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[geisinger.org/pharmacy](https://www.geisinger.org/pharmacy)

2022-2023 Year in Review

# Geisinger Enterprise Pharmacy

## Geisinger

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## Mission

- To work collaboratively with healthcare professionals across Geisinger and the community it serves
  - To provide safe, cost-effective, evidence-based medication therapy management
  - To enhance the lives and health of our patients, system and region
- 

## Vision

- To be the premier steward for all medication-related needs across Geisinger
- To be recognized as a national model for medication management, pharmacy management and leading innovative and evidence-based programs of care delivery, research and education



## Message from the chief pharmacy officer



Welcome to the 2023–2024 edition of the Geisinger Enterprise Pharmacy annual report.

This past year was unlike any year Geisinger has ever experienced. The announcement of Risant was a highlight, but we faced challenges including competition from tech giants; consumerism driving patients' healthcare decisions; and shortages in medication, supplies and the workforce. Fortunately, these disruptors to the healthcare environment have inspired and motivated our pharmacy team to get creative and develop innovative ideas to remain competitive. This report details some of the exceptional accomplishments of our Geisinger Enterprise Pharmacy Team.

While continuing to navigate the tremendous cost burden in healthcare, our team stayed true to our mission, continuing to grow existing programs and implement new programs that support high-quality, high-value, safe, cost-conscious, world-class care. Several accomplishments bear mentioning here, but be sure to review the entire report for the full picture.

We've opened new home infusion pharmacy services, home infusion suites, retail pharmacies and specialty pharmacies. We implemented Epic Willow Inventory and Epic Willow Ambulatory across Enterprise Pharmacy. Our pharmacy services expanded, with dual accreditation of Geisinger Medical Center, Geisinger Wyoming Valley Medical Center and Geisinger Community Medical Center retail and specialty pharmacy services. Providing vaccinations to our community was an immense undertaking — many pharmacists and technicians rose to the challenge and aided by preparing and administering COVID-19 vaccinations. Ambulatory chronic disease management pharmacists expanded their patient reach outside the clinic walls by managing HTN patients through remote monitoring blood pressure cuffs. Centralized clinical pharmacy services has expanded its program to manage the majority of the system's phone, MyGeisinger and Epic in-basket messages related to medications.

Pharmacy is one of Geisinger's most valuable assets, and we continue to focus on the collective strength of our pharmacy team. With input from our team, we've identified several key opportunities for the near future to achieve our goal of continued clinical and financial success. Delivery of pharmacy services at Geisinger would not be possible without the dedication and commitment of our entire pharmacy team. I'd like to thank everyone for their commitment to the pharmacy profession and to the care of Geisinger's patients and communities.

Let's hope next year brings health, wealth and happiness to all.

**Michael A. Evans, RPh, MBA, FASHP**

Chief Pharmacy Officer  
Geisinger

# Pharmacy leadership



**Mike Evans**  
Chief Pharmacy Officer



**Kelly Guza**  
Associate Vice President  
Acute Programs



**Seth Gazes**  
System Director  
Planning, Strategy and Analysis



**Gerard Greskovic**  
Associate Vice President  
Ambulatory Programs



**Dave Klinger**  
System Director  
Operations and Compliance



**Eric Wright**  
Professor and System Director  
Managed Care Pharmacy



**Daniel Longyhore**  
System Director  
Knowledge Management



**Jamie Miller**  
Associate Vice President  
Managed Care Pharmacy

# Enterprise Pharmacy pillars



## Acute Programs

- Medication optimization
- Multidisciplinary team rounds
- Emergency bedside response
- Antimicrobial stewardship
- Anticoagulation management
- Pharmacokinetics
- Medication reconciliation
- Specialty services (e.g., hem/onc, peds)
- IV infusion
- OR



## Planning, Strategy & Analysis

- Innovation
- Project management
- CarePaths
- Population health
- EP program analysis and evaluation
- Automation/technology
- Data informatics



## Operations & Compliance

- Medication safety
- Corporate compliance
- Policies and procedures
- 340B



## Ambulatory Programs

- Specialty care
- Primary care chronic disease management
- Pharmacy call center
- Retail
- Mail-order
- Specialty
- Home infusion
- Pharmaceutical patient assistance
- Geisinger at Home



## Contracting & Procurement

- IDN contracting
- IDN procurement
- IDN formulary



## Knowledge Management

- Pharmacy residencies
- Student coordination
- Staff training programs
- Competency development
- Patient education materials/ programs
- Collaborative practice



## Managed Care

- Drug benefit management
- Design management utilization
- Medication adherence
- Treat-to-target HEDIS metrics



## Center for Pharmacy Innovation & Outcomes

- Investigational drug services
- Pharmacy research support
- Pharmacy outcome studies
- Demonstrating effectiveness of pharmacy programs
- Research grants
- Translating research into practice



## Pharmacy Innovation Alliance

- Building and strengthening industry relationships
- Access to and sharing of Pharmacy Enterprise knowledge
- Promoting value leadership
- Driving market competitiveness

## Pharmacy Care Coordination & Enterprise EHR

Not a building; not a pharmacy: A complete system clinical pharmacy resource responsible for Medication Therapy Disease Management systemwide. We are matrixed throughout the system as a distributed pharmacy and pharmacist network and maintain the patient at the center of all we do.

# Ambulatory care



## Geisinger Home Infusion Services expansion

Ron Zsido

Geisinger Home Infusion Services (GHIS) has continued its expansion strategy by increasing its reach and service area through the addition of a satellite office in western Pennsylvania, diversifying its offerings by adding new medications and services, and looking for additional ways to provide a valuable service for patients and providers. With an increased attention on moving site of care and identifying when therapy can be moved from hospital to infusion center and infusion center to home, GHIS is working to exceed expectations.

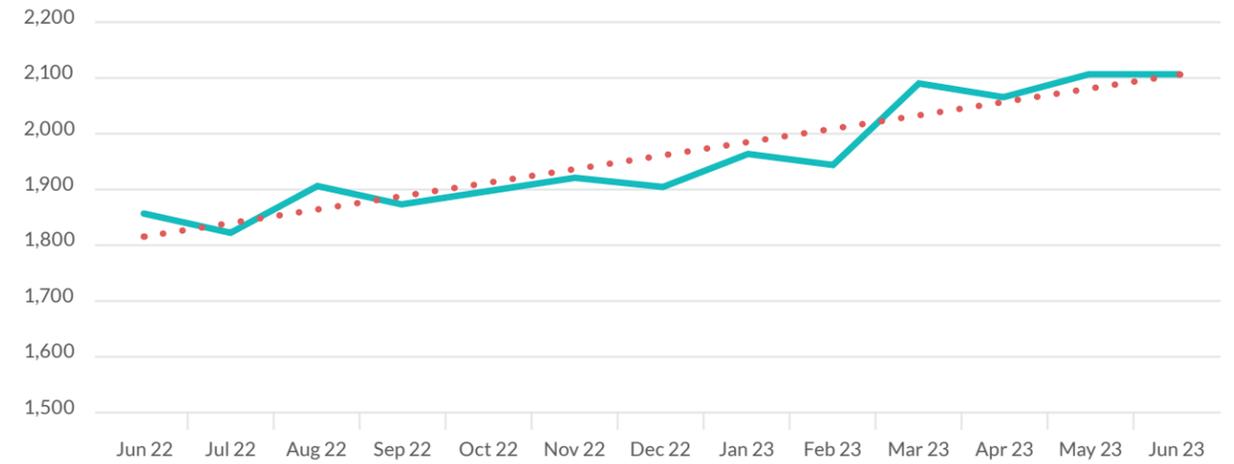
GHIS opened its inaugural home infusion suite in Danville in February of 2023. The four-bed suite is in the same building as the GHIS Pharmacy and offers another location for patients in central Pennsylvania who require on-site infusions or are unable to receive infusions in their home. In the first five months of being open for expanded business, over 260 patients have been treated on site and over \$2,000,000 in revenue earned.

GHIS opened a new satellite office in State College, Pa., in May of 2022. This allowed GHIS to expand its coverage and service area, to apply for additional payor contracts and to provide a more reliable acute discharge service to Geisinger hospitals in those regions. Thus far, this site has served over 625 patients and returned over \$830,000 in revenue. Additionally, in the coming year, GHIS will be expanding its footprint at this site to allow for additional storage, workspace, and a potential two- or four-bed home infusion suite.

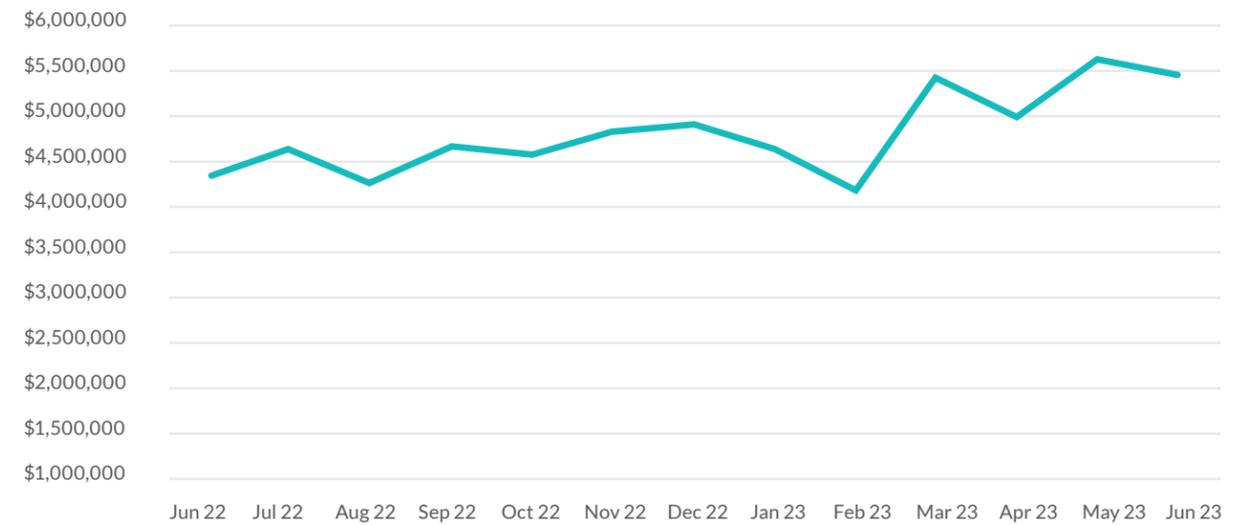
The continued collaboration with Medication Therapy Disease Management (MTDM) Pharmacy services across the system has been successful at identifying and transitioning new patient populations to home therapy where clinically appropriate. Working with MTDM and clinical leadership in neurology, GHIS has completed the process for adding Rituximab (Ruxience®) as an at-home infusion option for patients.

As part of a multidisciplinary effort, GHIS developed a hospital discharge assistance program for patients who would not otherwise qualify for home infusion services upon discharge because of home health nursing shortages. For patients unable to go home to continue therapy because of the complexity of their needs or insufficient resource available through home health agencies, the program supports the patient's transition to ensure safe medication delivery and administration in their home. The program is a collaborative effort with Geisinger's hospitalist providers, inpatient pharmacy teams at Geisinger Community Medical Center and Geisinger Lewistown Hospital, case management teams and other discharge planning team members.

Number of patients served by Geisinger Home Infusion Services, 2022-2023



Geisinger Home Infusion Services monthly revenue



## Continued evolution of Geisinger Mail-Order Pharmacy

Jenny Plummer

Utilization of Geisinger Mail-Order Pharmacy has always been a key driver in bringing care and medication dispensing service directly to the consumer. Persistent surges in prescription growth rate throughout 2022-2023 have driven the commitment to enhancing and growing Geisinger's mail-order prescription fulfillment model to meet the demands of current service line volumes, while also maintaining a consistent level of service excellence for Geisinger's patient base. Geisinger Mail-Order Pharmacy's strategy is to provide innovative solutions to expand upon access to prescription services and ease of use for the consumer via solutions such as MyChart, auto-refill and soon, med synchronization.

Mail-order is composed of 61 employees. The team of 13 pharmacists, 40 technicians and eight support associates manages all call center and prescription fulfillment operations. From July 2022 to end of June 2023, Geisinger Mail-Order Pharmacy processed over 950,000 prescription orders, with a peak volume in June 2023 of nearly 89,000.

In the last 12 months, Geisinger Mail-Order Pharmacy has seen several operational enhancements, including:

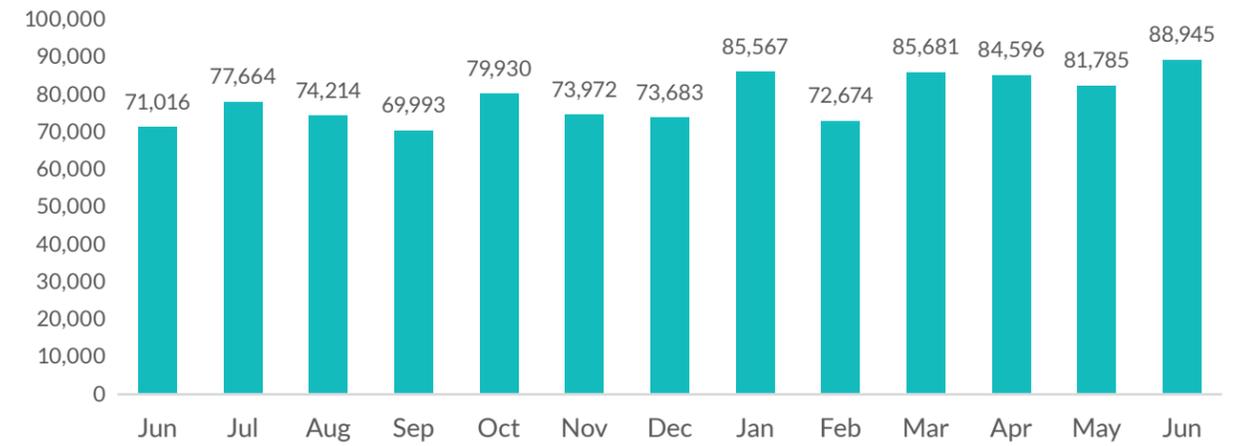
- Adherence packager cycle fill fulfillment for LIFE Geisinger facility participants completed
- Phase I automation line expansion
- Pharmacy operating system change to Epic Willow ambulatory
- Enhanced web portal patient experience via MyChart
- Upcoming: Phase II automated line expansion and workstation/server upgrade

The roadmap into the next 12 months for Geisinger Mail-Order Pharmacy includes:

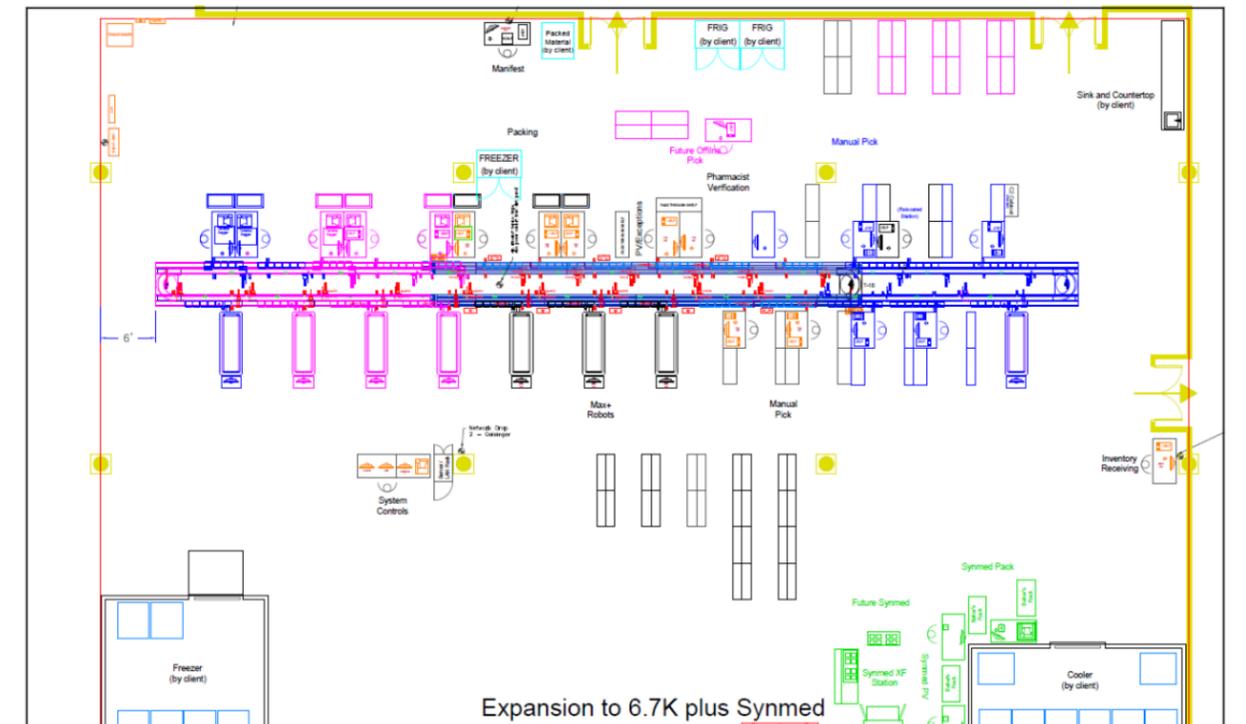
- Adherence packaging options for non-LIFE Geisinger patients with Geisinger Health Plan
- Med synchronization with auto-refill enrollment
- Pursuit of URAC accreditation for 2024
- Central filling services for retail pharmacy footprint

## Geisinger Mail-Order prescriptions filled FY22-23

2022 - 2023



## 2023 Line Expansion Footprint Geisinger Mail-Order Pharmacy



# How alternate dispensing pivoted medication distribution

Jenny Plummer

One of the greater challenges of Geisinger's ambulatory pharmacy retail footprint is its coverage area relative to the overall system footprint. While Geisinger Mail-Order Pharmacy offers a larger network of medication access for Geisinger Health Plan patients, there is still a gap for point-of-care medication services for Geisinger patients who have immediate medication needs post-visit to a Geisinger clinic or ConvenientCare location not in proximity to a Geisinger Retail Pharmacy.

To increase access to Geisinger Pharmacy retail services, Enterprise Pharmacy quickly recognized the best way to support Geisinger patients with medication needs outside the traditional pharmacy setting was to leverage an out-of-the-box solution that would allow for patients to leave outpatient provider visits with medications in hand. Partnering with leadership at ConvenientCare, our system's urgent care centers, a cash-and-carry pilot program was developed. Patients seen by Geisinger providers at the South Abington ConvenientCare location could obtain select medications on site and at an affordable cash price, bypassing insurance billing and preventing the need for an added stop by the pharmacy on the way home.

The providers developed a formulary with standard quantities and directions prepackaged by Geisinger Pharmacy in Mount Pleasant for the facility to use in dispensing. Medications had a preidentified price point of \$5, \$10 or \$15. Patients seen by a provider and prescribed a medication available from the prepackaged formulary could pay the out-of-pocket price and leave with medication in hand. The pilot launched April 3, 2023, with 60 medications dispensed in the first month.

The alternate dispensing model created an opportunity for Geisinger Pharmacy to broaden its scope and capabilities to meet the demand of the system footprint and created a change to expand patient access. Program expansion in 2023 includes two new ConvenientCare locations (Danville and Burnham), as well as the development of a similar model for Geisinger's community medicine locations, which would offer patients a take-home starter pack of medications with subsequent fills from Geisinger's Mail-Order Pharmacy to follow.

## Retail & mail-order 2022-2023

### I. By the numbers

- a. Geisinger Pharmacy collectively filled over 1.5 million prescriptions from July 2022 to June 2023, 13% growth year-over-year. Of that total, Geisinger Mail-Order Pharmacy filled close to 950,000 prescriptions from its centralized location in Elysburg. The Geisinger Retail Pharmacy team provided the balance of 565,000 scripts filled throughout the system over the script year, inclusive of vaccines, LIFE Geisinger and Meds to Beds services.
- b. The retail footprint remained stable from November 2022 through July 2023 with 16 locations between State College and Mt Pocono. Upcoming expansion will add four new locations by summer 2024.
- c. Geisinger Mail-Order Pharmacy has continued to expand its pharmacy delivery radius by obtaining non-residential licenses in two new states over the last script year. Geisinger Mail-Order pharmacy is now licensed in 17 states: PA, DE, NJ, NY, OH, FL, IN, WI, ME, AZ, VT, CT, NH, GA, SC, NC and MN.

### II. 2022-2023 highlights/accomplishments

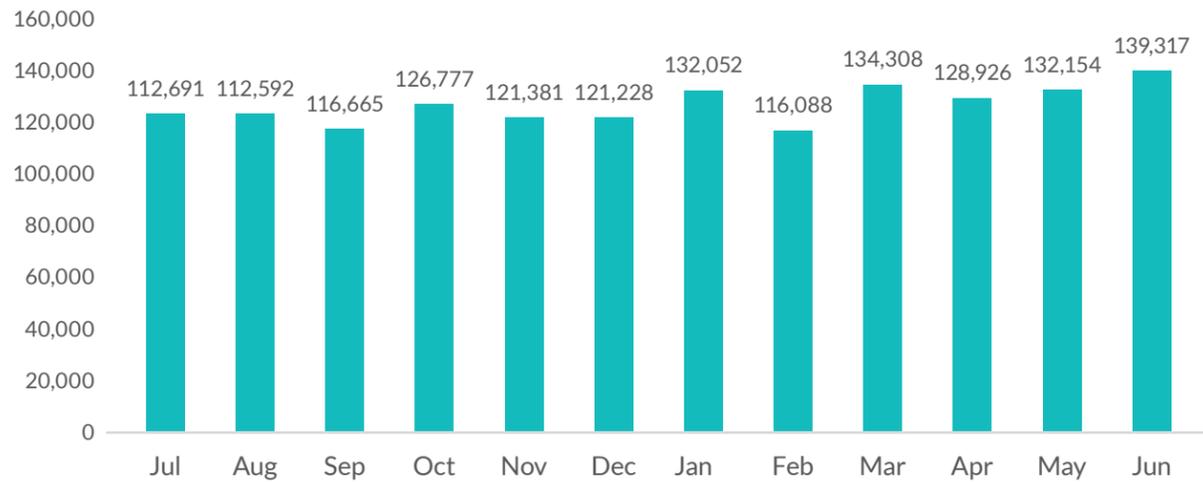
- a. Epic Willow Ambulatory conversion
  - i. Fifteen retail locations, Geisinger Specialty Pharmacy and Geisinger Mail-Order Pharmacy were converted over five waves, starting November 2022 and completing July 2023.
- b. LIFE Geisinger/Adherence Packager centralized fulfillment via Geisinger Pharmacy Belleville and co-located Synmed Adherence Packager at CLAM, generating more than 6,000 prescriptions per month for five LIFE Geisinger facility participants.
- c. Expanded retail footprint: Muncy (8/22), Mifflintown (11/22)
- d. Alternate Dispensing Model launch at ConvenientCare South Abington location (4/23)
- e. Expansion of Geisinger Meds to Beds program to Geisinger Medical Center Muncy (7/23)

### III. 2023-2024 Roadmap

- a. Mail-order line expansion and workstation upgrades (TBD 2023)
- b. Retail point-of-sale PCI compliance upgrades (8/23)
- c. Expanded retail footprint: Reedsville (9/23), Buckhorn (3/24), Geisinger Wyoming Valley Medical Office Building (5/24), Orwigsburg (TBD)
- d. Expansion of ConvenientCare Alternate Dispensing Model to Danville and Burnham locations (fall 2023)
- e. CMSL Alternate Dispensing Model pilot (2024)

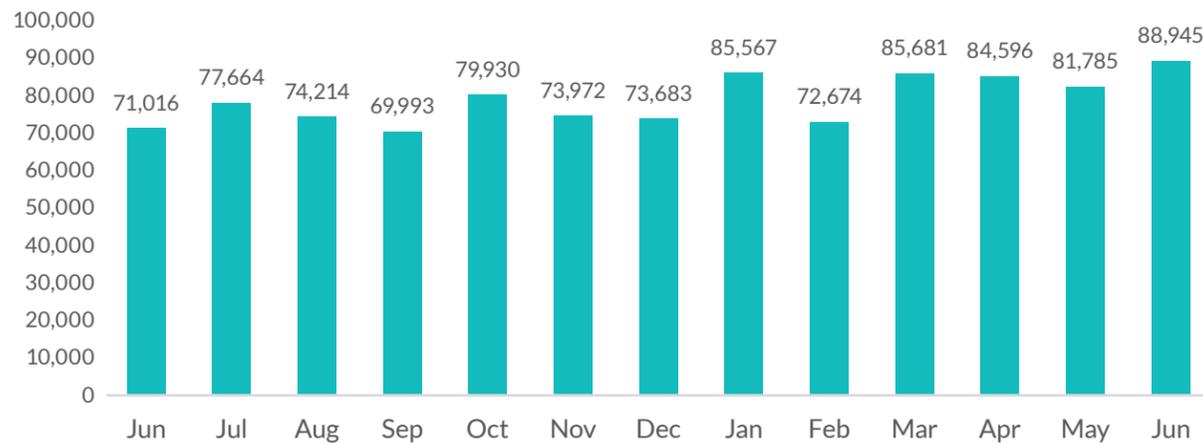
### Geisinger Pharmacy Rx Volumes Retail + Mail Order

2022 - 2023



### Geisinger Mail-Order Prescriptions Filled FY 22 – 23

2022 - 2023



Total script volume July 2022 – June 2023: Geisinger Mail-Order 948,704 prescriptions, Retail 565,475 prescriptions

### Expanding access for HIV pre-exposure prophylaxis

Daniel Longyhore

The collaborative practice agreement maintained between Geisinger pharmacists and physicians is a cornerstone for clinical pharmacy services across the system. The agreement allows pharmacists to practice at the top of their license as members of the interdisciplinary care teams Geisinger has developed. Pharmacists in acute care practice, medication therapy and disease management (MTDM) clinics, home infusion services, centralized clinical pharmacy services, hematology/oncology, specialty pharmacy and specialty pharmacy clinics participate in any number of collaborative protocols. Our pharmacy team members engaged in the collaborative practice agreement undergo annual certifying exams to ensure they are meeting Geisinger’s expectation for clinical pharmacy services. Geisinger Pharmacy’s collaborative practice agreement allows pharmacists to engage with physician colleagues in up to 41 different protocols across all services and facilities, depending on the physician’s specialty and pharmacist certifications.

In 2022, Geisinger Pharmacy extended its clinical protocols to include pre-exposure prophylaxis (PrEP) for patients at risk for contracting human immunodeficiency virus (HIV). The protocol sought to expand Geisinger patient access to HIV PrEP through primary care practices with embedded pharmacy services. Previously, Geisinger patients were mostly only able to access PrEP through consultation with an infectious diseases physician. This new protocol provides access points for patients across the system, many times in the same office where they receive primary care. For patients with more complex needs or seeking non-oral alternatives to PrEP, pharmacists in infectious diseases practice are also available to assist with patient access.

The protocols were developed and implemented with the help of Katelin Ivey, PGY2 health system pharmacy administration and leadership resident (at the time); Cara Ciamacco, MTDM pharmacist in infectious diseases, pharmacy strategy & innovation leadership, ambulatory pharmacy services leadership, Geisinger Retail Pharmacy services; and Darrell McBride, DO, infectious diseases physician with Geisinger.

Program evaluation is ongoing, but the implementation of this protocol has provided easier access for the Geisinger community to receive HIV preventive care services.

## Migraine management in primary care & development of the Virtual Headache Hospital

Adriene Zook

A unique population of patients in primary care have been improving their headache and migraine outcomes through care provided by the MTDM Program. In May 2023, after a pilot period that began 16 months earlier, MTDM expanded program-wide into the treatment of headache and migraine in primary care. A Geisinger Health Plan quality grant collaboration with neurology in 2023 is now providing MTDM with added opportunity to help this patient population gain improved headache care by creating a Virtual Headache Hospital (VHH). While the term *hospital* is used in the naming of this space, it is not a brick-and-mortar hospital, but rather emphasizes the *virtual* part of its title to allow patients to get to the right care team member at the right time, using an intake and triage process after an emergency room visit.

The VHH team plans to go live with the intake process in late summer 2023 and continue the momentum of creating better access for our partners in neurology and better headache care for our patients and members closer to home, in their primary care locations. Preliminary data show a significant reduction in headache days for patients who've engaged with the MTDM headache management in primary care. Data are also showing a decrease in neurology referrals coming out of the primary care space, which allows for greater access in the specialty care space. All this, combined with shared decision-making and education of our patients and providers, will help reduce pharmacy spend and ER utilization – a win-win for all partners involved.

## ConnectedCare 365 Hypertension Management Remote Patient Monitoring Program

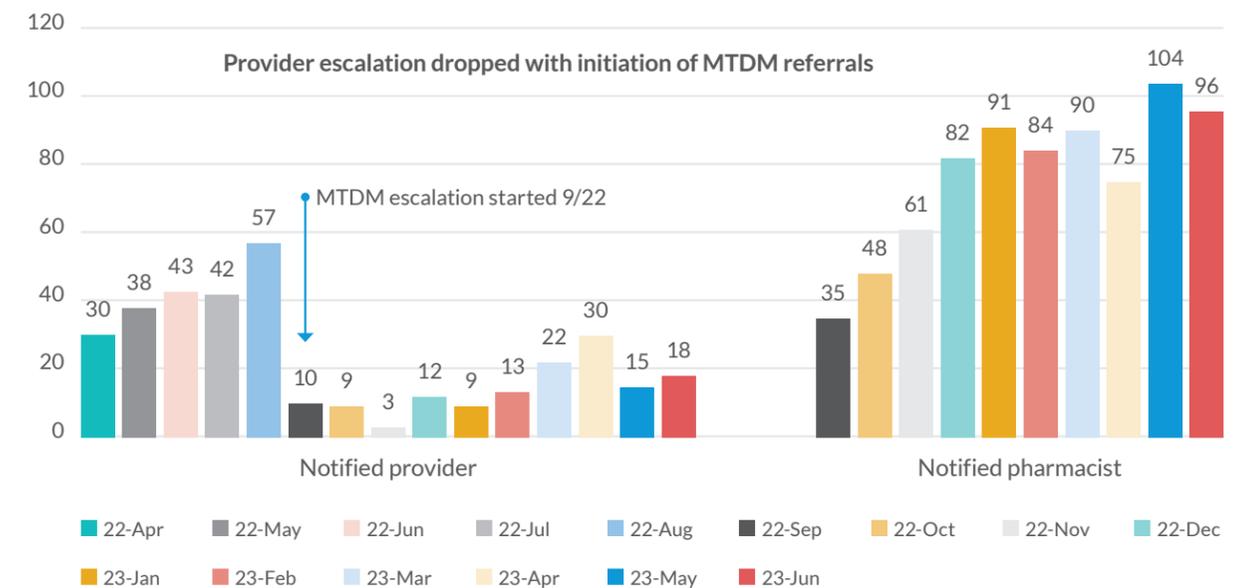
Stacey Grassi

The Chronic Disease Management Command Center, in conjunction with nephrology, developed the ConnectedCare 365 Hypertension Management Remote Patient Monitoring Program to provide remote self-monitoring to patients with uncontrolled hypertension. The program's goal is to provide a more realistic picture of the daily trending blood pressures through Bluetooth-connected home blood pressure monitoring, intervene on any necessary lifestyle changes and provide medication optimization. Patients identified by nephrology as meeting the inclusion criteria are referred to the program and enrolled by a nurse specialist. Patients must take blood pressure readings daily to stay enrolled in the program.

As the ConnectedCare program grew, medication therapy disease management (MTDM) was integrated into the multidisciplinary care team model to allow for further triage of elevated blood pressure results. Patient alerts for singular hypertension reading greater than 180/120 or singular hypotension reading less than 90/50 are sent directly to the nephrologist. Alerts for average blood pressures over seven days greater than 140/90 with or without new symptoms, are sent to MTDM pharmacists for management under a collaborative drug therapy management agreement. Early results indicate MTDM involvement has improved systolic blood pressure 25–30 mmHg (Figure 1). The number of elevated blood pressure alerts being sent to the MTDM pharmacists has also increased (Figure 2) allowing for increased access for the nephrologists. Additional metrics identify since March 2023 MTDM has received 167 alerts for elevated seven-day average blood pressure readings. These alerts have resulted in 13 new medication additions, 20 medication dose titrations, one medication discontinuation and many positive patient satisfaction comments.

## Hypertension Alarm Escalation Volume

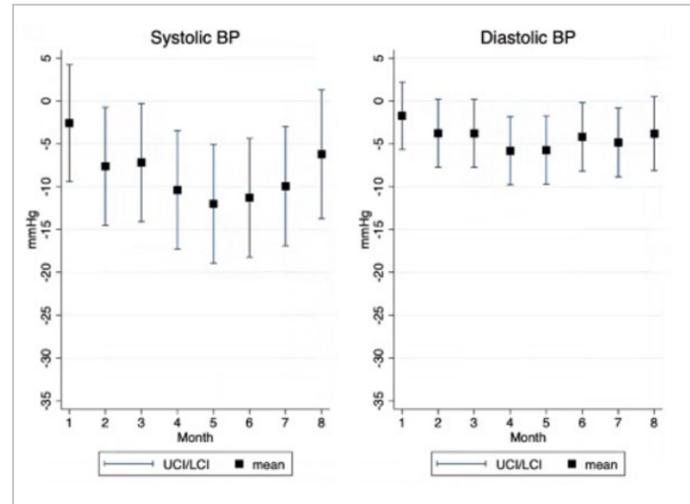
Number of Hypertension Alarm Escalations



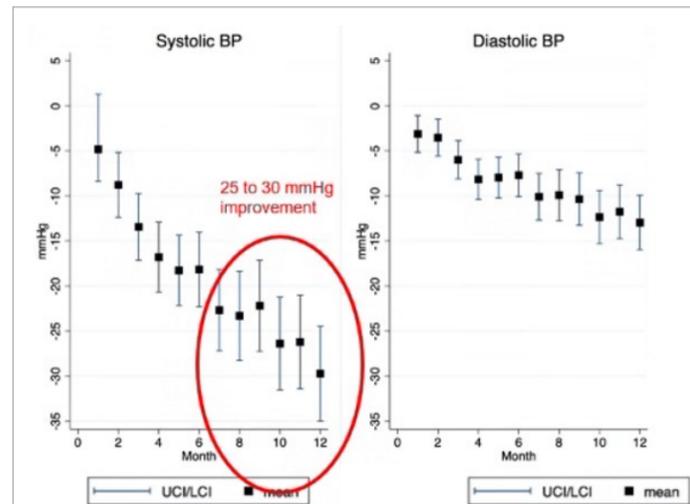
# Improvement in BP Pre & Post Pharmacy Interventions

Pre and post Oct. 1, 2022

## Pre-Pharmacy Participation



## Post-Pharmacy Participation



# Northeast Pharmacy Business Hub

Allyson Hess

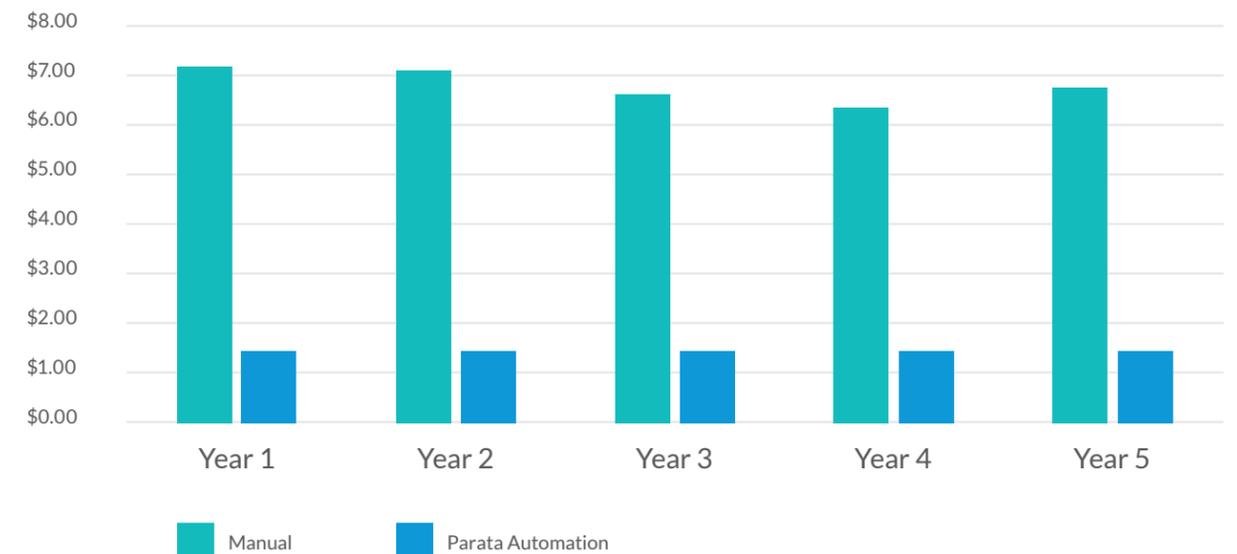
Geisinger Pharmacy has received funding approval for the Northeast Pharmacy Business Hub, a centralized and coordinated Ambulatory Pharmacy operations center in northeastern Pennsylvania. This site will house a home infusion suite, state-of-the-art home infusion satellite office, pharmacy conference room and drop-in workstations for hybrid Centralized Clinical Pharmacy Services teams and Wilkes University pharmacy students. In addition, Geisinger Specialty Pharmacy (GSP) will relocate to this new space from the campus of Geisinger South Wilkes-Barre.

As part of the GSP relocation, several changes will be implemented, including the expansion of the operations and distribution center footprint and the addition of an automated production line. With a year-over-year growth rate close to 20% and projected 2023 revenue from specialty medications filled at the entity pharmacies and Geisinger Specialty Pharmacy at \$70 million and \$378 million, respectively, it is critical to create a highly efficient and centralized specialty medication distribution channel.

The production line, inclusive of three high-speed robots for prescription filling, will boast modern processing and distribution technology, improved centralized workflow and workflow management software tools, optimized inventory procedures, and additional capacity for growth. The automated system will increase productivity and accuracy, with less dependence on human resources. It is estimated that that over the next five years the decreased labor needs will result in approximately \$3.9 million of labor savings. The inclusion of robots in the new production line will also allow this site to serve as a redundancy strategy for the Geisinger Mail-Order Pharmacy, with a capability of filling up to 3,150 prescriptions over 10 hours.

Figure 1. Estimated labor savings from the Parata automated production lines in the plans for the new Northeast Business Hub.

## Labor cost / Rx



# 340B Program & Specialty Pharmacy

Allyson Hess & Dave Klinger

The 340B Drug Pricing Program helps Geisinger stretch scarce healthcare dollars to deliver high-quality care and services to vulnerable populations including low-income, underinsured and uninsured people, as well as those living in isolated rural communities. This program allows Geisinger to support a full spectrum of comprehensive medical services for our communities. Some of the initiatives include Free2B Moms; Fresh Food Farmacy™; 4Ride, a transportation program for seniors; and Geisinger 65 Forward.

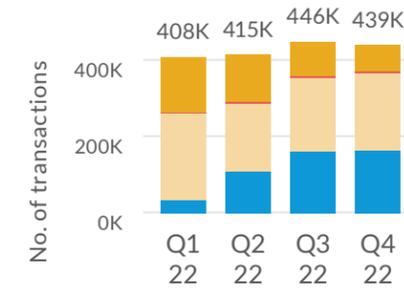
- Program overview
  - Five covered entities
    - Geisinger Medical Center
    - Geisinger Wyoming Valley Medical Center
    - Geisinger Community Medical Center
    - Geisinger Lewistown Hospital
    - Geisinger Jersey Shore Hospital
  - 151 clinic child site locations
  - 215 contract pharmacies collaborations
- Key projects
  - BOT automation – claim auditing
    - CY 2022
      - Hospital claims audited – 1,500,000
      - Retail claims audited – 220,000
      - Realized savings – \$1.5M
      - FTE savings – 20 FTE

**Total hours**  
41,675

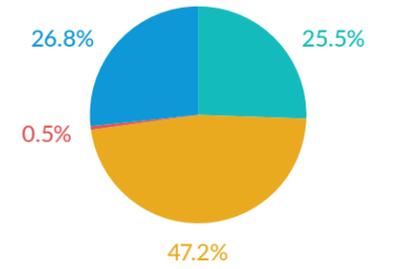
**Total realized benefits**  
\$1,462,776

**Total transactions**  
1,707,713

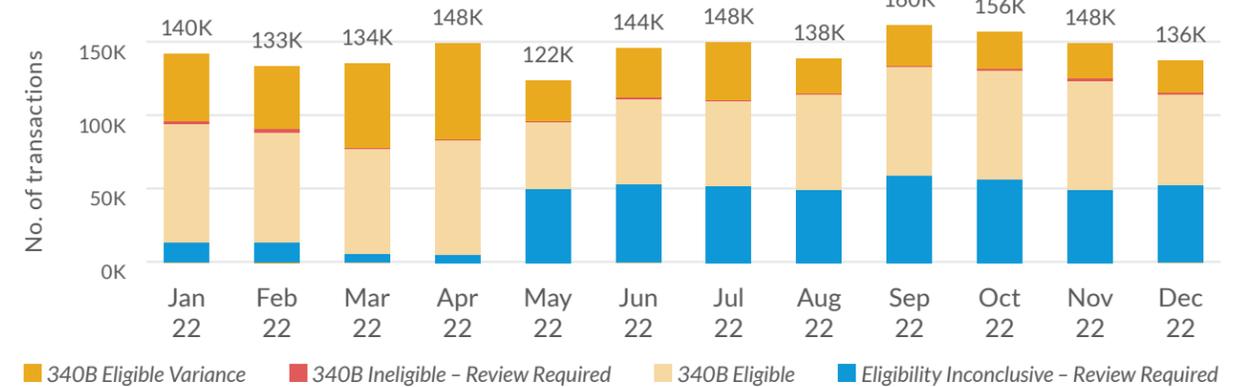
Quarterly Transactions



Overall Transactions %



Monthly Transactions



Geisinger Specialty Pharmacy (GSP) implemented several structural and operational changes as a strategy to mitigate a January 30th U.S. Court of Appeals for the Third Circuit decision allowing for manufacturer restrictions on the use of contract pharmacies under the 340B drug pricing program. Responses from manufacturers have been varied, with some continuing to allow contract pharmacies to remain eligible for 340B pricing without restriction or through the exchange of claims-level data, while others are restricting the number of allowed contract pharmacies, the use of contract pharmacies by geographical location, or not allowing contract pharmacies to participate at all.

To date, over 20 manufacturers have made changes to their 340B pricing eligibility policies, limiting the availability of 340B pricing on many medications, specialty drugs included. The impact to Geisinger, like many other health systems across the country, is significant and, without the implementation of mitigation strategies, has the potential to amount to tens of millions of dollars in lost benefit to the organization and the patients it cares for.

In response to the new manufacturer restrictions, Geisinger Specialty Pharmacy transitioned eligible prescriptions to our entity-owned pharmacies for processing and distribution, preserving the 340B pricing benefits for these medications where allowable. Geisinger's entity-owned pharmacies are already accredited by the Utilization Review Accreditation Commission (URAC) and will gain Accreditation Commission for Health Care (ACHC) accreditations in 2023. This dual accreditation is necessary for many manufacturers and payers to access specialty medications and participate in networks. This is a constantly evolving process with new manufacturers being added or restrictions being updated almost weekly. Subsequently, the GSP team has partnered closely with the Retail Pharmacy, Strategy, and Operations and Compliance teams to predict further manufacturer restrictions related to specialty and high-dollar retail medications and to anticipate impactful rulings as other decisions related to 340B contract pharmacy use are being reviewed in other Courts of Appeals.

# Acute care

## InsightRX

Kayla Kotch & Bradley Lauver

The 2020 Therapeutic Monitoring of Vancomycin Revised Consensus Guideline led to a large practice change for Geisinger Enterprise Pharmacy. Historically, vancomycin has been dosed using trough-based monitoring as a surrogate for area under the curve (AUC), vancomycin's known ideal pharmacodynamic target. However, literature has demonstrated this method to be inferior to AUC-based vancomycin dosing, potentially leading to increased vancomycin exposure and risk for acute kidney injury.

On June 26, 2023, Geisinger Enterprise Pharmacy went live with AUC-based vancomycin dosing using a Bayesian software program called InsightRX. This software program uses a-priori population models in addition to patient-specific information to predict vancomycin clearance, volume of distribution and steady-state AUC using just one vancomycin level for most patients. The InsightRX software program can also interpret levels drawn at almost any time during a dosing interval, allowing for vancomycin levels to be bundled with other scheduled lab draws. This feature can minimize lab draws, thus improving patient experience and lessening the workload on nursing and phlebotomy staff. The software program is also able to interpret levels drawn prior to reaching a steady state, allowing for early target attainment and making early dose adjustments for critically ill patients.

Overall, the transition to AUC-based vancomycin dosing using InsightRX software is anticipated to improve patient experience, reduce vancomycin exposure, improve vancomycin safety by reducing the risk of AKI, improve vancomycin efficacy by maximizing probability of therapeutic target attainment, and reduce the workload on patient care teams.

## Omnicell updates

Elizabeth Gajkowski

Pharmacy operations are supported by Omnicell® and the automated distribution cabinet system. The system controls and tracks the movement and use of medications at Geisinger. Several key updates over the last year have improved pharmacy operations and patient care.

We have installed numerous Omnicell units in hospitals and clinics, including the newly expanded Frank M. and Dorothea Henry Cancer Center, Geisinger Healthplex CenterPoint Ambulatory Surgical Center and Acadia Behavioral Health Joint Venture. A new Omnicell Pharmacy Carousel was also installed in Geisinger Wyoming Valley Medical Center's central pharmacy.

Automated dispensing systems keep the right medication for the patient at nurses' fingertips. In addition to Omnicell expansion, better use of the technology has resulted in several other changes.

- With the implementation of Epic Willow Inventory, Omnicell operability was updated to allow integration between the two inventory systems and better transparency into medication available, as well as to support consistent medication availability.
- In Geisinger Janet Weis Children's Hospital, including antibiotics in the Omnicell system reduced the number of direct-dispensed antibiotics from the satellite pharmacy by nearly 200 doses in three months.
- In Geisinger Medical Center's IV preparation area, staff dispensed nearly 600 doses less per week of piperacillin/tazobactam by moving the medication's availability to Omnicell.
- Wireless technology updates allow anesthesia workstations in the operating room area to go mobile and improve access to critical medication in various locations.

## Standardizing sterile compounds

Adam Castro & Heidi Yanoski

One of the core goals of infusion and sterile preparation and medication safety is to meet expectations of product quality and consistency. From a quality perspective, users of the compounded product should expect to have the same product available to them with each use. From a safety perspective, employing standardized practices and products reduces the risk of error when one product has multiple formulations.

In the time leading up to the launch of Epic Willow Inventory, the Infusion and Sterile Products team streamlined the medication compounding services provided to Geisinger clinics, attempting to identify a common formulation for products used across specialty practices such as dermatology, orthopaedics and ophthalmology. The goal was to identify a recipe for all specialties to use, thereby increasing the ability to provide a consistent product and reduce the risk of error associated with multiple formulations and concentrations. Additionally, the process of standardization has decreased drug costs and preparation time, and increased the department's efficiency. This new focus on standardization has advanced the level of transparency for the system, such that all departments can easily recognize which combinations are being compounded and be confident the products provided are safe, reliable and prepared with the benefit of our patients at the forefront.

## Epic Willow Inventory implementation

Bradley Dudeck

With a value of approximately \$52 million, pharmacy inventory is a significant financial asset to the organization. Total pharmaceutical purchases for the health system are approximately \$780 million per year. To help manage this asset, Epic Willow Inventory (WINV) was implemented systemwide across all inpatient, hematology/oncology infusion center, ambulatory surgery center, retail, mail-order and specialty pharmacies. WINV was also implemented at all non-pharmacy locations to allow for clinic and floor stock ordering of medications. Approximately 900 individual clinic departments throughout the system order medications from pharmacy locations.

WINV has provided an integrated and streamlined process for managing pharmacy inventory through our electronic health record. It provides real-time decrementing and incrementing of medication inventory through normal pharmacy operations (e.g., dispensing, wasting, receiving), as well as visibility across the system for item inventory levels at each pharmacy inventory location; this includes approximately 500 automated dispensing cabinets and anesthesia workstations.

All inventory locations are perpetual, which streamlines the purchasing process by identifying items below par and generating purchase requests. Other features of WINV include barcode scanning for receiving and sending medications, which promotes safety and accuracy; guided cycle counts to ensure inventory counts are correct; and reporting functionality that allows the system to better optimize the inventory from a financial standpoint. With the enhanced visibility into each sites' inventory, Epic Willow Inventory is helpful in managing backorders and allows storage of overstocked medications at our central pharmacy distribution center. All these features have allowed us to better track inventory, reduce waste and improve efficiency.

# Hematology & oncology



## Chimeric antigen receptor T-cell (CAR-T) therapy

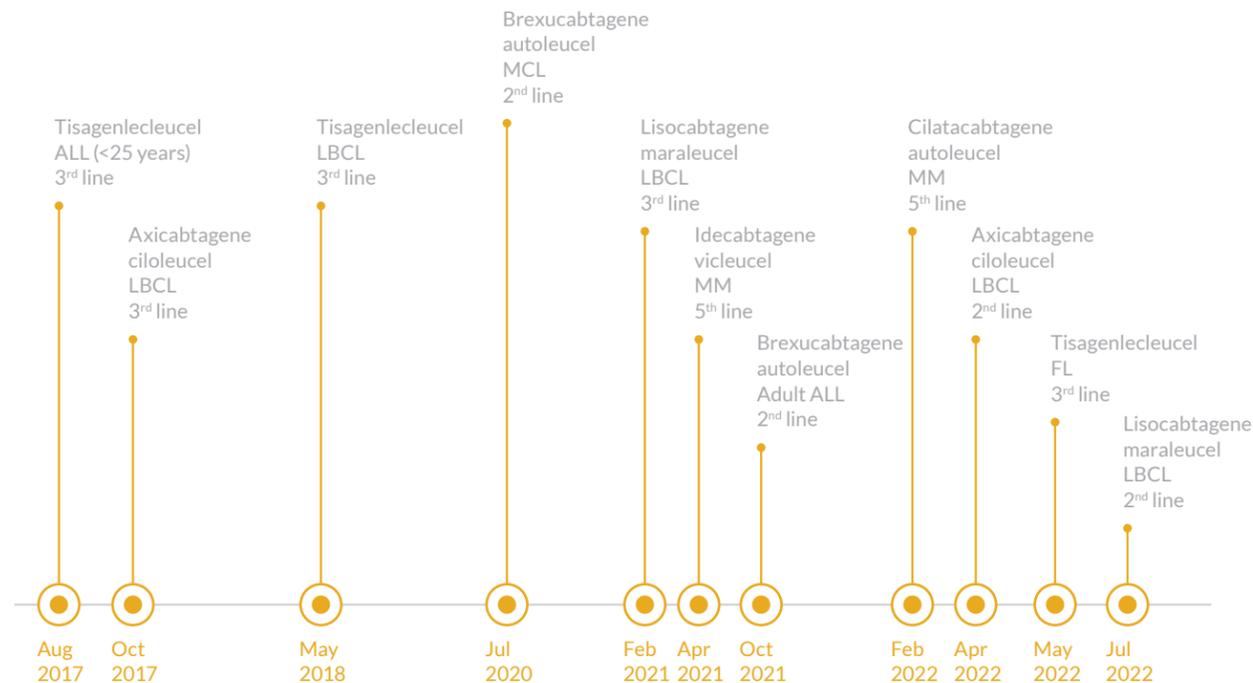
Gwen Hua and Rachael Straining

Geisinger is rapidly approaching an exciting milestone as it finalizes preparations for administering its first chimeric antigen receptor T-cell (CAR-T) therapy to a patient. This has been an extensive and diligent effort by the entire multidisciplinary team. CAR-T therapy represents a cutting-edge advancement in cancer treatment, harnessing patients' own T-cells to combat their cancer.

Contracts with CAR-T companies underwent review and site inspections ensured the utmost safety and feasibility of implementing this therapy at Geisinger. In preparation for the first therapy, the hematology/oncology teams:

- Developed policies to bolster the safety of this treatment
- Built drug records into the electronic medical record, along with appropriate billing codes to assist with financial services; treatment plans used the Beacon oncology module to ensure a safe and comprehensive treatment plan for each product and patient
- Developed order sets for specific cellular therapy toxicities, such as cytokine release syndrome (CRS) and immune effector cell-associated neurotoxicity syndrome (ICANS)
- Collaborated with critical care and neurology team members to streamline and optimize the management of related toxicities

Moreover, the hematology/oncology pharmacy team conducted extensive education sessions across departments — including providers, nursing and pharmacy — focusing on this groundbreaking therapy, its potential toxicities and effective patient management. As evidenced by the timeline, CAR-T is emerging as a new standard of care that Geisinger is wholeheartedly prepared to deliver.



## Geisinger hematology/oncology changes following Wayne Memorial Cancer Center closure

Stephen Farley

In August 2022, following the closure of Wayne Memorial Hospital's outpatient cancer care, the pharmacy team at Geisinger Community Medical Center's Frank M. and Dorothea Henry Cancer Center, in Geisinger's northeast region, took on the responsibility of caring for hundreds of displaced patients.

From August to October 2022, the Henry Cancer Center received 163 new referrals, with about 50 of these patients carrying active cancer diagnoses. Before August 2022, the center's chemotherapy volumes averaged 400 per month. However, after Wayne Memorial services closed, volumes surged to over 500 per month, a level consistently maintained since. Additionally, there was a notable increase of around 100 non-chemotherapy infusions per month.

With the increased numbers came the need to provide more patients with a fresh establishment of care, adjusted chemotherapy treatments and renewed supportive care. The hematology/oncology pharmacy team took on the responsibility to review, optimize and coordinate chemotherapy plans for each new patient without interrupting their planned care. Ralph Ferraro's expertise played a pivotal role in the endeavor's success. Working diligently alongside him were Michael Hessmiller and Candance Hanson from the technician team, ensuring accurate and efficient preparation of chemotherapies.

The successful patient transition into the Geisinger hematology/oncology program was a highlight for the team and a great representation of Geisinger's priority to provide patients with ease of access, operational excellence and managing total health. The northeast hematology/oncology pharmacy team proudly continues to hold firm to their mantra, "We get to do this!" They recognize the privilege of supporting patients through one of the most challenging phases of their lives.

## Oral Chemotherapy Clinic

Justine Maley

Hematology/oncology's Oral Chemotherapy Clinic celebrates 10 years in 2023. In the past decade, it has become the cornerstone in delivering care to Geisinger patients with cancer. The clinic and its care delivery model continue to prove essential to the multidisciplinary team of the Geisinger Cancer Institute.

Oral chemotherapy is now a primary treatment option in most cancers, allowing patients to spend more time with loved ones and receive treatment from the comfort of home with the phone-based clinic model. Pharmacists call patients to discuss laboratory assessments and offer recommendations for managing the side effects of treatments. In certain instances, pharmacists work directly with patients to provide supportive care for treating and preventing side effects through collaborative drug therapy management agreements.

The Oral Chemotherapy Clinic cares for 2,361 patients across the Geisinger footprint. More than 100 oral chemotherapy medications are managed for hematologic and oncologic diseases; most commonly acute and chronic leukemias; myeloproliferative neoplasms; multiple myeloma; melanoma; and colon, breast, ovarian, lung, hepatic and prostate cancers. In the past year, the clinic completed 56,803 patient encounters for lab and adverse effect monitoring. The magnitude of these encounters ranges from continuing current treatment plan and lab assessments to recommending and coordinating urgent care and Emergency Department visits for patients with acute and life-threatening issues. At the end of 2022, the clinic grew by 496 new patients for the year and is projected to exceed this in 2023 due to the continued growth of oral chemotherapy treatment options.

The Food and Drug Administration's (FDA) Risk Evaluation and Mitigation Strategies (REMS) Program plays a significant role in giving patients access to the medications needed for oral chemotherapy. Prescribers, nurses, pharmacists and patients are subject to different requirements to ensure risks associated with drug use are managed to reduce risk as much as possible. To assist with navigating REMS and the FDA-managed REMS website and making sure patients have uninterrupted access to their medications, Geisinger's hematology/oncology team added more pharmacy technician support. As of June 2023, the technicians are managing approximately 150 patients monthly.

## Windmere home infusion

Alysha Spickler

With the expansion of Geisinger Home Infusion Pharmacy to the Western Region of Geisinger's footprint, the pharmacy team at Windmere expanded their practice scope from oncology medications to providing medication-related services in patient homes. Initially, the expansion focused on local chemotherapy home pumps for Scenery Park and Lewistown, with only 35 prescription fills per month. Over time, the expansion has grown to more than 300 fills per month, including new home antibiotic referrals and home infusion antibiotic refills for the region. The team has created a seamless and secure healthcare service, delivering to the patient's doorstep, with a particular emphasis on transitions of care.

Changing the location of pharmacy presence has also had an impact on the expansion. The hematology/oncology pharmacist previously working out of the Windmere location was relocated to work from the Scenery Park Infusion Center twice a week. This move fostered a culture of open communication, resulting in better decision-making and a clearer understanding of everyone's role. Additionally, nursing expanded its reach to offer weekly dressing and lab check appointments in the traditional hematology/oncology outpatient clinic for patients without home nursing services. The recent change showcases how our pharmacy can expand patient care beyond traditional methods. On the horizon, Geisinger Home Infusion at Windmere will see more nursing innovation and renovated space to include private infusion chairs for on-site treatment.



# Geisinger Health Plan

## Geisinger Health Plan Medicaid expansion

Kristen Bender

For the first part of 2022, Geisinger Health Plan Family (GHP Family), Geisinger Health Plan's managed Medicaid plan, covered Medicaid-eligible recipients in Pennsylvania's northeast counties — one of five HealthChoice zones in the state. However, in September of 2022, the state awarded GHP an expansion to provide for Medicaid-eligible recipients across the state and in all five zones of the HealthChoice program. With this expanded coverage area, Geisinger Health Plan saw its GHP Family membership grow from just under 238,000 to more than 325,000 in the first 12 months.

As anticipated, the growth in new membership caused a spike in prior authorization requests for medications, increasing 41% from the prior year. As the HealthChoices contract requires all managed Medicaid plans to review and make coverage determinations within 24 hours of receiving a request, the pharmacy team and plan medical directors had to work as a team to be sure all regulatory timelines were met.

With the end of the public health emergency, GHP expects Medicaid membership to decrease. As a result of the COVID-19 pandemic, Medicaid redeterminations were paused, allowing many members who would no longer be eligible for Medicaid to continue receiving services. States have been given until May 31, 2024, to complete the redetermination process for Medicaid members and GHP Family is expected to see a reduction in membership following the scheduled redetermination.

## Medication Therapy Management Program

David Griffith

In January of 2022, Geisinger Health Plan (GHP) and Geisinger's Ambulatory Pharmacy Services launched programming targeting Medication Therapy Management (MTM) Comprehensive Medication Review (CMR). The program moved these efforts from a program hosted by a third-party call center to an internal collaboration between GHP pharmacists and technicians, telepharmacy services pharmacists and technicians, and pharmacists in the medication therapy disease management (MTDM) clinics.

The MTM-CMR efforts were moved to an in-house model to increase completion rates, which have traditionally been lower than expected. As the Center for Medicare and Medicaid Services (CMS) uses CMR completion rates in their determination of health plan Star ratings, it was important to develop a process to connect Geisinger with its eligible members. As with any new program, the initial months were met with unexpected hurdles — which the team met head on and turned into opportunities to refine and improve the process, leading to a resounding success.

Early indications of the calendar year results showed a 92+% completion rate for both GHP Medicare contracts. This is a significant increase from calendar year 2021, when the process was outsourced. While the CMS rankings have yet to be released, there is no doubt the increase in rates will correlate to an increase in ratings.

In addition to increasing CMR completion rates, moving the program to be run by Geisinger pharmacists and technicians, members saw more follow-up from Geisinger regarding their medications. For members seeing a Geisinger physician, it led to opportunities for MTDM and Telepharmacy pharmacists to engage the collaborative practice agreement with their physician colleagues to address patient medication needs. For patients not seeing a Geisinger physician, pharmacists with the health plan were able to increase the number of outreach calls and targeted medication reviews. CMS requires these as well for all members who qualify for a CMR. Through these reviews and consultations, medication optimization happened more frequently, leading to better quality of care for the members.

As we move through calendar year 2023, there is an appreciable increase in the number of members who qualify for a CMR. The Geisinger team and process are thriving because of a more streamlined approach and constant desire to do the right thing for GHP Medicare members.

# Prescription details for Geisinger Health Plan

## Prescriptions processed (millions)

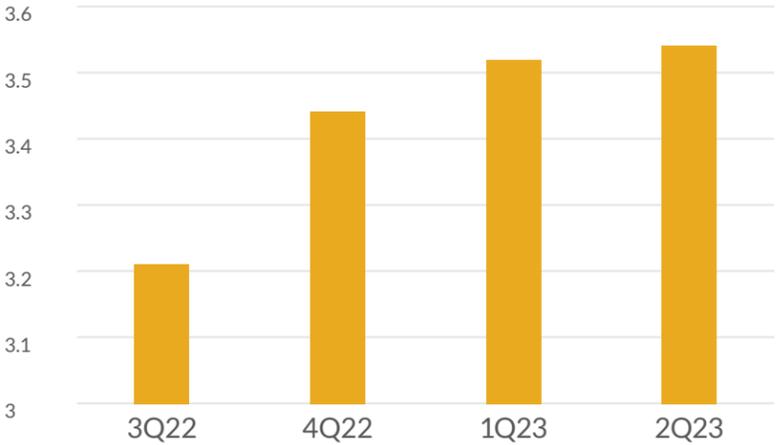


Fig 1. Number of prescriptions (in millions) processed by Geisinger Health Plan by quarter

## Allowed amount (millions)

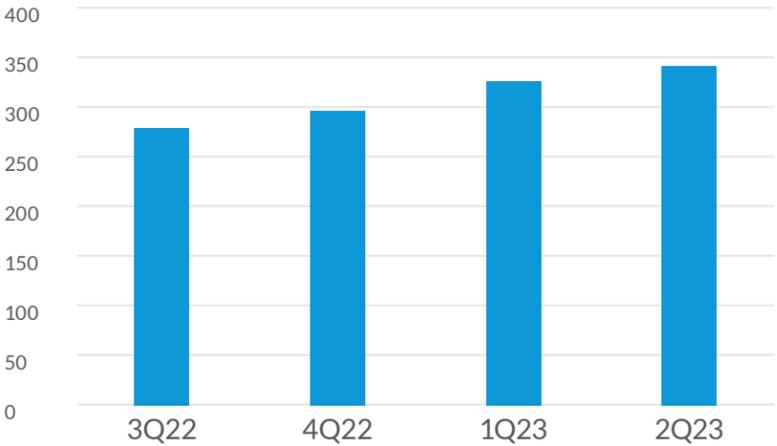


Fig 2. Amount paid by Geisinger Health Plan for medications (in millions) by quarter

## Prior authorizations

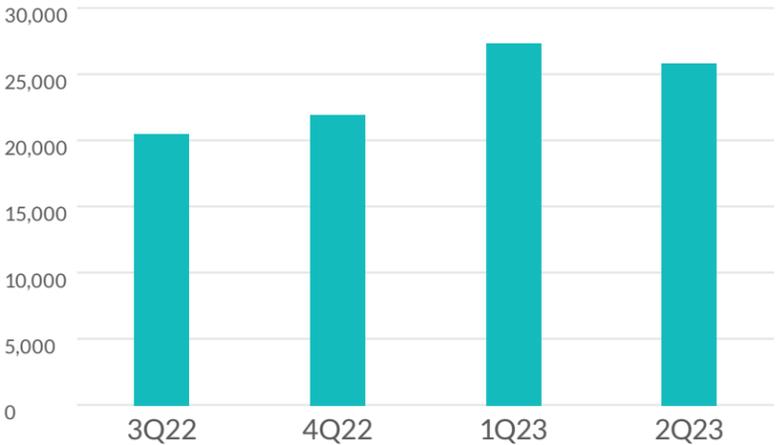


Fig 3. Number of prior authorizations for medications processed by Geisinger Health Plan by quarter

# Medicare Star adherence

David Griffith

One of several factors used by the Center for Medicare and Medicaid Services (CMS) to evaluate health plans for Star ratings in member adherence to medications across three measures: cholesterol, diabetes and hypertension. For the last two years, Geisinger Health Plan (GHP) has increased its efforts to conduct patient outreach and help improve medication adherence.

Since 2020, the GHP pharmacy team has expanded the number of pharmacists and pharmacy representatives working to connect with patients and discuss opportunities for adherence in one of the three measures. In 2022, the team reached its full contingent to meet the increasing volume of patients requiring outreach.

With the full model in place, calendar year 2022 showed an increase in all measures, even with the total number of eligible patients increasing by nearly 7,000 over the previous two years. At the end of 2022, GHP members showed overall adherence rates of 89% for diabetes, 91% for both cholesterol and hypertension with the HMO line of business, and 92% for hypertension in the PPO line of business. These are all the highest adherence rates recorded by the health plan to date.

Early calendar year 2023 data show Geisinger Health Plan members projecting to continue to meet the high percentages of adherence even as the total number of eligible members continues to grow.

# Strategy & innovation

## Demonstrating financial value in the ambulatory clinical pharmacy Medication Therapy Disease Management Program

Leeann Webster

Geisinger's medication therapy disease management (MTDM) pharmacists serve as essential care team members across primary care, senior-focused care, and medicine specialty service lines. Launched in 1996 solely as an anticoagulation service, the MTDM Program has grown to become one of the largest ambulatory clinical pharmacist platforms in the country, now managing over 20 conditions and composed of 84 clinical pharmacists embedded in 71 practice sites across the Geisinger footprint.

Since pharmacists in Pennsylvania do not have provider status and are not directly reimbursed for clinical services, Geisinger's MTDM Program, like others across the country, has significant challenges generating sufficient revenue to completely offset program costs. Consequently, the program must reliably be able to demonstrate significant clinical and operational benefits to the organization, as well as creating cost-savings outcomes to justify expansion and sustainability.

Since anticoagulation and diabetes are the two primary conditions managed by MTDM, these areas have served as the primary focus of the program's value proposition. Most recently, Geisinger's pharmacy leadership and medical research teams collaborated on an internal study evaluating clinical and cost outcomes for Type 2 diabetes patients managed by MTDM between 2017 and 2022. The study, led by Thomas Morland, MD, demonstrated a 17% decrease in all-cause mortality for patients managed by MTDM vs. traditional care [Figure 1]. Additionally, 13% and 24% reductions in total per member per month (PMPM) costs were observed at years one and two of MTDM enrollment, respectively [Figure 2].

When looked at in the context of the current patient population managed by MTDM — approximately 50% non-GHP and 50% GHP members — the PMPM cost savings attributed to the diabetes management service demonstrate a formidable value proposition. After accounting for pharmacist labor expense and additional revenue streams and cost savings realized by the program, the net value of each MTDM pharmacist is approximately \$624,000 [Figure 3]. Plans are in place to assess the value of the program across other conditions and patient populations managed, in hopes of further demonstrating the importance of an MTDM clinical pharmacist as a member of the care team.

Fig 1.

Adjusted Mortality Analysis

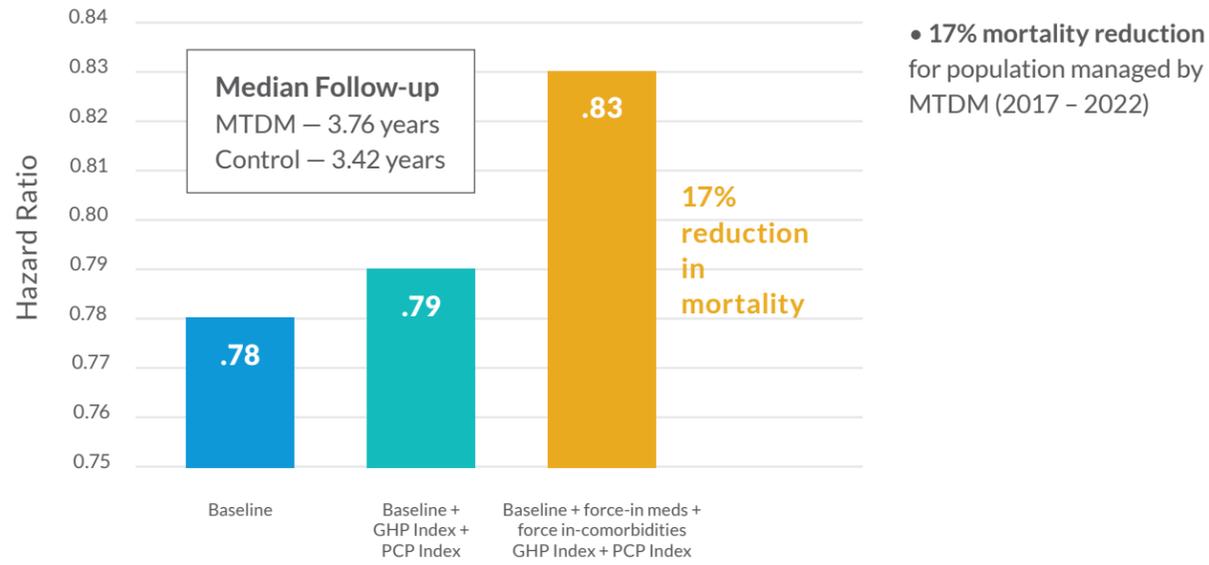


Fig 2.

Mean PMPM - Total

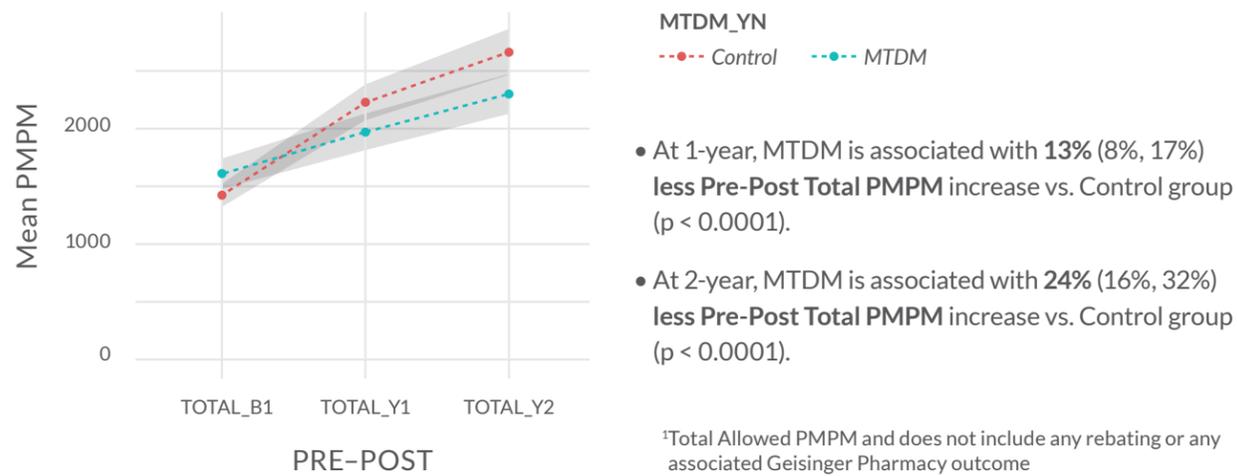
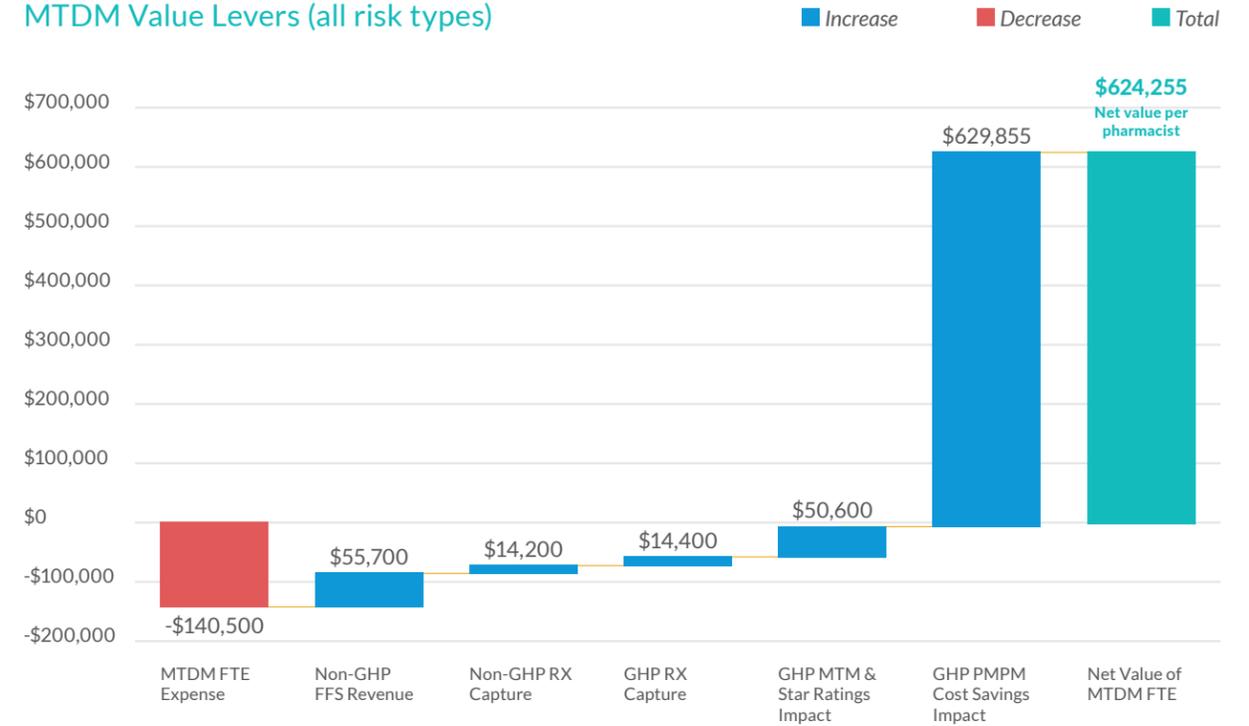


Fig 3.

MTDM Value Levers (all risk types)



## Channel growth in pharmacy

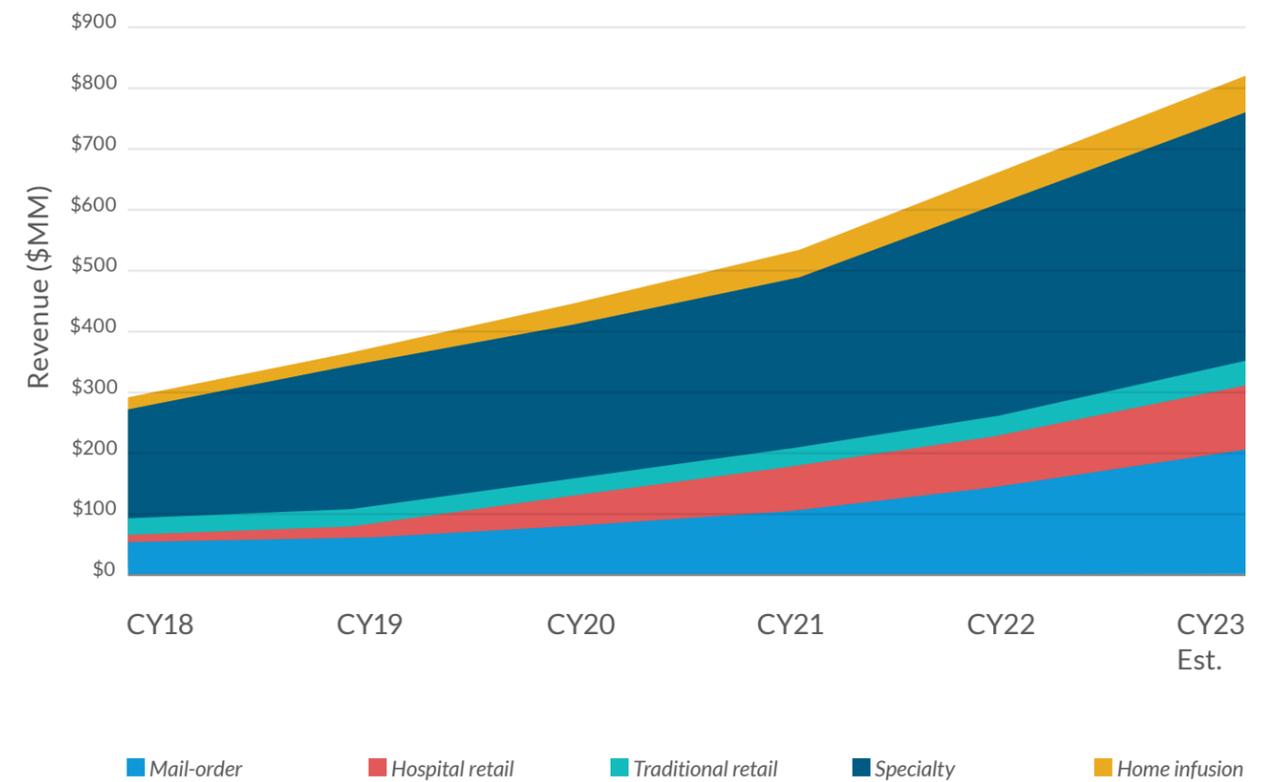
Jonathan Brady

The past 12 months have marked a period of continued growth for Geisinger Pharmacy, with non-traditional integrated delivery network (IDN) pharmacy assets estimated to grow 20%+ to an annual revenue of \$800+ million in calendar year 2023. Over the past five years, Geisinger Pharmacy channels have maintained +20% compound annual growth rate [Figure 1]. Key strategic drivers of growth by distribution channel for this year include:

- Retail (clinic and hospital)
  - Accreditation expansion for hospital retail pharmacies as satellites of the Geisinger Specialty Pharmacy network
  - Capture of high-margin non-GHP prescriptions across medicine specialties
  - Meds2Beds growth through continued collaboration with hospital staff across locations
  - **CY23 estimated revenues of \$146 million with 22% growth rate**
- Mail-order
  - Optimal patient experience around prescription turn-around times and phone service levels
  - Enhanced insulin cost savings in benefit structure for Geisinger Gold members
  - Targeted script capture initiatives in endocrinology, gastroenterology and pulmonology
  - **CY23 estimated revenues of ~\$208 million with 38% annual growth rate**
- Specialty
  - Third-party payer specialty network expansion efforts for top commercial payers
  - Manufacturer partnerships to increase access to limited distribution medications
  - Enhanced script capture of non-GHP volumes enabled by integration with Central Med Hub
  - **CY23 estimated revenues of ~\$411 million with 15% annual growth rate**
- Home infusion
  - GHP site of care policy expansion to include multiple sclerosis (MS) therapies
  - Implementation of infusion suite model at Woodbine to increase capacity and reduce hospital length of stay
  - Post-acute service expansion into Western Region via Windmere satellite pharmacy
  - **CY23 estimated revenues of ~\$61 million with 19% annual growth rate**

Integration of distribution channels with the Medication Therapy Disease Management (MTDM) Program to enhance the Geisinger patient journey and quality of care remains the core of Geisinger Pharmacy growth strategy, enabling many of the channel-specific initiatives noted above. MTDM stewardship of medication management optimizes channel selection to reduce barriers to care, maximizes script capture and associated value, and ensures an “easy button” experience for patients and providers alike.

Figure 1. Geisinger Pharmacy Channel Growth CY18 to CY23 est.



# Geisinger Pharmacy consulting

Kristen Kruszewski

One of the newest service lines is the Geisinger Pharmacy Consulting Service, which aims to provide pharmacy expertise for external health system clients to implement or optimize their home infusion (HI) pharmacies and/or ambulatory infusion suites (AIS). Over the past few years, the market has seen significant expansion of infusion therapies administered in an ambulatory setting, and growth is expected to continue in the future (Figure 1).

Figure 1. Home infusion market trends

## Home infusion market trends



**\$19B**

Total market size



**300%**

Growth over the last 10 years



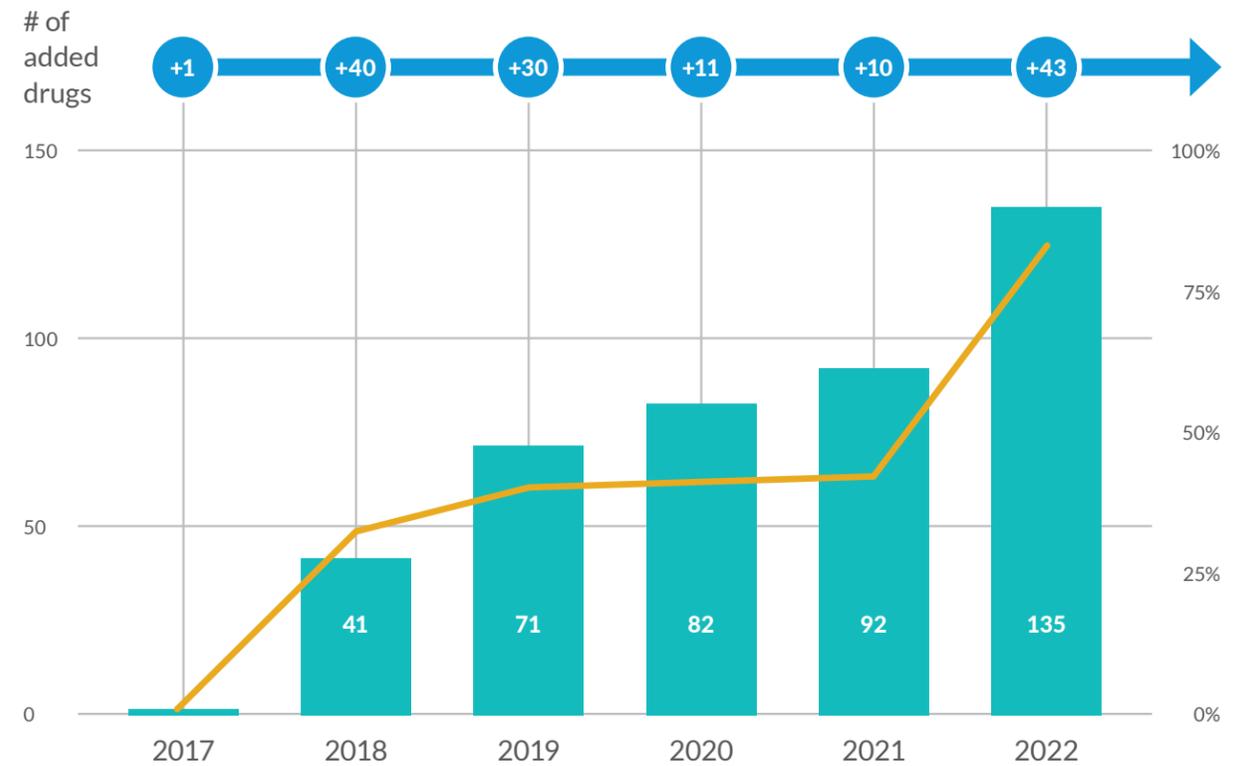
**7.9%**

Projected annual growth through 2030

Source: National Home Infusion Foundation 2020 Trend Report. Accessed July 14, 2023.

Optimizing value-based care is a critical strategy for health systems across the nation, and ambulatory infusion services provide a pathway to reduce the overall cost of care. Additionally, national trends show market shifts of care away from traditional infusion sites due to payer restrictions (Figure 2).

Figure 2. Growing site-of-care impact from large national payer



Source: The coming infusion site-of-care shock: strategies, outcomes and opportunities. Recon Strategy. Accessed July 20, 2023.

— HOPD cost of drugs on policy as a % of total HOPD costs

The goal of Geisinger Pharmacy consulting is to empower clients to identify and assess the viability of strategic growth channel opportunities to meet their organizational goals.

In partnership with AmerisourceBergen, the Geisinger Pharmacy Consulting HI/AIS offering consists of two phases: the business plan and financial proforma (Phase 1), and program implementation with ongoing growth support (Phase 2).

Geisinger Pharmacy Consulting also offers services across specialty pharmacy and ambulatory clinical pharmacy.

# Residencies





Resident name: **Humam Alkhaled**  
 Program: PGY2 Oncology  
 MUE: Evaluation of hepatitis B universal screening best practice alert implementation in patients receiving systemic anticancer therapy  
 Research project: Evaluation of therapeutic cyclosporine levels and the development of aGVHD in patients undergoing matched unrelated donor transplants with post transplantation high dose cyclophosphamide



Resident name: **Alexis Chlada**  
 Program: PGY1 Geisinger Wyoming Valley Medical Center  
 MUE: Evaluation of appropriate de-escalation of MRSA coverage utilizing MRSA PCR in pulmonary sepsis patients  
 Research project: Impact of reduced left ventricular function on vasopressor weaning in recovery septic shock

Fellow name: **Ravi Desai**  
 Program: Postdoctoral research fellowship. Focus in health system science and industry relations  
 Research projects: Facilitated innovative collaboration with EQRx, a biopharmaceutical company intending to drive down spending associated with high-cost drugs in various spaces including oncology and immunotherapy  
 Evaluation of the rheumatology medication therapy disease management care pathway  
 Press Ganey patient satisfaction scores and their relation to hemoglobin A1c reduction in primary care patients with Type II diabetes enrolled in pharmacy medication therapy disease state management

Resident name: **Erin Eickman**  
 Program: PGY2 Oncology  
 MUE: Timing of bone marrow biopsy and subsequent dose modifications of Venetoclax  
 Research project: Breakthrough fungal infections for hematologic patients on prophylaxis

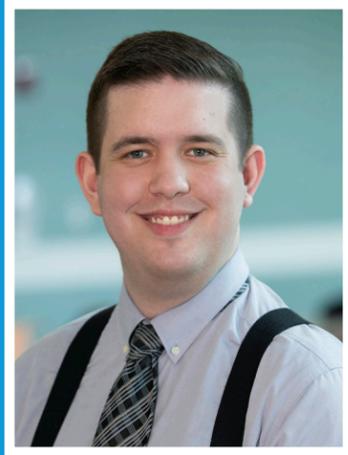


Resident name: **Mallory Ellis**  
 Program: PGY1 Geisinger Clinic Northeast  
 MUE: Prevalence of overprescribing triptans for migraines without chronic prophylactic therapy within Geisinger outpatient clinics  
 Research project: Utilization of partial opioid agonist to reduce doses of full opioid agonist within the Geisinger MTDM pain program



Resident name: **Taylor Everett**  
 Program: PGY1 Geisinger Lewistown Hospital  
 MUE: Medication utilization evaluation (MUE) of the appropriateness of Sugammadex in the Geisinger health system  
 Research project: Emergency medicine pharmacists improving PALS compliance and dosing in pediatric cardiac arrests





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Resident name: **Sawyer Foyle**  
Program: PGY1 Geisinger Community Medical Center  
MUE: A descriptive evaluation of platelet function testing throughout Geisinger  
Research project: A comparison of epinephrine and norepinephrine in in-hospital cardiac arrest (IHCA) patients



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Resident name: **Miranda Graham**  
Program: PGY2 Critical Care  
MUE: Safety and effectiveness of tenecteplase in patients with NIHSS < 5  
Research project: Impact of therapeutic enoxaparin on anti-Xa levels when transitioning to unfractionated heparin



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Resident name: **Katelin Ivey**  
Program: PGY2 Health System Pharmacy Administration & Leadership  
MUE: Assessment of voriconazole dosing post implementation of new dosing guidelines at Geisinger  
Research project: Implementation of oral PrEP for the prevention of HIV pharmacist co-management services in primary care and infectious disease clinics

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Resident name: **Sarah Jallen**  
Program: PGY1/2 Health System Pharmacy Administration & Leadership  
MUE: Impella systemic heparin nomogram standardization across Geisinger: Medication use evaluation of order set design and implementation  
Research project: Optimization of medication administration time and patient access through conversion of an outpatient hematology/oncology infusion pharmacy into a hybrid home infusion pharmacy



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Resident name: **Princy John**  
Program: PGY2 Critical Care  
MUE: Evaluation of enteral and parenteral protein nutrition in trauma patients  
Research project: Inhaled epoprostenol for patients with acute respiratory failure



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Resident name: **Gionna Knauss**  
Program: PGY1 Geisinger Wyoming Valley Medical Center  
MUE: Management of BTK inhibitor-induced renal impairment at Geisinger clinics  
Research project: Ambulatory pharmacist urine culture review on emergency department patients

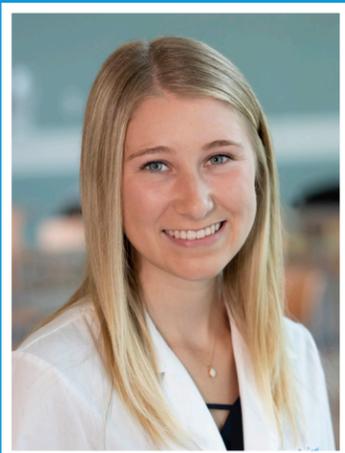




Resident name: **Melinda Novak**  
 Program: PGY1 Geisinger Lewistown Hospital  
 MUE: Assessment of updated fluconazole dosing within Geisinger  
 Research project: Intravenous versus oral Sotalol loading for treatment of atrial arrhythmias



Resident name: **Brandon Rinehimer**  
 Program: PGY1 Geisinger Medical Center  
 MUE: Evaluation of ketorolac dosing in the emergency department  
 Research project: Safety and efficacy of ticagrelor use in patients with ich hx after neuroendovascular procedure



Resident name: **Megan Sokol**  
 Program: PGY1 Geisinger Clinic West  
 MUE: Appropriateness of angiotensin converting enzyme inhibitors (ACE) and angiotensin receptor blockers (ARB) utilization in presence of albuminuria  
 Research project: SGLT2i associated euglycemic diabetic ketoacidosis in multi-hospital cohort



Resident name: **Sarah Tucker**  
 Program: PGY1 Geisinger Clinic West  
 MUE: Prevalence of appropriate medication therapy selection and monitoring for chronic gout managed by primary care  
 Research project: Clinical benefits of hosting a Medicare Part D medication therapy management program into an integrated care delivery system



Resident name: **Nichole Varela Gonzalez**  
 Program: PGY1/2 Health System Pharmacy Administration & Leadership  
 MUE: Optimization of glycemic management in patients receiving parenteral nutrition  
 Research project: Impact of obesity on hemodynamics in patients receiving dexmedetomidine



Resident name: **Mikayla Wright**  
 Program: PGY1 Geisinger Medical Center  
 MUE: Impact of an improved electronic medication record for pediatric dexmedetomidine infusions  
 Research project: Trauma enoxaparin VTE prophylaxis in pediatric patients; a dosing and monitoring characterization study

## Residency preceptors of the year

Each year, our residency programs come together to identify a preceptor of the year — one member of the team who has made outstanding contributions to the residents, the residency program and their fellow residency faculty. Nominations for preceptor of the year may come from residents, colleagues or residency leadership. We are pleased to have the following team members selected as preceptors of the year for their respective programs.

[Benjamin Andrick](#)

PGY1/2 Health System Pharmacy Administration & Leadership

[Anna Baughman](#)

PGY2 Critical Care Pharmacy Residency

[Kimberly Limouze](#)

PGY1 Geisinger Wyoming Valley Medical Center

[Justine Maley](#)

PGY2 Oncology Pharmacy Residency

[Elena Marines](#)

PGY1 Geisinger Clinic West

[Autumn Peck](#)

PGY1 Geisinger Lewistown Hospital

[Lindsey Schneider](#)

PGY1 Geisinger Community Medical Center

[Christina Steele](#)

PGY1 Geisinger Medical Center

[Alison Walck](#)

PGY1 Geisinger Clinic Northeast

At the end of the academic year, the residency leadership team selects a systemwide preceptor of the year from those who received program-level preceptor of the year accolades. This person has had an exemplary influence on residents, resident programs and residency faculty throughout the year. For the 2022–2023 academic year, **the system preceptor of the year was awarded to Benjamin Andrick.**

His nominator included this as part of the nomination:

“Over the last year, Ben has consistently made himself available to me as a mentor, preceptor and friend. He has been an enormous part of my development from the very beginning... During my [residency] year, I had to make a difficult decision. He listened to me and gave me fully transparent advice, ensuring I knew the consequences of my choices. I am extremely grateful for him and for his ability to challenge me and my thought processes. His lessons on life and management have had a great impact on molding me into an effective leader.”

# Expanding continuing education opportunities

Geisinger Pharmacy values the professional development of its staff and is continually expanding the continuing education opportunities for its staff. Programs such as FreshPharm, led by Angela Slampak-Cindric, Heme-Onc CE Day, led by Tristan Maiers, and the Medication Safety Conference, led by Diane Polombo, have been a staple of pharmacy's multidisciplinary continuing education portfolio. In 2023, Geisinger Pharmacy introduced one upgrade and one new continuing education series for the professional development of pharmacists and pharmacy technicians in the system.

## Pharmacy Lunch & Learn gets an upgrade

In 2019, the Center for Pharmacy Innovation and Outcomes (CPIO) and the Knowledge Management pillar teamed up to create a twice-monthly scheduled series of CE programs for pharmacists, providing education and development in the areas of research and preceptor development. Gradually, the program grew to become a consistent presence for continuing education. Over the next three years, it was expanded to provide continuing education for pharmacy technicians. And in January of 2023, the programming formerly known as Lunch and Learn was upgraded to Grand Rounds. With the name upgrade came a change in the content made available, expanding beyond research and educational topics to include content related to therapeutics, regulatory issues, practice advancement and panel discussions with subject matter experts on a variety of topics. As Pharmacy Grand Rounds continues to expand, it will be a key venue for pharmacists and pharmacy technicians to hear from experts both internal and external to Geisinger on topics relevant to their professional practice.

## Pharmacy technician series

In March of 2023, Geisinger Pharmacy introduced a new continuing education series aimed at the core knowledge and skills of our pharmacy technicians. The program was designed and implemented to provide education focused on the content outline and blueprint for the Pharmacy Technician Certification Exam (PTCE). The monthly continuing education series is offered as 30-minute sessions at two to three separate times to provide technicians across all shifts an opportunity to attend. The goal is to develop a series that both prepares pharmacy technicians for certification and assists those with certification maintain the annual continuing education requirements. The programming advisory team include the PGY2 health system pharmacy administration and leadership residents, Mary Beth Mickel, pharmacy technician supervisor at Geisinger Medical Center, and Michael O'Hara, pharmacist with centralized clinical pharmacy services. Pharmacists and pharmacy technician staff are always welcome to request an opportunity to lead a continuing education program and participate in the development and mentorship of colleagues.



# Center for Pharmacy Innovation and Outcomes

The CPIO is a dedicated pharmacy research unit embedded in Enterprise Pharmacy and supported by Geisinger's Research Institute. This unit's mission is to optimize medication use through careful design and evaluation of pharmacy services. We are composed of a dedicated team of full-time and clinician faculty (assistant, associate and full professors), a program manager, a project manager and coordinator, research assistants, a postdoctoral fellow and an investigational drug pharmacist.

Leveraging Geisinger's rich culture of innovation, fully integrated and archived electronic health record, large genomic database, long-term patient cohorts, integrated system-level pharmacy services and embedded pharmacy researchers, we study real-world problems and develop and test innovative solutions. Our health-system-based unit is one of few pharmacy-based research units in the nation, making us leaders in embedded pharmacy research. Our team deploys the scientific method, performing both quantitative and qualitative research to rigorously implement and evaluate medication-focused innovations in the real world. Our focused efforts include integrating investigational drug services, acting as a principal research resource to pharmacists and residents, developing and conducting real-world medication-focused outcomes studies, demonstrating effectiveness of pharmacy programs, developing and testing innovative solutions to medication-related problems, and assisting the clinical enterprise in translating research learnings into practice. The CPIO also supports the clinical pharmacy enterprise in the support of research initiatives led by others in pharmacy or outside of pharmacy including support for residency research projects. Investigators practice and/or research in the spaces of substance use disorder, medical devices, cardiometabolic disease, pharmacogenomics, hematology, oncology, geriatrics, managed care and pediatrics.

## 2022–2023 Pharmacy Resident Research Projects (select)

### Evaluation of Enteral and Parenteral Protein Nutrition in Trauma Patients

**Resident:** Princy John, PharmD, MBA, MSc

**Residency program:** PGY2 Critical Care, Geisinger Medical Center

**Research mentor(s):** Sally Tice, RPh, PharmD, MHA, BCPS

**Research question:**

In Trauma ICU patients, evaluate the utilization of enteral and parenteral protein nutrition for wound healing.

**Main findings:**

Most patients were initiated on the lower end of their protein requirements and weren't advanced. Although more than half of the patients' protein needs were reassessed, not all achieved their goal protein.

**Implications/meaning of research:**

Results indicate that opportunities for improvement exist in supporting achievement of target protein goal in critically ill trauma patients. Since a wide protein goal range is being used, perhaps having dietitians determine patient criteria as to who needs the lower end, middle or higher end of protein range, as well as specify at what intervals would protein goals be reassessed (e.g., every day, every other day), would help in achieving the goal protein.

**Presentation(s):**

- ASHP Midyear Clinical Meeting, Las Vegas, NV, Dec. 7, 2022

### Effect of enoxaparin on drug levels when transitioning to unfractionated heparin infusion

**Resident:** Miranda Graham, PharmD, BCPS

**Residency program:** PGY2 Critical Care, Geisinger Medical Center

**Research mentor(s):** Laura Andrick, PharmD, BCCCP, and Amber Linkhorst, PharmD, BCPS

**Research question:**

What is the impact of therapeutic or prophylactic enoxaparin dosing on anti-Xa levels for patients changed to unfractionated heparin (UFH) infusions?

**Main findings:**

When comparing patients who received therapeutic or prophylactic enoxaparin, there was no difference in the number of patients with supratherapeutic anti-Xa levels obtained at the first level check obtained 5–7 hours after starting UFH. However, when assessing anti-Xa levels obtained prior to starting UFH, patients who received therapeutic enoxaparin were more likely to have supratherapeutic levels.

**Implications/meaning of research:**

Patients who are transitioning from enoxaparin to UFH may have elevations in anti-Xa levels that impact dose adjustments; a supratherapeutic anti-Xa level could result in falsely reducing the rate of the UFH infusion, ultimately resulting in subtherapeutic dosing. This suggests patients who receive higher doses of enoxaparin may benefit from monitoring UFH infusions by other drugs levels such as aPTT, which is not impacted by enoxaparin, although the number of aPTT levels to assess in our study was limited.

**Presentation(s):**

- Eastern States Residency Conference, Hershey, PA, May 10, 2023
- Geisinger Scholarship Days, Danville, PA, May 3, 2023

## Breakthrough Fungal Infections in Hematologic Patients on Prophylaxis

**Resident:** Erin Eickman, PharmD

**Residency program:** PGY2 Hematology/Oncology

**Research mentor(s):** Rachael Straining, PharmD, BCOP

**Research question:**

In patients with hematological malignancies on prophylaxis, is there a difference in the rate of breakthrough invasive fungal infections (bIFI) with fluconazole, posaconazole, isavuconazole, and voriconazole?

**Main findings:**

Fluconazole has a statistically significant higher rate of bIFI compared to posaconazole at our institution. No difference was noted in rate of bIFI among the mold active agents.

**Implications/meaning of research:**

All patients with hematological malignancies should receive prophylaxis with a mold active agent going forward, rather than fluconazole.

**Presentation(s):**

- Geisinger Scholarship Days, Danville, PA, May 3, 2023
- HOPA Annual Meeting, Phoenix, AZ, March 31, 2023

## Sodium-glucose co-transporter-2 inhibitor associated euglycemic diabetic ketoacidosis: a multi-hospital case-control study

**Resident:** Megan Sokol, PharmD

**Residency program:** PGY1, Geisinger Clinics West

**Research mentor(s):** Jarret LeBeau, PharmD

**Research question:**

Are SGLT2 inhibitors associated with an increased risk for euglycemia diabetic ketoacidosis (EDKA), compared to other therapies, in adult patients with Type 2 diabetes mellitus (T2DM) hospitalized with diabetic ketoacidosis (DKA)?

**Main findings:**

In this case control study that included 1,511 patients, there was a statistically significant association of EDKA in hospitalized patients taking SGLT2 inhibitors compared to patients who were managed on other therapies (odds ratio 3.14 [95% CI, 1.91-5.18]; P = 0.000003). The most common characteristics of patients in this study with EDKA included infection/illness, surgery, and malnutrition.

**Implications/meaning of research:**

Based on the findings from our study, we hope to develop improved counseling protocols across Geisinger for providers who prescribe SGLT2 inhibitors in patients with T2DM.

**Presentation(s):**

- Eastern States Residency Conference, Hershey, PA, May 10, 2023

## Ambulatory Pharmacist Urine Culture Review on Emergency Department Patients

**Resident:** Gionna Knauss, PharmD

**Residency program:** PGY1 Acute Care, Geisinger Wyoming Valley Medical Center

**Research mentor(s):** Jamie Kerestes, PharmD, BCCCP, and Leonard Learn, PharmD

### Research question:

In adult patients having a urine culture obtained at a Geisinger Emergency Department (ED), do telehealth pharmacist-led urine culture follow-up services result in improved time to appropriate antibiotic therapy and reduction in recurrent ED admissions in comparison to provider-led services?

### Main findings:

The pharmacist-led follow-up service addressed urine cultures in less time while providing appropriate antibiotic changes for all patients under this collaboration. This transfer of results review not only allowed ED providers more time to address currently admitted ED patients, but also allowed the ED pharmacist to do the same with less culture drug information questions.

### Implications/meaning of research:

This research further demonstrates the positive impact of Geisinger's Clinical Pharmacy Services (CCPS) (previously known as Telepharmacy). This continuing positive impact has not only affected patients, but has also helped the CCPS propose expansions of their services into other areas aimed at reducing ED visits.

### Presentation(s):

- Eastern States Residency Conference, Hershey, PA, May 10, 2023

## The efficacy and safety of intravenous sotalol loading versus oral sotalol loading in patients with atrial arrhythmias in maintenance of normal sinus rhythm

**Resident:** Melinda Novak, PharmD

**Residency program:** PGY1, Geisinger Lewistown Hospital

**Research mentor(s):** Keturah Weaver, PharmD, BCPS

### Research question:

To evaluate the safety and efficacy of patients with atrial arrhythmias who have undergone IV sotalol loading compared to patients who have undergone oral sotalol loading in maintenance of normal sinus rhythm.

### Main findings:

IV sotalol loading for atrial arrhythmias did not lead to statistically significant differences in safety and efficacy endpoints compared to oral sotalol loading while reducing length of hospital stay by an average of 2 days. Repeat studies should be conducted with adequate power to determine noninferiority of IV sotalol.

### Implications/meaning of research:

Consider expanding IV sotalol loading to other hospitals (GCMC and GWV) and eliminating traditional oral sotalol loading.

### Presentation(s):

- Eastern States Residency Conference, Hershey, PA, May 9, 2023

## Emergency Medicine Pharmacists Improving PALS Compliance and Dosing in Pediatric Cardiac Arrests

**Resident:** Taylor Everett, PharmD

**Residency program:** PGY1, Geisinger Lewistown Hospital

**Research mentor(s):** Jamie Kerestes, PharmD, BCCCP

### Research question:

Does the presence of an emergency medicine pharmacist (EMP) increase compliance with PALS guidelines during pediatric cardiac arrest?

### Main findings:

There is benefit gained from EMPs on overall treatment and outcome of our patients. The findings of this study support that the direct involvement of an EMP at the patient's bedside during a pediatric cardiac arrest improves compliance with PALS algorithm supported weight-based dosing of epinephrine and decrease time to that first epinephrine administration. Although not statistically significant, there was an observed trend of increased algorithm compliance when a pharmacist was present.

### Implications/meaning of research:

Emergency medicine pharmacists are vital to the safety and care of our patients presenting to the ED, especially our critically ill pediatric patients, who require more complex medication dosing.

### Presentation(s):

- Eastern States Residency Conference, Hershey, PA, May 9, 2023

## Evaluating the impact of an electronic health record based alert on headache management in primary care

**Principal investigator:** Apoorva Pradhan, BAMS, MPH

**Funding:** Clinical research funds

The pharmacy, neurology and primary care teams in Geisinger collaborated to implement and assess the impact of an interruptive electronic health record (EHR)-based alert on the management of headache disorders within primary care settings using a cluster-randomized control trial design. Adult patients with primary headache disorders with a significant headache burden characterized as experiencing more than 12 headache days within 3 months, or headache impact test (HIT-6) score of 50 or greater were identified between December 2021 and February 2022. The study was implemented across 38 primary care locations within Geisinger, and the sites were cluster randomized to either the control arm that received the silent EHR based alert, or the intervention arm where in the providers saw the interruptive EHR-based alert. Two hundred and three eligible patients were enrolled at baseline and followed for a period of 6 months. A difference in difference analysis was performed, and the primary outcome assessed was the change in patients HIT-6 score between groups at 6 months. Secondary outcomes assessed included change in the proportion of patients referred to neurology, initiation of medication therapy and use of the Emergency Department. The study also assessed the change in the frequency and intensity of headaches experienced by patients during this period. The study found that when compared to patients in the control arm, patients in the intervention arm did not have a statistically significant improvement in their headache scores, frequency or intensity. Similarly, resource utilization between groups was also not significantly different. On exploring the potential reasons behind the lack of effectiveness, it was discovered that despite efforts for promoting the use of the alert in primary care, only 11% of the alerts that fired were acted upon. The study team further explored the causes behind the low adoption of the tool and found that the alert misfired or at times inappropriately fired in patients and hence were dismissed. As a result, significant changes were made to the alert as well as its firing criteria. Our study provides new insight that as designed, electronic health record alerts are largely ineffective as a mechanism to improve headache outcomes in primary care. In a time where electronic alerts are the norm and physician fatigue and apathy toward them is mounting, the implications of our pragmatic trial are large. Our study enables healthcare systems to scientifically ascertain which alerts should remain active, and which need to be deactivated or revised, when appropriate.

### Previous presentations

Oral presentation at the Health Care Systems Research Network (HCSRN) 2023 Annual Conference held in person in Denver, Colo., February 21-23, 2023

Manuscript under review.

## Pharmacy engagement in two Geisinger Health Plan quality funded projects

Geisinger Pharmacy is actively engaged in two of the five awarded quality projects funded by Geisinger Health Plan for the 2023–2024 timeframe. The projects relate to optimizing treatments in patients who have headaches and heart failure with reduced ejection fraction (HFrEF). A brief overview of the two projects is in Table 1. The projects will directly impact patient care and improve overall costs, and are projected to show impact by the end of 2024.

Table 1

<b>Title</b>	Evaluating Strategies to Improve Guideline Directed Medical Therapy: The GDMT Research, Education & Assist Trial for Heart Failure Care (GREAT-HF Care)	Taking the Headache out of Headache Care: The Virtual Headache Hospital
<b>Project lead</b>	Stephen Voyce, MD	Scott Friedenber, MD
<b>Pharmacy participants</b>	Susanne Burns, Leeann Webster, Jonathan Brady, Amanda Popko, Eric Wright, Vanessa Hayduk, Apoorva Pradhan, Duncan Dobbins, Thomas Matsumura, Keturah Weaver, Nathan Sauers, Sarah Knauer, Danielle Karaffa, Kendyl MacLean, Derek Hunt & Liam Callejas	Apoorva Pradhan, Eric Wright, Leeann Webster, Rachel Dragano, Leonard Learn, Henry Aftewicz, Peyton Klembara, Adriene Zook, Sandra Herr
<b>Project overview</b>	Despite convincing data that evidence-based medications improve mortality and heart failure-related events, there remains insufficient utilization. This project was designed to improve uptake of evidence-based medication use (and ultimately clinical endpoints) in patients with heart failure through electronic health record (EHR)-based nudges and cardiology clinic embedded pharmacist care.	Patients with headache disorders are often under treated due to inefficient and incomplete healthcare access and utility. This contributes to added patient morbidity, reduced workplace productivity and increased healthcare utilization and costs. This program is designed to virtually identify patients who are undercontrolled for headaches and seeks to triage and manage patients.
<b>Design</b>	Cluster randomized clinical trial	Randomized clinical trial
<b>Population</b>	Adult patients with heart failure with reduced ejection fraction (HFrEF) and followed by cardiology at Geisinger	Adult patients with Geisinger insurance and followed by Geisinger with uncontrolled headaches
<b>Interventions</b>	<ul style="list-style-type: none"> <li>• Usual care</li> <li>• Clinical decision support in the EHR</li> <li>• Pharmacist co-management</li> <li>• Focused education</li> </ul>	<ul style="list-style-type: none"> <li>• Population intake screening</li> <li>• Triage referral to and follow-up with primary care, pharmacist or neurology</li> </ul>
<b>Outcomes</b>	<p>New GDMT added or upward dose titration within 30 days of index visit</p> <p>Composite endpoints of all-cause mortality, emergency visit for heart failure or hospitalization for heart failure</p>	<p>Change in proportion of patients getting appropriate migraine/HA diagnosis</p> <p>Change in proportion of patients initiating medication therapy</p> <p>Emergency visits within 12 months of enrollment</p>
<b>Timing</b>	January 2023–December 2025	January 2023–December 2025
<b>ID on clinicaltrials.gov</b>	NCT05990296	To be assigned



# 2023 board certifications

### Board Certified Ambulatory Care Pharmacist (BCACP)

Brian Bedwick	Kayla Kline	Colleen Strouse
Kimberly Carozzoni	Samantha Kunkel	Julia Swigart
Sarah Dombrowski	Daniel Longyhore	James Taleroski
Jennifer Fever	Scott Opalka	Theron Ward
Catherine Haupt	Lauren Pheasant	Ariana Wendoloski
Michael Kachmarsky	Amanda Popko	Krista Wetzel
Michael Kessock	Ivan Puskovic	

### Board Certified Critical Care Pharmacist (BCCCP)

Anthony Alu	Darlene Chaykosky	Kristen Lopatofsky
Anna Baughman	Kimberly Farnham	Lindsey Schneider
Laura Andrick	Jamie Kerestes	Laurie Sherrick
Amy Brokenshire	Kayla Kotch	Angela Slampak-Cindric
Allison Cebulko	Kimberley Limouze	

### Board Certified Cardiology Pharmacist (BCCP)

Amy Brokenshire	Liam Callejas	Samuel Eckel
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### Board Certified Emergency Medicine Pharmacist (BCEMP)

Jamie Kerestes

### Board Certified Geriatrics Pharmacist (BCGP)

Kimberly Carozzoni

### Board Certified Infectious Disease Pharmacist (BCIDP)

Benjamin Heikkinen	Marisa Perrella	Ricky Rampulla
Bradley Lauver		

### Board Certified Nutrition Support Pharmacist (BCNSP)

Stephen Adams	Mariya Monfette
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### Board Certified Oncology Pharmacist (BCOP)

Benjamin Andrick	Gwen Hua	Rachel Sneidman
Jei Won Eckel	Tristan Maiers	Jacqueline Starr
Stephen Farley	Anupama Mathur	Rachael Straining
Kayla Hart	Anna McDermott	

### Board Certified Pediatric Pharmacy Specialist (BCPPS)

Susan Butler	Michelle Ligotski	Leslie Taleroski
Shannon Draus	Sara Maiers	Emma Wysocki
Sarah Hale	Kimberly Nissen	
Joan Keehan	Bryan Snook	

### Board Certified Pharmacotherapy Specialist (BCPS)

Anna Baughman	Kelly Guza	Jordan Moore
Kelly Bolesta	Arthur Jankowski	Nicholas Preston
Amanda Boyer	Danielle Karaffa	Ivan Puskovic
Amy Brokenshire	Joan Keehan	Ricky Rampulla
Michelle Budzyn	Sarah Knauer	William Samselski
Adam Castro	Eric Kowalek	Melissa Sartori
Darlene Chaykosky	Danielle Kuhn	Rachel Seidel
Cara Ciamacco	Bradley Lauver	Krushna Shah
Stephanie Cybulski	Staley Lawes	Amanda Sharry-Rogers
Caroline Dillon	Frederick Leri	Sarah Siemion
Bradley Dudeck	Kimberley Limouze	Angela Slampak-Cindric
Sydney Estock	Sara Maiers	Rachel Taylor
Alyssa Falkowski	Vanessa Markle	Sally Tice
Sara Gaines	Andrea Mayer	Keturah Weaver
Dante Grassi	Eryn Milius	

### Board Certified Sterile Compounding Pharmacist (BCSCP)

Carol Ann Carozzoni

### Certified Anticoagulation Care Provider (CACP)

Amy Brokenshire	Stacey Grassi	James Taleroski
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### Certified Diabetes Care and Education Specialist (CDCES)

Bernie Eck	Leeann Webster
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# Awards and recognitions

Laura Andrick, PharmD, BCCCP

Presidential Citation, Society of Critical Care Medicine, March 2023

# Publications, presentations and posters

## Peer-reviewed articles

1. Adhikari S, Kumar R, Driver EM, Bowes DA, Ng KT, Sosa-Hernandez JE, Oyervides-Muñoz MA, Melchor-Martínez EM, Martínez-Ruiz M, Coronado-Apodaca KG, Smith T, Bhatnagar A, **Piper BJ**, McCall KL, Parra-Saldivar R, Barron LP, Halden RU. Occurrence of Z-drugs, benzodiazepines, and ketamine in wastewater in the United States and Mexico during the Covid-19 pandemic. *Sci Total Environ*. 2023 Jan 20;857(Pt 2):159351. doi: 10.1016/j.scitotenv.2022.159351. Epub 2022 Oct 12.
2. Aguilar AG, Beauregard BA, Conroy CP, Khatiwoda YT, Horsford SME, Nichols SD, **Piper BJ**. Pronounced Regional Variation in Esketamine and Ketamine Prescribing to US Medicaid Patients. *J Psychoactive Drugs*. 2023 Mar 1:1-7. doi: 10.1080/02791072.2023.2178558. Online ahead of print.
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4. Colvin KM, Camara KS, Adams LS, Sarpong AP, Fuller DG, Peck SE, Ramos AS, Acevedo AL, Badume MA, Briggs SA, Chukwurah TN, Davila-Gutierrez Z, Ewing JA, Frempong JO, Garrett AA, Grampp SJ, Gillespie JW, Herrera EJ, Horsford SME, Maddox EJ, Pelaez JC, Quartey OL, Rodriguez F, Vasquez LA, **Piper BJ**, Gowtham S. Profiles of COVID-19 vaccine hesitancy by race and ethnicity in eastern Pennsylvania. *PLoS One*. 2023 Feb 6;18(2):e0280245. doi: 10.1371/journal.pone.0280245. eCollection 2023.
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6. Eufemio CM, Hagedorn JD, McCall KL, **Piper BJ**. An Analysis of Oxycodone and Hydrocodone Distribution Trends in Delaware, Maryland, and Virginia Between 2006 and 2014. *Cureus*. 2023 Apr 27;15(4):e38211. doi: 10.7759/cureus.38211. eCollection 2023 Apr.
7. Gandhi A, **Andrick B**, Darling J, Truong T, Signorelli J. Oral Antineoplastics in Acute Myeloid Leukemia: A Comprehensive Review. *Clin Lymphoma Myeloma Leuk*. 2022 Dec;22(12):e1033-e1049. doi: 10.1016/j.clml.2022.08.005. Epub 2022 Aug 20.
8. **Graham J**, Novosat T, Sun H, **Piper BJ**, Boscarino JA, **Kern MS**, **Hayduk VA**, Beck C, Robinson RL, Casey E, Hall J, Dorling P, **Wright E**. Medication use and comorbidities in an increasingly younger osteoarthritis population: an 18-year retrospective open-cohort study. *BMJ Open*. 2023 May 24;13(5):e067211. doi: 10.1136/bmjopen-2022-067211.
9. Griffin SP, Signorelli JR, Lasko A, **Andrick BJ**, Doan D, Hough S, Riebandt G, Harnicar S. Oncology pharmacy practice in the United States: Results of a comprehensive, nationwide survey. *J Oncol Pharm Pract*. 2023 May 16:10781552231174858. doi: 10.1177/10781552231174858. Online ahead of print.

10. **Hamner AN, Andrick B, Mathur A**, Gionfriddo MR. Cancer patients' experience with a pharmacist-led oral chemotherapy clinic: A qualitative descriptive study. *JACCP*. Online version. doi: 10.1002/jac5.1741.
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15. Kaufman DE, Kennalley AL, McCall KL, **Piper BJ**. Examination of methadone involved overdoses during the COVID-19 pandemic. *Forensic Sci Int*. 2023 Mar;344:111579. doi: 10.1016/j.forsciint.2023.111579. Epub 2023 Jan 31.
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## Non-peer reviewed articles

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2. Centers for Disease Control and Prevention. Geisinger Ambulatory Pharmacy Care Program Field Notes. Centers for Disease Control and Prevention; 2023. doi: 10.15620/cdc:126232
3. Solgama JP, Davis MP, **Graham J**, McCall KL, **Piper BJ**. Fifteen-fold State-level Variation in US Oxycodone Distribution from 2000-2021. *medRxiv*. (no pagination), 2022. Date of Publication: 04 Sep 2022. doi: 10.1101/2022.09.03.22278873.
4. Solgama JP, Liu EY, Davis MP, **Graham J**, McCall KL, **Piper BJ**. Analysis of State-level Variation in Distribution of Oxycodone and its Adverse Effect Profile in the US from 2000-2021. *medRxiv*. (no pagination), 2022. Date of Publication: 04 Sep 2022. doi: 10.1101/2022.09.03.22278873.

## Published abstracts

1. **Neville M, Lopatofsky K, Brickett L.** 1023: Impact of Obesity on Hemodynamics in Critically Ill Patients Receiving propofol. 52<sup>nd</sup> Annual Critical Care Congress, January 21-24, 2023, San Francisco, CA. *Critical Care Medicine*. 2023;51(1):505-505.
2. **Pradhan A, Lussier M,** Nguyen M, Voyce S, **Wright E.** HSD22: Understanding Barriers and Facilitators to Prescribing Sodium-Glucose Transporter-2 Inhibitors in Patients with Heart Failure with Reduced Ejection Fraction. ISPOR 2023, May 7-10, 2023, Boston, MA. *Value in Health*. June 2023;26(Suppl 6):S241-S242.
3. Smith S, **Brickett L,** Akuamoah-Boateng E, Akuamoah-Boateng K, Carothers W, Everett T, Kao L, Nicastro O, Witenko C, Hobbs B. 105: Experience of a Peer Pre-Review Service in a Professional Association Between 2010 and 2022. 52<sup>nd</sup> Annual Critical Care Congress, January 21-24, 2023, San Francisco, CA. *Critical Care Medicine*. 2023;51(1):35-35.

## Invited presentations

1. **Baughman A, Ellis M, Sokol M.** DKA, DM1 and DM2: Doubling Down on Diabetes in 2023. Geisinger Fresh Pharm... A Medication Update Conference, Danville, PA, April 2023.
2. **Ciamacco C.** Approaches to Improve Antibiotic Prescribing in the Outpatient Setting. Geisinger 13<sup>th</sup> Annual Current Concepts in Medication Safety Conference, Wilkes-Barre, PA, March 2023.

3. **Gaines S.** Transforming Evaluations: A Model to Adapt Assessments to Meet a Resident's Need. Eastern States Residency Conference, Hershey, PA, May 2023.
4. **Lauver B.** COVID-19 Therapeutic Updates Three Years In: What Works and What Doesn't. Geisinger 13<sup>th</sup> Annual Current Concepts in Medication Safety Conference, Wilkes-Barre, PA, March 2023.
5. **Lopez A.** Sensibly Navigating USP800 Day-to-Day Operations. Pennsylvania Pharmacists Association Mid-Year Conference, Lancaster, PA, February 2023.
6. **Lussier M.** Use of guideline-concordant diabetes medications in an elderly population: a mixed-methods study. American College of Clinical Pharmacy (ACCP) Global Conference, San Francisco, CA, October 2022.
7. **Pradhan A\***, Park S, **Anderson H, Hayduk V,** Berhane J, Sponenberg M, **Webster L, Graham J,** Friedenberg S, **Wright E.** Impact of a Multi-Faceted Best Practice Alert among Patients with Headaches seen in Primary Care. Health Care Research Network (HCSRN) Annual Conference, Denver, CO, February 2023.
8. Scherrer J\*, Salas J, Gruzca R, Wilens T, Quinn P, Sullivan M, Rossom R, **Wright E, Piper B,** Sanchez K, Lapham G. Dual Prescription Stimulant and Opioid Use and Risk for Opioid Use Disorder. Health Care Research Network (HCSRN) Annual Conference, Denver, CO, February 2023.
9. **Sokol M.** Sodium-glucose co-transporter-2 inhibitor associated euglycemic diabetic ketoacidosis: a multi-hospital case-control study. Eastern States Conference for Pharmacy Residents and Preceptors, Hershey, PA, May 2023.
10. **Starr J, Cooper K.** Safety First – What We Need to Know About the Safe Handling of Oral Chemotherapy. Geisinger 13<sup>th</sup> Annual Current Concepts in Medication Safety Conference, Wilkes-Barre, PA, March 2023.
11. **Wright E.** Case Study on Health and Wellness. NACDS Health and Wellness Stakeholder Forum. Washington, DC, March 2023.
12. **Wright E.** Pharmacy Service and Medication-Related Research for Chronic Conditions: Current Status and Future Directions. Health Care Research Network (HCSRN) Annual Conference, Denver, CO, February 2023.
13. **Wright E\***, Rossom R, Gavin B, Haller I, Haapala J, Crain L, Hooker S., Kobylinski M, O'Connor P, Olson A, Romagnoli K, Borgert-Spaniol C, Muegge J, **Tusing L,** Allen C. Frequencies of Opioid Use Disorder Identification Using a Predictive Model in Primary Care. Health Care Research Network (HCSRN) Annual Conference, Denver, CO, February 2023.
14. **Wright E\***, Troiani V, **Pradhan A, Graham J,** Ramagnoli K, Beiler D, **Chopra A, Tusing L, Gregor C,** Hirsch A, Hall E, Davis M, Kraus C, **Piper BJ.** Geisinger ACRC – Building a Foundational Understanding of Marijuana Documentation in the Electronic Health Record to Catalyze Research. ACRC Summit, Hershey, PA, April 2023.

## Internal seminars

1. **Ellis M, Sokol M, Tucker S.** DiaBEATes: Combatting Diabetes with the 2023 ADA Standards of Care in Diabetes Updates. Geisinger Diabetes Educator Meeting, Virtual, April 2023.

## Poster presentations

1. **Addissie B, Gaines S, Khurana S, Unzueta A, Koo C, Kotru A, Marvin M.** Eight-week post-transplant treatment of HCV-negative kidney recipients from HCV-viremic donors with glecaprevir/pibrentasvir is as effective as twelve-week treatment. International Liver Transplant Society (ILTS) Annual Congress, Rotterdam, Netherlands, May 2023.
2. **Beiler D, Chopra A, Gregor C, Tusing L, Pradhan A, Hirsch A, Hall E, Davis M, Romagnoli K, Kraus C, Piper BJ, Wright E, Troiani V.** A Systematic Chart Review Protocol to Characterize Medical Marijuana Documentation within Electronic Health Records. ACRC Summit, Hershey, PA, April 2023.
3. **Boyle S, Brown S, Irace M, Learn L, Douthit S, Clark J, Gruver B.** Addressing polypharmacy during care transitions and the impact on high risk 30-day readmissions. American Pharmacists Association (APhA) Annual Meeting and Exposition, Phoenix, AZ. March 2023.
4. **Chlada A, Knauss G.** Analysis of Pharmacist Intervention on Duplicate “As Needed for Constipation” Orders at Geisinger Wyoming Valley. Geisinger 13<sup>th</sup> Annual Current Concepts in Medication Safety Conference, Wilkes-Barre, PA, March 2023.
5. **Cragun D, Roberts MC, Bendz LM, Ince P, Gonzales S, Haga SB, Wu RR, Petry NJ, Ramsey L, Uber R, Sperber NR.** A mixed-methods protocol to identify best practices for implementing pharmacogenetic testing in clinical settings. Updates in Precision Medicine and Pharmacogenomics, Gainesville, FL, March 2023.
6. **Desai R, Pradhan A, Park S, Kelchner A, Chronowski J, Grassi DM, Brady J, Gazes S, Burns S, Wright E.** Generation of a Dynamic Drug Recommendation Tool for Rheumatoid Arthritis using Real-World Cost Information. Health Care Research Network (HCSRN) Annual Conference, Denver, CO, February 2023.
7. **Desai RJ, Pradhan A, Park S, Wright E.** Trends in Higher Cost Medication Utilization and Spending for Psoriasis and Gastroenterological Conditions within an Integrated Delivery Network. American Society of Health System Pharmacists (ASHP) Midyear Clinical Meeting, Las Vegas, NV, December 2022.

8. **Farrell J, Gaines S, Addissie, B.** Cost Effectiveness of Checking Immunity for HAV Before Vaccination in HCV Patients. American College of Gastroenterology, Virtual, October 2022.
9. **Hanna C, Montross M, Douthit S, Learn L, Dombrowski S, Gruver B.** Impact of interdisciplinary case management and pharmacist transitions of care intervention on 30-Day readmissions: a retrospective cohort study. American Society of Health System Pharmacists (ASHP) Midyear Clinical Meeting, Las Vegas, NV, December 2022.
10. **Hirsch AG, Wright E, Nordberg C, DeWalle J, Kennalley AL, Stains E, Tusing L, Piper BJ.** Locations of Medical Marijuana Dispensaries in Pennsylvania: Associations with Certifications and Community Features. ACRC Summit, Hershey, PA, April 2023.
11. **Piraino EC, Lussier ME.** Implementation and Evaluation of a Mail Order Pricing Tool. Susquehanna Valley Undergraduate Research Symposium, Danville, PA, July 2022.
12. **Pradhan A, Chopra A, Tusing L, Gregor C, Hirsch A, Hall E, Troiani V, Davis M, Beiler D, Romagnoli K, Kraus C, Graham J, Piper BJ, Wright E.** EHR documentation of marijuana sharply increased in 2018 and is primarily located in unstructured progress notes. ACRC Summit, Hershey, PA, April 2023.
13. **Pradhan A, Chopra A, Tusing L, Gregor C, Hirsch A, Hall E, Troiani V, Davis M, Beiler D, Romagnoli K, Kraus C, Piper BJ, Wright E.** Prevalence of Marijuana Documentation within Electronic Health Records (EHR) at an Integrated Delivery Network (IDN). ACRC Summit, Hershey, PA, April 2023.
14. **Pradhan A, Lussier M, Nguyen M, Voyce S, Wright E.** Understanding Barriers and Facilitators to Prescribing Sodium-Glucose Transporter-2 Inhibitors in Patients with Heart Failure with Reduced Ejection Fraction. ISPOR 2023, Boston, MA, May 2023.
15. **Shiplett L, Helsel C, Hale SF, Slampak-Cindric A.** Evaluation of Vasopressor Titration Compliance in Critically Ill Patients. American Society of Health System Pharmacists (ASHP) Midyear Clinical Meeting, Las Vegas, NV, December 2022.
16. **Sokol M, Harris H, Kitko S, Marines E, Krahe Dombrowski S.** Appropriateness of angiotensin converting enzyme inhibitors (ACE) and angiotensin receptor blockers (ARB) utilization in presence of albuminuria. American Society of Health System Pharmacists (ASHP) Midyear Clinical Meeting, Las Vegas, NV, December 2022.
17. **Vitale H, Thomas R, Hale SF, Lawes S.** Buprenorphine Utilization Trends for Pain Management within an Integrated Health System. American Society of Health System Pharmacists (ASHP) Midyear Clinical Meeting, Las Vegas, NV, December 2022.

# About Geisinger

One of the nation's most innovative health services organizations, Geisinger serves more than 1 million patients in Pennsylvania. The system includes 10 hospital campuses, a health plan with more than half a million members, two research centers and the Geisinger Commonwealth School of Medicine. A physician-led organization, with 25,000 employees and more than 1,700 employed physicians, Geisinger leverages an estimated \$8 billion positive annual impact on the Pennsylvania economy. Repeatedly recognized nationally for integration, quality and service, Geisinger has a long-standing commitment to patient care, medical education, research and community service. For more information, visit [geisinger.org](http://geisinger.org) or connect with us on Facebook, Instagram, LinkedIn and Twitter.



The system is composed of the following entities:

**Geisinger Clinic** is widely regarded as a national model of healthcare delivery centered around a cutting-edge multispecialty group practice of more than 1,700 primary and specialty physicians who practice at Geisinger hospitals and non-Geisinger hospitals throughout the region.

**Geisinger Medical Center (GMC)** – Danville, Pa. The largest tertiary/quaternary care teaching hospital in central and northeastern Pennsylvania, GMC has earned a reputation for providing leading-edge medicine and treating the most critically ill patients. GMC is licensed for 505 beds, including 91 pediatric beds in the Geisinger Janet Weis Children's Hospital. GMC maintains the region's only Level I regional resource trauma center with additional qualifications in pediatrics. GMC offers a comprehensive array of highly specialized medical and surgical services, including neurosciences, cardiovascular services, transplantation, women's health, pediatrics, orthopaedics and oncology.

Outpatient services, including endoscopy and same-day surgery, are available on GMC's main campus, as well as at the Outpatient Surgery Center, located at the Geisinger Healthplex Woodbine campus.

GMC's Hospital for Advanced Medicine serves as an integrated center for the most critically ill patients. This "hospital within a hospital" houses nine stories of patient-focused space, including acuity adaptable beds that can convert from intensive care to recovery as the patient progresses. The hospital offers state-of-the-art inpatient and physician office facilities with cardiovascular services residing within the building, a surgical suite equipped with sophisticated robotic and interventional medical equipment, and shell space for future growth. This hospital is LEED certified silver (Leadership in Energy and Environmental Design), with environmentally friendly designs, recycled materials used in its construction and increased energy efficiency achieved by maximizing natural window light in patient rooms and offices.

**Geisinger Shamokin Area Community Hospital (GSACH)** – Coal Township, Pa. This hospital merged into Geisinger Medical Center in 2012. A campus of

Geisinger Medical Center, GSACH has a total of 48 beds, including 30 med/surg beds, 10 Post-Surgical Unit beds, seven Special Care Unit beds and one bed in the Biocontainment Unit. GSACH also has cardiac and pulmonary rehabilitation departments, and the Ressler Center offers specialty outpatient clinic appointments on campus.

**Geisinger Wyoming Valley Medical Center (GWV)** – Wilkes-Barre, Pa. Located in Plains Township, GWV is an acute tertiary care center that brings advanced clinical services to northeastern Pennsylvania. Licensed for 272 beds, GWV's state-of-the-art Critical Care Building houses the only Level I trauma center in Luzerne County. The GWV campus includes the Frank M. and Dorothea Henry Cancer Center, the Richard and Marion Pearsall Heart Hospital (an accredited Chest Pain Center), the Tambur Neonatal Intensive Care Unit, the Geisinger Janet Weis Children's Unit, a transplant program, the Brain & Spine Tumor Institute and more. GWV's Women's Health Program and various specialty clinics are offered at facilities in close proximity to the main campus.

**Geisinger South Wilkes-Barre (GSWB)** – Wilkes-Barre, Pa. GSWB is GWV's ambulatory campus. It offers an array of same-day health services, including adult and pediatric urgent care centers, inpatient and outpatient rehabilitation, same-day surgery, pain and sleep centers and an Emergency Department.

**Geisinger Community Medical Center (GCMC)** – Scranton, Pa. GCMC is a leading provider of quality healthcare services in northeastern Pennsylvania. Home to Scranton's only Level II trauma center, GCMC also has an adult inpatient behavioral health unit. It is licensed for 304 beds and features an array of clinical programs including orthopaedic services and a broad range of other specialized surgical and radiologic services.

**Geisinger Bloomsburg Hospital (GBH)** – Bloomsburg, Pa. GBH is licensed for 60 beds and is an acute-care hospital offering patients a variety of primary and specialty care services, a broad spectrum of surgical services, including in-and-out

surgery, obstetrics/maternity, behavioral health and a progressive emergency medicine and hospitalist program.

**Geisinger Lewistown Hospital (GLH)** – Lewistown, Pa. GLH is licensed for 133 beds and serves the residents of rural Centre, Mifflin, Juniata, Perry, Snyder and Huntingdon counties. It is an open-staff, acute-care community hospital that offers emergency, surgery, imaging, endoscopy, orthopaedics and cardiology services, among others.

**Geisinger Jersey Shore Hospital (GJSH)** – Jersey Shore, Pa. Licensed for 25 beds, GJSH joined Geisinger in 2017, though it opened as a private hospital in the early 1900s. It serves the residents of Clinton and western Lycoming counties, and is designated as Geisinger's only critical access hospital by the Commonwealth of Pennsylvania and the Medicare Program. GJSH is accredited by The Joint Commission, and offers inpatient, acute, emergency, outpatient and sub-acute care.

**Geisinger Medical Center Muncy (GMCM)** – Muncy, Pa. This full-service hospital opened in 2022 as part of a clinical joint venture between Geisinger and Highmark Health that expands access to care for those who need it most in Clinton, Lycoming, Sullivan and Tioga counties. The hospital is licensed for 20 inpatient beds and 10 ED beds. For routine care, the facility includes a multispecialty clinic with adult and pediatric primary care, orthopaedics, cardiology, ophthalmology and women's health services. Specialty outreach services, imaging, lab, medical oncology services, chemotherapy preparation and general surgery are also offered.

**Geisinger St. Luke's Hospital (GSL)** – Orwigsburg, Pa. GSL is a joint venture hospital between Geisinger and St. Luke's University Health Network serving Schuylkill County, Pennsylvania. Licensed for 80 beds, GSL is an accredited Primary Stroke Center and also provides specialized emergency medical services. It offers low-dose CT scanners and 3D mammography, as well as surgical, radiology and multiple specialty services.

**Geisinger Health Plan (GHP)** is the not-for-profit health insurance component of Geisinger. GHP provides high-quality, affordable healthcare benefits for businesses of all sizes, individuals, families, Medicare beneficiaries and Medicaid recipients. GHP serves more than half a million members in 44 counties throughout central, south-central and northeastern Pennsylvania. The provider network includes nearly 30,000 participating providers and 100+ participating hospitals. Additionally, GHP has partnered with Centers for Medicare & Medicaid Services (CMS) to provide Medicare benefits to 90,000 beneficiaries in the state. GHP also provides coverage to over 200,000 Medicaid recipients in the Commonwealth.

**Research** at Geisinger has been a key element of Geisinger's mission since the beginning. The current phase of research began in 2009, when we began a comprehensive Research Strategic Planning process which confirmed and elevated the role of research in Geisinger's mission. It emphasized research that improves health and healthcare – not only for our own patients, but also for patients nationally and globally through scholarly publications and presentations. Our board and leadership challenged us to conduct research that can be uniquely done at Geisinger, leveraging our high-quality patient care; our fully integrated healthcare system; our large, stable patient population; our advanced electronic health record; and our clinical data warehouse. Research is key to the development and implementation of the next generation of best practices with the goal of disease prevention as well as improved outcomes across a broad spectrum of clinical areas.

Dedicated research facilities include the Sigfried and Janet Weis Center for Research and the Henry Hood Center for Health Research in Danville, Pa.; the Susquehanna Valley Imaging Center in Lewisburg, Pa.; and the Geisinger Precision Health Center in Forty Fort, Pa.

**Geisinger College of Health Sciences** – Established as the umbrella entity uniting Geisinger's schools of medicine, nursing and graduate education, the College of Health Sciences leverages the system's

unique approach to value- and team-based care for all learners. The medical school has campuses in Atlantic City, Danville, Lewiston, Scranton, Wilkes-Barre and Sayre. The School of Nursing is based in Lewistown, and the School of Graduate Education is both virtual and in-person on the Scranton campus. Both the medical and graduate schools are accredited by the Middle States Commission on Higher Education, while the Liaison Committee on Medical Education also accredits the medical school. Graduate medical education is accredited by the Accreditation Council for Graduate Medical Education. The School of Nursing holds accreditation from the Accreditation Commission for Education in Nursing.

**Geisinger Community Health Services (GCHS)** is a not-for-profit organization that annually provides healthcare services to nearly 40,000 patients in the communities in which they live and work. GCHS is committed to advocacy, excellence and innovation in the provision of services that complement and expand the continuum of care provided by the health system. Its programs include:

- ConvenientCare, which provides walk-in urgent healthcare services in the evening and on weekends when physician offices are closed
- Health Care Quality Unit nurses who educate community members and caregivers of intellectually disabled individuals
- LIFE Geisinger, which provides a comprehensive program of health and social services to the frail elderly

**International Shared Services Inc.** is a wholly owned, for-profit subsidiary of Geisinger Medical Management Corporation. It provides comprehensive clinical engineering and computer technical services to providers both within and outside Geisinger.

**Geisinger Marworth Treatment Center**, located in Waverly, Pa., is recognized as a national leader in the treatment of alcohol and chemical dependency. Geisinger Marworth has over 90 beds and offers personalized residential and outpatient programs as well as specialized programs for healthcare and uniformed professionals.

**Geisinger Life Flight®** is a component of the system's response to critical care transport needs, with 9 air ambulances and two ground ambulances operating 24 hours a day, 7 days a week from the following locations:

- Penn Valley Airport, Selinsgrove
- Wilkes-Barre/Scranton International Airport, Avoca
- University Park Airport, State College
- Williamsport Regional Airport, Montoursville
- Good Will Fire Department, Minersville
- Jake Arner Memorial Airport, Lehighton

Life Flight averages 3,600 patient transports a year.

