 8 (Above):*** *MI-ONCOSEQ Clinical Trials/Studies from pg. 44.*
***Table 9:*** *Graduate Student Thesis Defense and Current Positions from pg. 66.*
***Table 7 (Above):*** *List of Inventions from pg. 56.*

## Years of Service Recognition FY24

### 10 Years

| | | |
|---|---|---|
| Faheem Al Hilali | Melissa Derosia | Threase Nickerson |
| Ryan Bajema | Jamie Estill | Kelly Novak |
| Cathy Bobowski | Kate Ferguson | Scott Parker |
| Jennifer Brewer | Peter Heyboer | Ramesh Surisetty |
| Julie Butcher | Caroline Landau | Liz VanderElzen |
| Luanne Daly | Scott MacLellan | Jiong Yang |

### 20 Years

| | | |
|---|---|---|
| Jill Bayliss | Lynn Knudson-Horneber | Andrea Vincent |
| Jennifer Campbell | Radhika Lnu | Lei Wang |
| Ladislaus Dombrowski | Jessica Matheny | Maegan Weighman |
| Melissa Dunn | Lynn McCain | Misty Wideman |
| Erica Gotsis | Christy Taylor | |
| Devon Kandrevas | Scott Truskowski | |

| 30 Years | | 40 Years |
|---|---|---|
| Allen Ano | Anthony Sinay | Stephen Marshall |
| Tonya Hoffman | Aaron Smith | Vicki Wescott |
| Douglas Mullen | Stefan Stoll | |
| Jharna Saha | Roscoe Warner | |

## Above and Beyond Award Recipients

### Anatomic Pathology

| | | |
|---|---|---|
| Jonathan Black | Jennifer Hayes | Linda O'Brien |
| Ja'Nee Bolden | Dakota Heiden | April Oler |
| Rachel Brandimore | Casey Hollier | Jamie Roberts |
| Laurie Chopko | Sharon Kerr | Sally Smith |
| Lindsay Crater | Sonia Lakshmanan | Keishia Tooson |
| Mary Currie | Kristin LaMaire | Tammi Toth |
| Stephanie Edwards | Karen Marusza | Angela Wilson |
| Gerson Gran | Monique Micallef | |
| Jessica Hagan | Threase Nickerson | |

### Clinical Pathology

| | | |
|---|---|---|
| Stephanie Agozino | Andrew Entrup | Scott McClellan |
| Jenn Berks | Jaclyn Epple | T'nai McElrath |
| Shannon Bishop | Bradley Exell | Jody Metski |
| Alysha Boyle | Sarah Guenther | Christopher Monge |
| Jennifer Brewer | Michelle Herrst | Priti Patel |
| Janette Brown | Steven Holden | Amanda Peabody |
| Kristina cantrell | Mariana Hristeva | Corrine Potocki |
| Kathleen Chandler | Kyle Jennings | Emily Robledo |
| Brenda Church | Dawn Jucha | Rachel Salmon |
| Hanna DeLapp | androniki Kapousouzi | Martha Tahir |
| Elizabeth DeWitt | Colleen Keller | Katherine Turner |
| Alexandria Donnally | Erin Liwienski | vicki Westcott |
| Dina Eadeh | Sheridan Mattson | Kaila Wiktor |

**Team Awards**

| |
|---|
| Brighton Specialty Care Lab Team |

### Pathology Informatics

| | | |
|---|---|---|
| Beth Gibson | Eric Jedynak | |
| Andrea Hawk | Dena Ryan | |

### Finance & Administration

| | | |
|---|---|---|
| Ashley Boguslaski | Caryn Crane | Jason Schwartzenberger |
| Lauren Branson | Regina Ferguson | Christopher Smith |

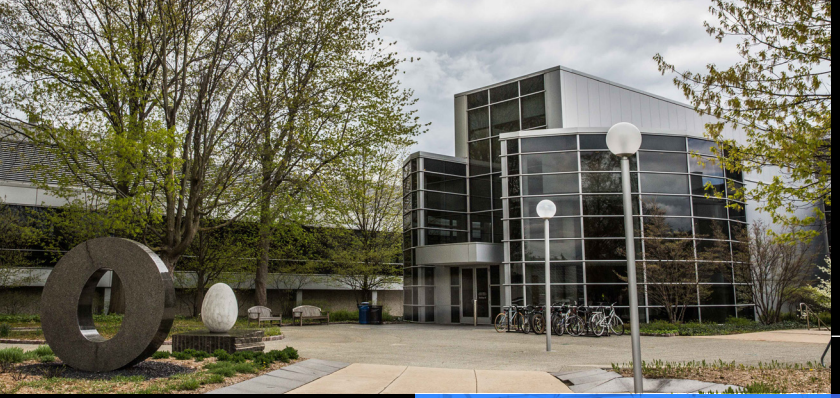
| MlLabs | | Chair's Office |
|---|---|---|
| Nel Amr | Shirley Pindzia (*Hoffman*) | Yvonne Beadle |
| Marie Brady | Christine Meldrum | Angela Suliman |
| | | Michal Warner |

***Table 10 (Above):*** *Years of Recognition recipients from pg. 76.*
***Table 11 (Right):*** *Retirees from years 2023-2024 from pg. 77.*

## Retired 2023-2024

| Name | Job Title | Date | Years |
|---|---|---|---|
| Alganesh Abraham | Medical Technologist, Molecular Diagnostics | *May 4, 2024* | 33.3 |
| Henry D. Appelman | Professor, GI Pathology | *Jan 1, 2024* | 54.5 |
| Terri L. Bauer | Phlebotomist Specialist, Satellite Support | *Mar 5, 2024* | 34.4 |
| Connie L. Brenke | Clinical Technologist Senior, Microbiology | *Dec 3, 2023* | 35.3 |
| Mary Currie | Admin Specialist Assoc Health | *Dec 16, 2023* | 14.8 |
| Cathy S. Dolezal | Medical Assistant Associate, Satellite Support | *Sep 12, 2023* | 28.0 |
| Sarah L. Dudley-Short | Admin Manager Assoc Healthcare, Academic Human Resources | *Jan 3, 2024* | 17.5 |
| Lorrie S. Gosselin | Phlebotomist Specialist, Satellite Support | *Mar 2, 2024* | 26.1 |
| Kathleen M. Gower | Training Specialist Associate, Chemical Pathology | *Mar 2, 2024* | 20.1 |
| Phyllis T. Gruszczynski | Clinical Technologist Senior, Blood Bank | *Jul 1, 2023* | 35.1 |
| David M. Harro | Allied Health Senior Supr, Special Chemistry/ Immunology | *Apr 6, 2024* | 39.8 |
| Chia-Mei Huang | Research Technician Senior, MCTP | *Sep 16, 2023* | 21.4 |
| Farah Keyoumarsi | Research Technician Associate | *Feb 29, 2024* | 25.4 |
| Nanci K. Lefebvre | Admin Manager Assoc Healthcare, MLabs | *Dec 5, 2023* | 33.8 |
| Michael J. Meade | Nursing Supervisor, Transfusion/Apheresis | *Jan 27, 2024* | 43.0 |
| Judy Poore | Research Lab Specialist Assoc | *Feb 1, 2024* | 13.4 |
| Sunita Punjabi | Medical Technologist, Microbiology | *Mar 8, 2024* | 33.4 |
| Stephen L. Soltis | Business Systems Analyst Inter, Pathology Informatics | *Apr 3, 2024* | 18.0 |
| Cindy L. Straub | Allied Health Associate Supr, In-patient Phlebotomy | *Sep 30, 2023* | 25.6 |
| Terri Tallmadge | Medical Technologist, Blood Bank | *Mar 20, 2024* | 13.3 |
| Vicki L. Westcott | Medical Technologist Spec, Chemical Pathology | *Feb 23, 2024* | 40.6 |

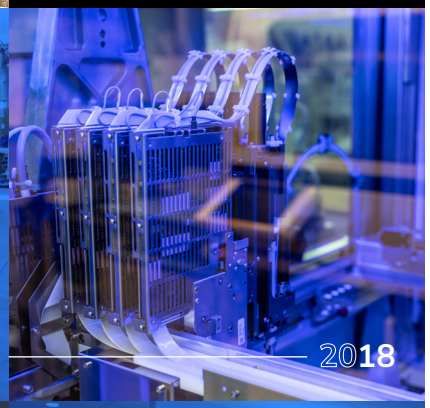

Dr. Riccardo Valdez, presenting for the CP division, and recognizing some of employees recognized at the 2024 Employee Recognition ceremony.



2015

2016

2017



2018

2019

2020

2021

2022

2023

2024

Annual Report compiled by Pathology Communications: Lynn McCain, Editor; Anastazia Hartman, Editor; Brent Temple, Design and Layout; Anastazia Hartman, Camren Clouthier, Dustin Johnston, and Elizabeth Walker, Photography. A special thanks to the many contributors who provided the content for this report.

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