Welcome to the Department of Pharmacy Services Annual Report for Fiscal Year 2011. This was a year in which we continued our efforts to improve the quality of our services through the implementation of major projects and transformation of our pharmacy services. Among these were continued planning for pharmacy services in a replacement Children’s and Women’s Hospital (scheduled for opening in December 2011), the initiation of pharmacy-managed inpatient anticoagulation services, continued expansion of our decentralized pharmacy practice model, consolidation and remodeling of pharmacy satellite operations in University Hospital, and expansion of our residency program to name a few.

We continued to expand our pharmacy practice model, deploying more generalist pharmacists to inpatient care areas to complement the wide range of clinical specialists in the department. We are very excited about advancing our pharmacy practice model even further in the coming year utilizing our technician workforce, taking advantage of computerization, automation, and clinical decision support, and creating teams of generalist and specialist pharmacists to manage the drug therapy needs of our patients. We are also excited about expanding the role of pharmacy students and residents in the model.

One of the most important and remarkable accomplishments during the past year has been the integration and expansion of our ambulatory care clinical pharmacists into the Ambulatory Care Services Medical Home model. Under the direction of Hae Mi Choe, PharmD, ambulatory care pharmacists have been integrated fully into the UM Medical Home Model. In addition to reimbursement for their services within the medical home, these pharmacists are now billing and being reimbursed by third parties for their clinical services. The results of the impact of these pharmacists are now being measured and the demand for their services and involvement continues to increase. This service was recognized by the Michigan Pharmacists Association with the 2010 Innovative Practice Award.

The Department has worked very closely with the College of Pharmacy to help in expanding opportunities for Introductory Pharmacy Practice Experiences (IPPEs) for our Doctor of Pharmacy students. These students have been integrated into direct patient care and this has
been a positive experience for the students and the staff and has resulted in improved patient care. We have also created a new “generalist pharmacist” Advanced Pharmacy Practice Experience (APPE) in which P4 students will gain experience in the role of a decentralized generalist pharmacist in an integrated patient care role. We initiated this experience with the plan that within a year all students in the UM College of Pharmacy will have this experience.

An ongoing source of pride is our post-PharmD residency program. This year we expanded the program to 12 residents and we are planning for continuing growth of the program. In addition, we were thrilled to be recognized by the ASHP Foundation with the 2010 Residency Excellence Award for our PGY1 program. Dr. John Clark was instrumental in submitting the winning submission highlighting the excellence and impact of our program over the years.

As with most hospitals in the US, the past year has been characterized by an unprecedented number of drug shortages and recalls. Our staff has done an excellent job managing these disruptions in the medication supply chain and have minimized the clinical, operational, and economic impact on our patients, providers and the overall health system. We also played a leadership role in working with ASHP to help quantify the impact of drug shortages on health-system personnel. This information was published and has been used in the national summit meeting on drug shortages as well as in FDA hearings. We hope that this work will help better explain the issue and will lead to ultimate solutions.

Our ambulatory care pharmacy services has seen the expansion of the Transplant Prescription Drug Program and the Specialty Pharmacy Program (in collaboration with the UM Prescription Drug Program), which have significantly contributed to the financial margin of the health system. The Transplant program current supports approximately 1000 patients and projections are that the program could have as many as 2000 patients by FY2015. The ambulatory care pharmacy has also been involved in the implementation of e-Prescribing throughout our ambulatory care clinics, and is planning for a larger new location in Taubman Center in the future.

Another major advance has been the implementation of a pharmacist-managed Inpatient Anticoagulation Service. Megan Barnes, PharmD, BCPS, has led this service and Mike Dorsch, PharmD, has been instrumental in working with the Anticoagulation Committee to develop policies. Our entire staff has been engaged in incorporating this important patient care service into our work.

The advances I have described are just some of the many accomplishments that you will see in this report. They are due to the outstanding men and women in our department who provide excellent service to our patients and their families, and other constituencies, every day. The following report highlights many of the activities and accomplishments in the various component areas of our department during FY2011.
The department works to support the mission, vision, values and goals of the University of Michigan Health System and the UM College of Pharmacy. Our mission and goals are listed below:

**Mission**
The University of Michigan, Department of Pharmacy Services strives to attain the highest level of services in patient care, education, and research. It is our intention to utilize available resources in an efficient manner to achieve the following goals:

- **Patient Care:** To provide rational, progressive pharmacotherapy in a safe, efficient, and compassionate manner to enhance the quality of life for all patients we serve.
- **Research:** To provide a leadership role in the evolution of knowledge through the development and support of investigations to benefit the advancement of health care.
- **Education:** To provide current and innovative pharmaceutical information and instruction to health professionals, healthcare students and the general public.

**Department of Pharmacy Services Specific Goals**
1. To meet the University of Michigan Health Systems mission, vision, values, and goals.
2. To assure that pharmaceutical care is of the highest quality, meeting or exceeding community and national standards.
3. To identify pharmaceutical care issues, trends, and opportunities for improvement related to the systems that support that care.
4. To assure that pharmaceutical care, practice and professional performance are regularly, validly, and reliably evaluated.
5. To assure that procedures, methods, and systems are cost effective and demonstrate significant impact.
6. To conduct research and create new knowledge related to medications and pharmacy services in patients.
7. To participate in the education of pharmacy students, post-graduate pharmacists (residents and fellows), as well as other health professionals. Collectively, by embodying these values and goals we help make the Michigan Difference. [http://www.med.umich.edu/michigandifference/mdiff/index.htm](http://www.med.umich.edu/michigandifference/mdiff/index.htm).

In order to achieve these goals we rely on excellence among our staff. In order to learn more about the department and joining our staff, please go to [http://www.med.umich.edu/careers/careers/pharmacy/index.html](http://www.med.umich.edu/careers/careers/pharmacy/index.html) for more information.

To see our current openings, please go to: [http://websvcs.itcs.umich.edu/jobnet/search.php?searchBox=pharmacy&searchwhat=current](http://websvcs.itcs.umich.edu/jobnet/search.php?searchBox=pharmacy&searchwhat=current).

An organizational chart of the department is displayed below:
INPATIENT SERVICES

The Inpatient Pharmacy Services, consistent with the values of the University of Michigan Hospitals and Health Centers, places a priority on patients and family, teamwork and never-ending improvement.

The Department is responsible for dispensing medications daily for an average inpatient population of 900 patients between the University and Mott Hospitals and the Cardiovascular Center combined. Additional services are provided to support the Emergency Department and other outpatient and clinic settings. The Department consists of pharmacists as well as technical and support personnel, who work together to assure patients receive the highest quality pharmaceutical care possible.

Denise Glenn, Phil Brummond, Brian Callahan

Inpatient Decentral Services Management Team

- John Clark, Director of Pharmacy
- Phil Brummond, Assistant Director of Pharmacy, Medicine, ED and Oncology
- Brian Callahan, Assistant Director of Pharmacy, Surgery, Transplant and Cardiology
- Denise Glenn, Assistant Director of Pharmacy, Pediatrics
- Chadi Abbas, Technician Recruiter and Trainer
- Annette Davis, Technical Coordinator
- Kelli Dorsch, Lead Pharmacist, Kellogg Pharmacy
- Lisa Ginsberg-Evans, Manager, IV Systems
- Rusty Kalmbach, Technician Coordinator
- Kathy Kinsey, Educational Coordinator
- Mike Kraft, UH Clinical Coordinator
- Pam Walker, Coordinator, ED Pharmacy Services
- Nancy Robare, Lead OR Pharmacist
There are currently 8 satellite pharmacy service areas:

**University Hospital (4)** – Medicine/Surgery, Oncology, Emergency Department, Operating Room

**Mott Children’s Hospital (2)** – Medicine/Surgery/Oncology, Pediatric Operating Room

**Cardiovascular Center (1)** – ICU/Acute care (includes support of Cardiovascular Operating Room)

**Kellogg Eye Surgery Center (1)** – Ambulatory care pharmacy (includes support of Kellogg OR)

In addition, we utilize a USP 797 compliant central clean room for IV admixture batch activities.

The Inpatient Pharmacy performs a wide range of duties 24 hours per day, 7 days per week. These include but are not limited to: prescription order verification, IV dosage and filling, chemotherapy admixtures, sterile lab and bulk drug compounding and packaging, filling of unit based medication cabinets, provide drug information to Physicians and Nurses and participation on the Cardiac Arrest Team.

The inpatient generalist pharmacists provide a variety of clinical services such as active participation in service and unit based multidisciplinary rounds, aminoglycoside and vancomycin pharmacokinetic dosing, anticoagulation management, renal dose adjustments, therapeutic interchanges, IV to PO conversions, antimicrobial management and patient and family education.

There is also a commitment to many educational initiatives including the training of pharmacy residents, pharmacy students, pharmacy technician students and participation in international pharmacy exchange programs.

**Key Accomplishments/ Improvement Initiatives**

- UH Pharmacy Satellites were remodeled and workflow was redesigned to gain efficiencies and improve safety
- Standardized processes for medication preparation and double checking
- Decentral clinical pharmacy services were expanded to include coverage 7 days per week from 0700-2100
- Implemented pharmacist managed Anticoagulation Services
- Expanded pharmacist roles in precepting pharmacy students on both IPPE and APPE rotations
- Implemented high risk medication discharge counseling on 3 adult inpatient units
- Implemented inventory management strategies to reduce inventory carrying costs in the UH pharmacies
- Implemented a twice per day batching process for oral liquid doses to reduce waste

**Inpatient Pharmacy Statistics**

- **3.1 million** prescription orders processed per year
- **21,000** doses of oral medications dispensed per day
- **5,200** doses of intravenous medications dispensed per day
- **1.4 million** doses of medications packaged per year
- **25,600** chemotherapy products prepared annually
• Implemented batch preparation of Lantus insulin to improve safety and reduce waste
• Redesigned the starter pack medication process in the Emergency Department (ED)
• Improved coordination of discharge planning for patients discharged from the ED with enoxaparin
• Assisted with disaster planning for surge in burn patients
• Participated in the planning for new CPOE system with initial roll-out planned for the ED
• Developed community acquired pneumonia protocol for the ED to adhere with CMS guidelines
• Implemented batch compounding activities for midazolam, fentanyl and Calcium Gluconate to support storage in unit based Omnicell cabinets and reduce waste
• Developed strategies for managing national shortages of IV products by compounding bulk solutions or batch activities
• Generated cost savings through reductions in IV medication waste by preparing bulk solutions in IV Clean Room
• Opened the Kellogg Eye Center pharmacy
• Implemented processes for compounding intracameral injections for Kellogg Eye Center and Livonia Surgical Center
• Implemented a discharge prescription process for Kellogg Eye Center
• Updated the intraocular/periocular ophthalmic preparation recipes
• Created a policy for ‘Extemporaneously Compounded Ophthalmic Solutions’
• Developed a pilot program utilizing Pharmacy Technicians to assist with improving transitions of care with a focus on issues related to access to medications
• Adapted and implemented UHC guidelines for hazardous drug handling
• Developed workflow plans for pharmacy services in the new Mott Children’s Hospital. This includes plans for two new pharmacies:
  - Pediatric Oncology, Infusion and BMT
  - Pediatric Emergency Department
• Workforce planning, recruiting and hiring for new Mott Children’s Hospital pharmacist and technician positions
MEDICATION USE SYSTEMS

The Medication Use Systems Pharmacy Services is based out of the B2 pharmacy area. This section of the Department of Pharmacy Services is responsible for a wide variety of services to both internal (inpatient satellite pharmacy staff) and external (Omnicell end users, clinic staff) pharmacy customers.

Medication Use Systems
Pharmacy Services Management Team

Members:
Barb Higgins, Assistant Director, Medication Use Systems
Kim Landini, Manager, Medication Use Systems
Sherry Deloach, Purchasing and Contracting Coordinator
Trudi Bates, Barcode Medication Administration Project pharmacist
Diane Shoemaker, Technician Coordinator
Trish Marion, Technician Coordinator
Susan Garrett, Purchaser
Jeremy Dornbos, Purchaser
Brian Brower, Purchaser
Paula King, Database Integration Technician
MCIT Pharmacy—Russ Burnham, Robin Schmidt, Rob Hall, Pete Link, Todd Benner and Rick Rinke

Responsibilities of the Team:
• Procuring all medications from wholesalers and direct manufacturers
• Managing drug shortages and recalls
• Processing all medications into Omnicell Pharmacy Central (OPC) vertical carousels
• Maximizing the use of OPC software to better manage inventory turns and PAR levels
• Restocking majority of the over 130 Omnicell Unit Based Cabinets (UBC) with collaboration of staff in inpatient drug distribution area for restocking the 24 cabinets in the cardiovascular center (CVC).
• Processing, dispensing and monitoring all controlled substances through the B2 Vault
• Annual controlled substances inventory process for inpatient medication supplies and ambulatory clinics
• Packaging bulk doses of controlled and non-controlled substances
• 3 times per week bulk compounding activities
• Servicing all on-site and off-site clinic medication needs through the requisition process
• RobotRx functionality and upkeep for filling the UH cartfill
• PACMED functionality and upkeep for packaging RobotRx, OPC and Omnicell medications
• Maintenance of current line items, new additions, deletions and new templates for LabelSafe labeling software
• All filling and distribution of medication Kits and Boxes
• New entries, changes, and deletions in WORx pharmacy computer order entry system and Omnicell Pharmacy Central Carousel system
• Assuring all products have appropriate package barcodes (PBCs).
• Scanning/entering all PBCs (or NDC numbers) into Omnicell, OPC, and Robot-PACMED databases
• Assistance with discrepancy resolution for Omnicell UBC
• Use of Omnicell’s Executive Dashboard to optimize Omnicell UBC stocking and avoidance of stockouts

Accomplishments for 2010 – 2011

• **Inventory:**
  o Inventory turns at 16.4
  o Increased tracking of high cost items going to Outpatient infusion Rxs
  o Increased tracking of patient specific drugs to Outpatient infusion Rxs
  o August 2010 implemented Kellogg OR Rx scan tags, scanning workflow for stock
  o OR anteroom implementation of scan tags for ordering inventory
  o Labeled all OPC Hazardous and reproductive risk drug bins with new labels.
  o Implemented color code scheme for overstock sections in OPC Big zone for better clarity around location of overstock.
  o Upgraded ECHO software
  o Work extensively with Ambulatory Care Administration on the Flu Vaccine
  o Implemented process to manage items obtained from overseas (Foscavir and Thiotepa)
  o Implemented process to manage items with limited drug distribution (Yervoy and others)

• **Drug Shortages:**
  o Daily drug shortage management, over 350 short or affected items managed. X had to go to drug information for global assistance/clinical input from end users.
  o FTE obtained to manage drug shortages; rearranged 3 purchaser FTE and drug shortage FTE to maximize expertise.
  o Inventory Management of unit dosing for drug shortages (eg. Labetalol, dextrose syringes)
  o Implemented more widespread use of drug shortages PO to identify when short items have returned to ABC
  o Participated in critical drug shortage management meetings with timely information about supply chain and quantity on hand
  o Managed drug shortages without significant increase in on hand carrying cost as evidenced by only having an extra $4000 worth of ~350 drugs deemed short or affected by shortages when comparing the on hand value of those drugs in June 2010 compared with June 2011

---

**Numbers At A Glance**

*Installation of 8 Omnicell UBCs; current totals—145 cabinets, 4 servers, 2 test servers, 20 interfaces*
*327 Canisters in PACMED.*
*361 boxes being tracked by RFID.*
*Maintained inventory turns at approximately 16.4*
• **Omnicell:**
  - Implemented Anesthesia workstations at Kellogg Eye Center x 5
  - Added 3 new Omnicell UBC: CCB1PROC, Mott Cath Recovery, and Angio2
  - November 2010 participated in 4 day Omnicell organizational review for OPC, Omnicell UBC and Secure Vault.
  - Weekly changes including some very large scale additions due to shortages (ketorolac vials), formulary changes (pantoperazole oral switch to omeprazole oral), and medication safety issues (heparin vials)

• **PACMED:**
  - Currently have 327 canisters
  - Currently have 374 drugs being packaged for OPC via PACMED, dramatic increase due to shortages, inability to procure brand present in canister.
  - Change barcode to print from Expand 3 field after manual entry of system item ID number into Expand 3 field instead of NDC number specific to drug in canister; simplification for barcode medication administration at the bedside (BCMA). Weekly assessment of success in entering all item ID numbers into Expand 3 field.
  - STS barcode changes. Added item id as barcode and developed process to add item id and NDC to new products.
  - Updated pars for all canisters to reflect changes
  - Package 6000 doses/day
  - Implemented a process for return high cost mis-packaged medications
  - Use of Below PAR report for ordering vs waiting until canister is empty

• **Robot:**
  - Added 2nd barcode to Robot packaged product from PACMED to support BCMA.
  - Investigation into using Robot for Mott Cartfill
  - Adjusted cartfill exchange process and times to correlate with the UH satellite operational changes
  - Quarterly cell map adjustments
  - Updated current carts with new bed mapping
  - Investigated purchasing new carts
  - Trialed placard on medication drawers for cleaner looking cart and easier removal of patient labels
  - Implemented and trained staff to fill kits on midnight
  - Implemented safety feature of barcode scanning of canister and base when returning canisters during refills; allows tech refill, saving pharmacist time.
  - Added goal posts to the print header, allowing quick identification of print head printing problems which would affect the barcode printing.
  - Programmed the PACMED scanner to scan the canister then the bottle without stopping in a continuous motion. Previously two steps, this saves time.
  - Updated canister PARs
  - Decreased packaging staff by 2 positions per week, running 2 shifts vs 3 shifts x 2 days per week
  - Implemented tallMAN lettering for ISMP recommended meds in Robot/PACMED packaging

• **Vault:**
  - Continued surveillance increases particularly in the satellite areas with respect to items coming into and out of the Rx Omnis and in the vault related to GR
  - Pharmacy premade fentanyl and midazolam bag inventory management, Omnicell stocking and removal.
  - Pharmacy premade oral syringes of morphine and lorazepam oral solution.
  - Implemented a Kellogg controlled substance process for restock and for bulks for prescriptions.
  - Moved tramadol from OPC to the Vault
CV changes to be more secure for UH and Mott (Phase I)
Operational changes with midazolam and fentanyl bag conversion

- **Kit/Boxes:**
  - Cost savings initiative, worked with ED to decrease the amount of Intubation boxes down to 25 and cut the supplies in half.
  - Doubled the amount of ALS boxes in stock so we could reduce staffing on the weekend. We now stock 38 ALS boxes total. Total of ambulance/fire department boxes that we have on hand A-pack, Hazmat, RSI, first responder boxes we have a total of 77 on hand.
  - Added few more of several different types of boxes to accommodate growth for a total of 423 in house boxes.

- **LabelSafe**
  - Updates to templates.
  - Conversion of old barcode nomenclature on ½ and ¼ tabs primarily in Mott to appropriate Item ID numbers
  - Entire catalog review for labels needed, barcode and format changes, removal of duplicates.

- **Scheduling:**
  - 4th year for Holiday Selection Process
  - Implemented rotating shifts for technicians
  - Eliminated the separate weekly schedule we posted and incorporated it into the master schedule
  - Cleaned up the software database
  - Converted the scheduling guidelines, after many revisions, into a procedure
  - Made software adjustments in shift cycles and job descriptions within ScheduleRx to decrease time it takes to do the schedule.
  - Created a new scheduling process within ScheduleRx for call-ins that the Coordinator In charge handles
  - Inserted header repeats in tad editor version of ScheduleRx for easier editing and to decrease errors
  - Trained a new scheduler in November and trained Coordinators and Trainer to use ScheduleRx

- **BCMA:**
  - Incorporation of candidate for BCMA project into MUST OPS workflow
  - Software training for Sunrise Medication Manager
  - Assessment of barcoding strategy within pharmacy department
  - Policy and procedures around labeling products
  - Data queries for all PBCs in Omni/OPC to put into BCMA software (SMM)
  - Development of training materials for pharmacy staff
  - Weekly team meetings, bi-weekly Rx Subcommittee meetings

- **WORx**
  - Added ½ and ¼ tab entries
  - Database adjustments to support WORx automated price updating
  - Database adjustments to support pharmacy finance process changes to charge for amount of drug dispensed only.
  - Database adjustments to support automated product flagging with Omnicell Pocketload.
  - Ongoing WORx order analysis with our other on-integrated database systems.
  - Drug shortage database changes, planned, most unplanned.
  - Assisting IDS with adds/changes/removals of study drugs in WORx.
  - Ongoing development of training materials
Database changes to support compounding in IV room for drug shortage items (e.g. labetatol syringes) or formerly satellite compounded items (e.g. midazolam and fentanyl IVPB) or to create unit of use oral products (e.g. morphine and lorazepam oral solution syringes).

- Weekly Pharm-Omi meetings
- Weekly MUST OPS meetings
- Weekly Robot/PACMED meetings
- Bi-weekly All Staff meetings
  - Ergonomic review of all central technician roles
  - Functional job descriptions for all central technician roles.
- Promotions: 4 technicians to Tech II, 1 technician to Tech III
CLINICAL PHARMACY SERVICES

The Department of Pharmacy Services provides pharmaceutical care to both inpatients and outpatients. Clinical pharmacists function as integral members of health care teams at University Hospital, the Cardiovascular Center and C.S. Mott Children’s Hospital, working with physicians to achieve desired therapeutic outcomes, prevent or minimize drug-related problems, and improve medication use. Clinical specialists also practice in several of our ambulatory care clinics. Currently, 35 clinical pharmacist specialists provide direct patient care services.

One of the significant accomplishments this year was the implementation of a Comprehensive Adult Inpatient Anticoagulation Service at University Hospital, Women’s Hospital and Cardiovascular Center. Through this service, our pharmacists provide anticoagulation assistance for adult inpatients receiving therapeutic anticoagulation to assure standardization and appropriateness of anticoagulation care. This includes monitoring anticoagulation therapy, ordering lab tests, adjusting doses of anticoagulants, providing patient education, and facilitating the patient’s post-discharge follow-up anticoagulation care. The service has been effectively rolled out to approximately 35% of our inpatients who need anticoagulation management; our goal is to provide this care to all adult patients receiving therapeutic anticoagulation and the roll-out will continue over the next year.

Theradoc®, a software system that helps our pharmacists organize patient information, identify opportunities to impact patient care, document clinical interventions, and communicate with one another regarding patient care issues, was implemented in our pharmacist-managed Cancer Center Symptom Management and Palliative Care.

We continued revising and expanding our clinical practice model this year. Workgroups continued to define our new practice model. We implemented the first clinical specialist/generalist team to provide direct care for a population of general medicine patients. Lessons learned from this initial work will assist us in developing and implementing other teams and advancing our practice model.

Our health system continued its participation in national initiatives directed at improving care transitions and reducing unplanned readmissions (e.g., the Society of Hospital Medicine’s Project Boost, the Institute for Healthcare Improvement’s STAAR Initiative). Pharmacists served on the Operations Committee for these initiatives and many of our pharmacists provide discharge medication teaching for patients identified to be at high risk for readmission.

Over the last year, pharmacists lead several important initiatives to significantly reduce drug cost and help the department achieve budgetary targets. Notably, our staff was intimately involved in helping to manage crucial drug shortages involving antimicrobial agents, chemotherapy agents, and many other drug classes.

Our clinical specialists actively participate in the development, implementation and enforcement of drug use guidelines, policies and procedures, help to ensure appropriate use of high-risk medications, and serve on quality improvement committees throughout the institution. Initiatives and quality improvement projects undertaken by clinical pharmacists this year are listed below:
Medication Use Guidelines, Protocols and Treatment Algorithms

- Adjunct Sleep Medication protocol for Mott General Care patients
- Administration and Monitoring of IV Neostigmine for Colonic Pseudo-Obstruction Guidelines
- Administration of Intranasal Fentanyl in NICU/Pediatric Palliative Care patients
- Adult Kidney Acute Cellular Rejection Protocol (Updated)
- Adult Kidney Antibody Mediated Rejection Protocol (Updated)
- Adult Kidney Transplant Bone & Mineral Metabolism Guidelines
- Adult Kidney Transplant Dyslipidemia Management Protocol
- Adult Kidney Transplant Standard Immunosuppression Protocol (Updated)
- Adult Kidney Transplant Steroid Withdrawal Protocol (Updated)
- Albumin Guidelines (Updated)
- Alerts To Target Patients With Infections Caused By MDR Organisms
- ALS drug box (Updated)
- Annual Antibiogram Prepared
- Anthracycline Cardiotoxicity (for Pediatric Hematology/Oncology Patients)
- Basal/Bolus Insulin Initiative
- Campath Dosing Protocol
- Candidemia Bundle Project
- CGC Pain Management Guidelines
- Chemotherapy Induced Nausea/Vomiting Guidelines for Pediatric Hematology/Oncology patients
- Comprehensive Manage of Patients With Candidemia Initiative
- Consolidation of ICU Electrolyte Replacement Protocols into one protocol for all adult ICUs
- Conversion from Novo Nordisc insulins to Lilly insulin products
- Culture Review Alerts for All Patients using TheraDoc
- Deletion of Normosol from stock
- Dexmedetomidine Guidelines for Pediatric Pre-medication
- ED HomeMed Enoxaparin Order Sheet (Updated)
- Emergency Department Burn Surge Plan
- Epidural Solution Standardization
- Erythropoiesis Stimulating Agent Guidelines (Updated)
- Factor VIIa Guidelines (Updated)
- Fever in Pediatric Hematology/Oncology patients
- GCSF Protocol (Updated)
- Guidelines for the Appropriate Use of Intravenous Lipid Emulsion in the Setting of Hypertriglyceridemia and Cholestasis
- Guidelines for the Use of Erythropoiesis Stimulating Agents (Updated)
- Hazmat Protocols (Updated)
- Heparin Concentrations in Mott OR (Updated)
- ICU Electrolyte Replacement Protocol (Updated for calcium gluconate shortage, potential magnesium sulfate shortage)
- Infection Prophylaxis Pediatric Hematology/Oncology patients
- Insulin Infusion and Sliding Scale Hospital Forms (Updated)
- Lung Transplant Antifungal Prophylaxis Protocol (Updated)
- Lung Transplant CMV Prophylaxis Protocol (Updated)
- Lung Transplant CMV Prophylaxis Protocol for High Risk Patients
- Lung Transplant Immunosuppression Protocols (Updated)
- Methotrexate Toxicity Guidelines (Pediatric Hematology/Oncology patients)
- Pediatrics downtime CPR card revisions
- Phenylephrine IV Push Guidelines
- Plerixafor Minimization Strategy
• Prevention of Acute Kidney Injury in Patients Receiving Vancomycin (Pediatric Hematology/Oncology patients)
• Procedural Sedation Protocols for Pediatric Cath Lab
• Real-time Review of High-Risk Patients and Improved Time to Appropriate Antibiotic Therapy
• Regional Anesthesia Drug Tray for Mott
• Removal of procainamide from arrest drug boxes
• Sedation Drug Protocols for Physician Sedation Credentialling
• Sleep Guidelines for Adults
• Standardization of fluids, diluents and rates of chemotherapy administration in the Cancer Center
• Standardized insulin concentration for Obstetrics
• Stress Ulcer Prophylaxis Guidelines for Non-ICU Adult Patients
• Synagis (Palivizumab) Guidelines (Updated)
• Syringe Pump Libraries (Updated)
• Travel Drug Boxes Eliminated
• Type 1 Adult Custom Insulin Infusion Protocol
• Type 2 Insulin Infusion Protocol for Obstetrics
• Vancomycin Nomogram Targeting Troughs of 15-20 Mcg/Ml
• Vancomycin QA Tool

Policy and Procedures

• Chemotherapy Extravasation Policy (Updated)
• Chemotherapy Policy (Updated)
• Erythropoiesis Stimulating Agents - Implemented a process to meet the REMS requirements
• Insulin Pump Policy (Updated)
• Surgical Infection Prophylaxis Procedure for EAA Surgery Center

Carelink Order Set Development /Maintenance

• Cardiac PET Order Set
• Dofetilide Order Set
• Insulin Infusion, Order Set (Updated)
• Insulin Product Order Set (Updated)
• Insulin Sliding Scale Order Set (Updated)
• IV Naloxone Orally for Narcotic Induced Ileus
• Maple Syrup Urine Disease Order Set
• Pediatric Epidural Order Sets
• Prostacyclin Order Sets
• Thermostable Epoprostenol (Veletri) Order Set
• TPA For Patients With Pulmonary Embolism Order Set
Medication Use Projects Initiated and/or Completed In the Last Year

Our clinical pharmacists initiated, conducted and/or completed the following medication use evaluations/reviews:

- Assessment of TPN Provided to Low Birth Weight Infants (to address adequacy of volumes provided with starter TPNs)
- Cytofram MUE
- Evaluation of Concentrated Electrolyte Replacement Solutions (Concentrated Sodium Chloride, Ammonium Chloride, Sodium Acetate, Potassium Chloride) in Neonates (especially for patients on high dose diuretic treatment).
- Evaluation of Sedation Algorithms for PCTU
- Evaluation of the Potassium Supplementation portion of the newly adopted ICU Electrolyte Policy.
- Evaluation of Turn-Around Time for Inpatient Tacrolimus Lab Result Reporting
- Heparin Nomogram Quality Assessment and Changes to the Nomograms
- Methylprednisolone MUE
- Outsourcing Formulation of Pediatric Cardioplegia Solutions for Aspartate Glutamate Addition
- Review of Albumin Use in Patients With SBP
- Rituximab MUE
- Use Of Direct Thrombin Inhibitors and the Diagnosis Of HIT
- Use of Empiric Antibiotics for Late Onset Sepsis

Departmental/Health-System Publications

Our clinical staff contributed to our health-system publications:

- Post-Transplant Patient Education Book (Update)
- TBE Protocol/Guidelines Book, 2011 revision (Updated medication sections)

Other Activities

Our clinical staff was involved in many other activities which are not classified in the above categories. Clinical pharmacists:

- Addressed pediatric issues with the available enoxaparin concentrations, dose size and accurate/complete administration of doses
- Adult CPR simulation training exercises
- Ambulatory Red Bags (Updated)
- Availability of Adult ICU insulin infusion for adult patients housed in the Pediatric Cardiothoracic Unit (facilitated implementation of the changes to make these infusions available)
- Cancer Center Revenue Optimization Project
- Completed an outcomes assessment for the Pharmacist Run Anemia Management Service (cost and clinical endpoints)
- Developed a process for the successful development and maintenance of pediatric chemotherapy orders sets and maintenance of current adult chemotherapy order sets
- Drug Conversions
  - Conversion from brand to generic isoflurane
  - Conversion house-wide to pharmacy-drawn Lantus doses
  - Conversion of brand Prograf to generic tacrolimus
  - Conversion of Obstetrics from naloxone continuous infusions to nalbuphine
  - Converted OR's to neostigmine 1mg/ml concentration from 0.5 mg/ml
Converted voriconazole prophylaxis to fluconazole prophylaxis in MRD transplants

- EMS training videos developed
- Erythropoiesis stimulating agents process implemented to meet the REMS requirements
- HAART database implemented
- Implemented use of thermostable epoprostenol (Veletri) for inpatient use
- Infectious risk with shared blood glucose meters (Reviewed)
- National survey of OR pharmacy practices conducted
- Promoted appropriate dosing of antimicrobials by providing guidance and alerts in Carelink based on antibiotic, disease severity and renal function.
- Removal of Exactacine from arrest drug boxes
- Rounding of oral doses for pediatric patients so that they are easily measured by parents and caregivers in the outpatient setting
- Standardization of continuous infusions for all adult ICUs
- Streamlined starter pack medication currently available in the ED to 4 items and building a policy to have the ED pharmacist evaluated and dispense out of the ED satellite
- Threshold for hypoglycemia reporting by the lab (Reviewed)

Committee Participation

Clinical pharmacists served on the following hospital committees, work groups and task forces:

- Accreditation and Regulatory Readiness Council
- Anesthesiology QA Committee
- Antibiotic Stewardship Committee
- Antibiotic Subcommittee
- Anticoagulation Subcommittee
- Antimicrobial Subcommittee Bioterrorism and Pandemic Influenza Response Planning Committee
- BMT Quality Management Committee
- Burn Quality Care Committee
- C&W Arrest Committee
- Cancer Center Orders Team
- Cancer Center P&T Committee
- CES Division Group
- Children’s and Women’s Pharmacy/PICU Operational Planning
- College of Pharmacy Admissions Committee
- College of Pharmacy CSAS Communications Working Group
- College of Pharmacy CSAS PCARE Working Group
- College of Pharmacy CSAS Self-Care/Therapeutic Problem Solving Group
- College of Pharmacy Curriculum Committee
- College of Pharmacy Evidence Based Medicine Subcommittee
- College of Pharmacy Experiential Training Committee
- College of Pharmacy Faculty Development and Assessment Committee
- College of Pharmacy Faculty Recruitment Committee
- College of Pharmacy Practitioner Relations/CE Committee
- College of Pharmacy Professionalism/Leadership/Career Development Curricular working group
- College of Pharmacy Student Services Committee
- Committee on Pediatric Sedation
- CPR Committee
Critical Care Committee
Critical Care Steering Committee
Device Management Committee
ED Asthma Management Group
ED Management Team
ED Pharmacy Group
EPIC Medication Build
EPIC SME
Falls Committee
Glycemic Management Subcommittee of the P&T
Hazardous Drug Handling Committee
Holden Joint Practice Committee
ICU Steering Committee
Infection Control Committee
Inpatient Cardiology QI Group
Intravenous Acetaminophen Workgroup
Joint Commission Medication Management Readiness Committee
Ketogenic Diet Team
Kidney Transplant Quarterly CQI Committee
Kidney/Pancreas Transplant Operations Committee
Lipid Guidelines Committee
Liver and Lung Transplant Evaluation Committee
Liver and Lung Continuous Quality Improvement Committee
Liver Transplant Policy Committee
Liver Transplant Quarterly CQI Committee
Lung Transplant Patient Education Committee
MCHC Pain and Sedation Committee
Medication Profile Review Workgroup
Michigan Congenital Heart Center (MCHC) Joint Practice Committee
Microbiology Working Group Committee
Mott Discharge Prescription Committee
Mott Executive QA Committee
Mott Rounding Group for Family Centered Care
Mott Technical Support Committee
Mott Women's Leadership Committee
Needlestick Committee
Nutrition Advisory Committee
Pain Steering Committee
Pain/Sedation Executive Committee
Pancreas Transplant Quarterly CQI Committee Member
Patient Safety Committee
Pediatric CPR Committee
Pediatric Critical Care Medicine Joint Practice
Pediatric Medication Safety Committee
Pediatric/Adult Abdominal Organ Transplant Committee
Pharmacy and Therapeutics Committee (P&T)
Post-kidney transplant lean project
SCIP-3 Team
Sedation Committee
SICU Nursing Clinical Practice Committee
SICU QA Committee
Stroke Lean Team
Transition of Care: Medication Reconciliation Task Force
Trauma Quality Care Committee
Our pharmacists provided service and leadership to our profession by serving on a variety of external committees and work groups. These included:

<table>
<thead>
<tr>
<th>Organization</th>
<th>Involvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agency for Healthcare Research and Quality</td>
<td>○ Expert Panel, Healthcare-Associated Infections: Surgical Care Settings</td>
</tr>
<tr>
<td>American College of Clinical Pharmacists</td>
<td>○ Abstract review committee</td>
</tr>
<tr>
<td>American Society for Parenteral and Enteral Nutrition</td>
<td>○ Pediatrics PRN Collaborations Committee</td>
</tr>
<tr>
<td>American Society of Health-System Pharmacists</td>
<td>○ Program Committee</td>
</tr>
<tr>
<td>American Society of Health-System Pharmacists</td>
<td>○ Relations Ad Hoc Committee on Volunteer Recognition</td>
</tr>
<tr>
<td>College of Psychiatric and Neurologic Pharmacists</td>
<td>○ Membership Committee</td>
</tr>
<tr>
<td>Hematologist Oncologist Pharmacy Association</td>
<td>○ Self-Assessment Committee</td>
</tr>
<tr>
<td></td>
<td>○ ASHP Foundation Literature Awards Program</td>
</tr>
<tr>
<td></td>
<td>○ Chair, Medication Safety Sessions, Summer Meeting Planning</td>
</tr>
<tr>
<td></td>
<td>○ Committee on Nominations</td>
</tr>
<tr>
<td></td>
<td>○ Council on Therapeutics</td>
</tr>
<tr>
<td></td>
<td>○ Educational Steering Committee for Inpatient Care Practitioners</td>
</tr>
<tr>
<td></td>
<td>○ Innovation in Pharmacy Practice Selection Panel</td>
</tr>
<tr>
<td></td>
<td>○ Medication Management Accountability Measures Work Group</td>
</tr>
<tr>
<td></td>
<td>○ Student Committee</td>
</tr>
<tr>
<td></td>
<td>○ BCOP review panel</td>
</tr>
<tr>
<td></td>
<td>○ Education Committee</td>
</tr>
</tbody>
</table>
Michigan Pharmacists Association
- Executive Board
- Professional Affairs Committee
- Professional Affairs Committee
- Public Affairs Committee
- Treasurer

Michigan Society for Parenteral and Enteral Nutrition
- Board of Directors
- Membership Committee
- Michigan Pharmacy Practice Model Initiative
- Co-Chair, Educational Affairs

Michigan Society of Health-System Pharmacists
- Co-chair, NCCN Best Practices Standard Order Sub-Committee. Worked with the NCCN Best Practices Committee on *Standard Orders Pilot Project*
- Member, Chemotherapy Content and Knowledge Subgroup, NCCN Orders Management Project.
- Member, NCCN Fever and Neutropenia Panel
- Member, NCCN Risk Evaluation and Mitigation Strategies (REMS) Work Group

National Comprehensive Cancer Network
- Steering Committee, Endorsement Maintenance: Surgery Project
- Safety – Healthcare-Associated Infections, National Priorities Partnership

National Quality Forum (NQF)
- Abstract review Committee
- Co-chair, Advocacy Committee
- Professionalism Committee

Pediatric Pharmacy Advocacy Group
- SCCM Pediatric On-line Practice Exam Committee
- Public Policy Committee
- Antimicrobial Stewardship Task Force

Phi Delta Chi Fraternity

Society of Critical Care Medicine

Society of Infectious Diseases Pharmacists
State of Michigan Region II South

University of Michigan, College of Pharmacy

Washtenaw/Livingston Medical Control Board

Wayne County Medical Board

- EMS SE Regional Protocol Committee, Pharmacy Coordinator, Care Coordination, County EMS
- Region 2 Disaster Planning, Pharmacy Representative, ACC planning State Region
- Board of Governors
- Pharmacy Coordinator, EMS Protocols and Services County EMS Representative
- Pharmacy Coordinator, EMS Protocols and Services, County EMS
AMBULATORY PHARMACY SERVICES

Ambulatory Pharmacy Services encompass three separate outpatient pharmacies as well as three infusion pharmacies. The infusion pharmacies are located in the Cancer Center, Canton Health Center and East Ann Arbor Health Center. In addition to dispensing functions, the pharmacy staff supports many pharmaceutical care activities for the University of Michigan Hospitals and Health Centers (UMHHC) ambulatory areas. All pharmacies provide the following services:

- Clinical review of prescription
- Physician consultation and drug information provision
- Patient consultation
- Reimbursement assistance

Outpatient Pharmacies

The Ambulatory Care Pharmacy and the Cancer Center Pharmacy are located on the main campus, adjacent to the University Hospital. A third pharmacy services our East Ann Arbor Health Center. The population served by these pharmacies includes those patients receiving care from UMHHC, patients discharged from the hospital and/or our emergency department and employees. A customer satisfaction survey of employees, dependents and retirees was conducted by the University Staff Benefits Office for those individuals who utilized the Employee Prescription Plan. This survey reflected our dedication to patient services with the University of Michigan pharmacies ranked among the highest in terms of customer satisfaction.

Ambulatory staff provides consultative services to approximately 115 ambulatory sites related to compliance with medication management standards. Sites frequently contact pharmacy staff for assistance with new drug availability, reimbursement support and individual patient drug related support. Additional services include the training of site staff to complete self-review for accrediting agencies, annual on-site consultation visits, and tracking of compliance with monthly self inspections. The process of self-evaluation, with appropriate validation, has increased monthly site inspection compliance rates from 45% to 98%.

Ambulatory pharmacy representatives participate on several committees including:

- Ambulatory Formulary Committee
- Ambulatory Infusion Formulary Committee
- Cancer Center Pharmacy Committee
- Cancer Center Clinical Operations Committee
- Cancer Center Operations Committee
- University of Michigan Pharmacy Benefits Advisory Committee
- Ambulatory Services JCAHO Readiness Committee
In addition to these activities, ambulatory pharmacy staff is involved in the University of Michigan’s academic detailing program, as well as initiatives to improve the cost and quality of pharmacy services provided to university employees, dependents, and retirees with a prescription drug benefit carve-out.

### Pharmacy Demographics and Services

<table>
<thead>
<tr>
<th>Pharmacy Demographics and Services</th>
<th>Ambulatory Care Pharmacy</th>
<th>Cancer Center Pharmacy</th>
<th>East Ann Arbor Pharmacy</th>
<th>Transplant Specialty Pharmacy Services</th>
<th>UMHS Employee/Retiree</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Prescription volume = 300 / day</td>
<td>• Prescription volume = 135/ day</td>
<td>• Prescription volume = 300/ day</td>
<td>• Currently support 900 patients</td>
<td>• Current support approximately 200 patients</td>
</tr>
<tr>
<td></td>
<td>• Utilizes ScriptPro automation</td>
<td>• Supports a high volume of investigational drug protocols</td>
<td>• Supports U of M Specialty Pharmacy program</td>
<td>• Projected volume could grow to 2000 patients in 2014</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Discharge prescriptions account for 40% to 50% of total volume</td>
<td>• Generic dispense rate equals 70% which exceeds standards</td>
<td>• Supports U of M Transplant Specialty Pharmacy program</td>
<td>• Pharmacy staff facilitate obtaining Prior Authorization if needed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Compounding services provided—generally about 10 compounds per day</td>
<td></td>
<td>• Generic dispense rate equals 75% which exceeds standards</td>
<td>• Proactively contact patients for refills</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Generic dispense rate equals 75% which exceeds standards</td>
<td></td>
<td></td>
<td>• Staffing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Utilize coaster patient paging system to inform patients of prescription status.</td>
<td></td>
<td></td>
<td>- Program Manager (1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- Financial Counselors (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- Staff Pharmacist (1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- Pharmacy Technician (5.0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- Billing Specialists (2.0)</td>
<td></td>
</tr>
</tbody>
</table>
| Specialty Pharmacy Services | • Approximately 120 drugs designated as specialty product  
• Proactively contact patients for refills |
|---|---|
| Cancer Center Infusion Pharmacy | • Supports 73 patient chairs/beds, representing 150-200 patients per day  
• Approximately 46,000 infusion procedures annually  
• Significant support provided for investigational drug protocols  
• Utilizes Phaseal technology to safeguard employees from chemotherapy exposure  
• Emphasis on patient safety by tracking compliance with independent pharmacist double checks of new orders entered. Results indicate 98-100% compliance  
• Pharmacists monitor patient laboratory results and recommend dose adjustments when appropriate  
• Provide nursing education for new medication |
| Canton Health Center Infusion Pharmacy | • Primary support is for oncology patients; however other infusion needs are also supported  
• Capacity is 9 chairs. Average number of patients per day is 25.  
• On-site infusion pharmacy services |
| East Ann Arbor Infusion Service | • Opened in July 2010  
• Supports infusion therapy for non-oncology patients  
• Capacity is 10 chairs. Average number of patients per day is 25  
• On-site infusion pharmacy services |

**Current Initiatives**

- Planning to support growth of Transplant Specialty Pharmacy Services. Currently the service supports approximately 900 patients. Projections indicate that the program could have as many as 2000 patients by fiscal year 2014.

- Implement specialty pharmacy services for rheumatology patients

- Identifying opportunities for clinical involvement of staff pharmacists to access and improve adherence to medication regimen for Specialty Pharmacy patients

- Implementation of ambulatory infusion services in the Taubman Health Center

- Support implementation of CPOE in the Cancer Center Ambulatory Infusion area
- Implement pharmacist involvement on a Cancer Center Supportive Care Team.

- Implement a pharmacist anemia management service for ambulatory cancer patients.

- Implement a pharmacist managed clinical service for ambulatory patients on oral chemotherapy.

- Evaluate the potential for implementation of Medication Therapy Management Services in the retail pharmacies.

- Plan the relocation of the Ambulatory Care Pharmacy.
MEDICATION SAFETY

“It has been said that more mistakes in medicine are made by those who do not care than by those who do not know.”


The Medication Safety Committee at the University of Michigan is committed to improving the safe use of medications throughout our healthcare environment. The committee is represented by hospital administration, home care services, nursing, physicians, a physician assistant, pharmacy, quality assurance and risk management. Meetings are held monthly along with our sister committee, Peds Med Safety, and report directly to the Pharmacy & Therapeutics Committee.

Accomplishments:

• VinCRiStine ISMP Recommendations were reviewed and endorsed: ISMP and WHO recommend labeling changes from “Fatal if Given Intrathecally. For IV Use Only.” To “For Intravenous Use Only. Fatal if Given by Other Routes.” The Pharmacy & Therapeutics committee approved the change in UM-CareLink instructions from “Do not give intrathecally: FATAL.” To “For IV use only. FATAL IF GIVEN INTRATHECALLY”

• Nimodipine – ISMP recommends pharmacy prepare liquid preparations of niMODipidne rather than nurses. For patients unable to swallow the capsules the current practice is for nurses to pierce the capsule and draw up the contents of the capsule and administer to the patient. The contents are then usually in an IV syringe and could easily be administered by the IV route. The committee endorsed the ISMP recommendation and the Pharmacy recently implemented this practice.

• Lantus (insulin glargine): initiative by pharmacy to draw up patient specific doses to decrease the risk of harm from the incorrect drawing of insulin glargine syringes and to decrease costs from wasting a full insulin vial was endorsed by the committee. This process has been implemented by pharmacy.

• High Alert Policy Revision reviewed with draft policy changes including deleting High Risk definition, addition of other anticoagulants besides current heparin (warfarin, argatroban, bivalirudin, lepirudin, enoxaparin, and dabigatran) and epoprostenol and treprostinil, and changes to insulin floorstock (insulin aspart to insulin lispro) and individualized doses of insulin glargine, proposed double checks of epoprostenol and trepostinil.

• Nursing guideline that defines “independent double check and ‘verification’ was reviewed with plans to use when standardizing definitions within our Chemotherapy, Epidural, Intrathecal, and PCA policies.

• Neostigmine clinical guidelines for the use of neostigmine in adult patients with colonic pseudo-obstruction were reviewed. Highlights of the guidelines include restrictions to areas with telemetry monitoring, availability only a continuous infusion, and possible side effects of bradycardia and hypotension. The bolus is associated with a higher frequency of bradycardia and requires the attending or fellow to administer the bolus and remain the patient’s room to monitor the patient for 15 minutes following the bolus injection. The committee endorsed the proposed clinical guideline for only the continuous infusion in light of the risk associated with the bolus administration and operational issues with an attending or fellow remaining to monitor the patient.
Clinical guidelines for Reversal/Correction of Anticoagulants were briefly discussed. We determined phytonadione (vitamin K) will be removed from the inpatient omnicells and pharmacy will prepare vitamin K mini-bags for IVPB administration; exception is CVICU for transplant patients. The removal of vitamin K from the omnicell will facilitate the appropriate IV administration and not IM or subcutaneous administration. Revised Medication dose check soft-stop thresholds for UM-CareLink for 25 medications were identified that required an updating due to dosing changes for current therapy. The new threshold dose for soft alerts is based on data from MicroMedex and includes a 10% buffer.

Status of 59 medications in profiled Omnicells (inpatient) were changed from an over-ride status to a non-override status based on review of the following criteria:

- Emergency medications used for urgent/emergent/life-threatening or life-saving situations
- Patient comfort medications with low risk of harm (n/v, headache, itching, constipation)
- Controlled substance medications required for immediate relief
- Common As needed “PRN” medications (flush syringes)
- Insulin
- Protocol or procedure medications (gastrografin)
- Investigation medications (MCRU in CVC 1)
- Currently, multi-route meds cannot be made non-override as they need to be available if another route is required.
- Non-medications/devices/keys
- Medications required for Core Measure success (ie – SCIP)

**Reported Adverse Drug Reactions (ADRs)**

- A total of 208 adverse drug reactions were reported in 2010 in RiskPro.
  - Specific Drug Classes
    - Chemotherapy/Immunosuppressants
    - Contrast dye
    - Blood modifiers
    - Vaccines
    - Analgesic - Opioid

**Reported Medication Safety Reported Events**

- Selectively reviewed a number of the approximate 2,194 medication safety incident reports submitted in the past 12 months (increase of 4.4%).
  - Top Specific Medication Incidents
    - Wrong dose/volume
    - Dose not given
    - Wrong medication
    - Policy/procedure/protocol/guidelines not followed
    - Wrong frequency
RESEARCH AND EDUCATION

Research

The Department's research covers a wide range of inpatient and outpatient drug and disease state management, pharmacokinetic, and pharmacogenomic topics. Joint appointments with the Medical School, Department of Anesthesiology, and the Department of Pediatrics; underpin an emphasis on collaboration efforts. The collaboration effort includes the Department of Pharmacy Services and the Renal Replacement Therapy Kinetics Study Group (RRTKSG), which is a multidisciplinary research group established through the Department. The Focus on Medicine Project is a large collaboration between our department. Research areas of the individual clinical faculty members may be found at our Department website: http://sitemaker.umich.edu/csas/home (Department of Clinical, Social and Administrative Sciences).

Clinical Faculty Grants

The Department of Clinical, Social and Administrative Sciences’ Faculty had intramural and extramural grants totaling $1,250,936 in fiscal year 2010-2011.

<table>
<thead>
<tr>
<th></th>
<th>Tenure Track Faculty</th>
<th>Non-Tenure Track Faculty</th>
</tr>
</thead>
<tbody>
<tr>
<td># of these faculty on funded grants</td>
<td>13</td>
<td>9</td>
</tr>
<tr>
<td># of unique funded grants</td>
<td>51</td>
<td></td>
</tr>
</tbody>
</table>

(The number of grants does not include those submitted pending award notification.)

Departmental Direct and Indirect Cost Trends:

<table>
<thead>
<tr>
<th>Exp</th>
<th>FY02</th>
<th>FY03</th>
<th>FY04</th>
<th>FY05</th>
<th>FY06</th>
<th>FY07</th>
<th>FY08</th>
<th>FY09</th>
<th>FY10</th>
<th>FY11</th>
<th>10 Yr Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Cost Totals</td>
<td>347,133</td>
<td>0</td>
<td>170,962</td>
<td>641,879</td>
<td>248,605</td>
<td>1,200,862</td>
<td>1,201,627</td>
<td>626,063</td>
<td>715,000</td>
<td>860,860</td>
<td>6,012,991</td>
</tr>
<tr>
<td>Indirect Cost Totals</td>
<td>16,467</td>
<td>9,130</td>
<td>0</td>
<td>88,188</td>
<td>197,349</td>
<td>100,541</td>
<td>332,262</td>
<td>282,981</td>
<td>335,555</td>
<td>390,076</td>
<td>1,752,549</td>
</tr>
<tr>
<td>TOTALS</td>
<td>363,600</td>
<td>9,130</td>
<td>170,962</td>
<td>730,067</td>
<td>445,954</td>
<td>1,301,403</td>
<td>1,533,889</td>
<td>909,044</td>
<td>1,050,555</td>
<td>1,250,936</td>
<td>7,765,540</td>
</tr>
</tbody>
</table>
Clinical Faculty Publications

<table>
<thead>
<tr>
<th></th>
<th>Tenure Track (N= 18 faculty)</th>
<th>Non-Tenure Track (N= 28 faculty)</th>
</tr>
</thead>
<tbody>
<tr>
<td># of published peer reviewed articles</td>
<td>54</td>
<td>38</td>
</tr>
<tr>
<td># of published books, book chapters and books edited</td>
<td>5</td>
<td>12</td>
</tr>
</tbody>
</table>

# of publications does not include those in press or submitted. Numbers may not add up to totals on other pages due to fact that faculty often collaborate on papers.

Impact Factor

A stated goal of the Department is to publish our manuscripts in influential journals. This level of influence can be measured using “impact factor.” The impact factor for 2010-11 from Clinical Faculty peer-reviewed research manuscripts is depicted in the chart below.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Impact Factor</td>
<td>3.0</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>1.89</td>
</tr>
<tr>
<td>Range</td>
<td>0.5-8.8</td>
</tr>
<tr>
<td>Median</td>
<td>2.2</td>
</tr>
</tbody>
</table>

Mentoring

The Department’s research covers a wide range of inpatient and outpatient drug and disease state management, pharmacokinetics, and pharmacogenomics. In addition to conducting research itself, we mentor future researchers through our work with residents, pharmacy students and fellows and are mentoring 8 graduate students. Additionally, there were approximately 105 Pharm.D. Student Investigations Projects last year within the College of Pharmacy precepted by members of our Department.
<table>
<thead>
<tr>
<th>UM Pharmacy Residency Class</th>
<th>2010-2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pharmacy &amp; General Practice (PGY-1)</td>
<td>Specialty (PGY-2)</td>
</tr>
<tr>
<td>Cuong Hoang</td>
<td>Alexander Fohl – Critical Care</td>
</tr>
<tr>
<td>Jennifer Hlubocky</td>
<td>Rebecca Pettit – Pediatrics</td>
</tr>
<tr>
<td>Adrian Larkin</td>
<td>Ann Schwemm – Oncology</td>
</tr>
<tr>
<td>Melinda Tran</td>
<td>Allie Woods – Pharmacy Informatics</td>
</tr>
<tr>
<td>Marie Yu</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>UM Pharmacy Residency Class</th>
<th>2011-2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pharmacy &amp; General Practice (PGY-1)</td>
<td>Specialty (PGY-2)</td>
</tr>
<tr>
<td>Allen Antworth</td>
<td>Cuong Hoang - Critical Care</td>
</tr>
<tr>
<td>Walter Claire</td>
<td>Shannon Hough – Oncology</td>
</tr>
<tr>
<td>Elizabeth Koselke</td>
<td>Jennifer Lose – Cardiology</td>
</tr>
<tr>
<td>Paul Stranges</td>
<td>Jennifer Lunger – Pediatrics</td>
</tr>
<tr>
<td></td>
<td>David Mulherin – Informatics</td>
</tr>
<tr>
<td></td>
<td>Jerrica Shuster – General Cardiology</td>
</tr>
<tr>
<td></td>
<td>Melinda Tran – Hematology/Oncology</td>
</tr>
<tr>
<td></td>
<td>Marie Yu - Infectious Disease</td>
</tr>
</tbody>
</table>
Clinical Faculty Awards and Acknowledgements

In the past year, several of our COP faculty received prestigious and distinguished awards, and we acknowledge them for their significant contributions to the profession of pharmacy.

1. Dr. Rajesh Balkrishnan was appointed to the Healthcare Safety and Quality Improvement Research (HSQR) study section with the Agency for Healthcare Research and Quality (2011-
2013). He has performed services on other study sections and panels as well. He also delivered the keynote address at the 60th Indian Pharmaceutical Congress in December 2010 in Manipal, India, speaking about the growing need for Pharmaceutical Outcomes Research in India.

2. **Dr. Imad Btaiche** was the recipient of the P2 Student Teaching Appreciation Award in conjunction with being a Teaching Excellence Award Nominee. He was also the Research Advisor for the student recipient of the McGlone Research Award, Zhe Han.

3. **Dr. Peggy Carver** was selected as an Outstanding Poster for her work with **Dr. Btaiche** and Dr. Welch for their abstract on trace elements supplementation and monitoring in home parental nutrition patients. (2010). She was also a nominee for both Outstanding Student Group Advisor at the University of Michigan and the Outstanding Chapter Advisor for the Phi Delta Chi Fraternity.

4. **Dr. Hae Mi Choe** was part of the team that received the Excellence in Innovation Award for the University of Michigan Patient-Centered Medical Home Pharmacists, with the Michigan Pharmacists Association.

5. **Dr. Heidi Diez** was part of the team that received the Excellence in Innovation Award for the University of Michigan Patient-Centered Medical Home Pharmacists, with the Michigan Pharmacists Association.

6. **Dr. Vicki Ellingrod** served as the Grant Reviewer for the Italian Ministry of Health, Department of Innovation, General Direction for Scientific and Technologic Research, as well as for the Klinische Fellows Quality Grant Assessment in the Netherlands. She was also the Scientific Mentor for the ACCP Focused Investigator Training Program.

7. Congratulations to **Dr. Kristin Klein** for her promotion to Clinical Associate Professor!

8. **Dr. Michael Kraft** received, for the second time, the P-4 Teaching Appreciation Award after having won the P-3 Award. He was also nominated for the College of Pharmacy Teaching Excellence Award for the third time, making his total nominations three (twice in two years).

9. **Dr. Anjly Kunapuli** was on the Program Committee of the Society of Infectious Diseases Pharmacists, as well as being an ACCP and American Society for Microbiology member.

10. Congratulations to **Dr. Nancy Mason** for her promotion to Clinical Professor!

11. **Dr. Bruce Mueller** was the recipient of the University of Michigan College of Pharmacy Teaching Excellence Award.

12. **Dr. Randolph Regal** was nominated for the Teaching Excellence Award and the Preceptor of the Year Award.

13. **Dr. Tami Remington** received the Excellence in Innovation Award for the University of Michigan Patient-Centered Medical Home Pharmacists, with the Michigan Pharmacists Association.

14. **Dr. Stuart Rockafellow** was the recipient of the Michigan Pharmacists Association Innovative Practice as part of the University of Michigan Patient-Centered Home Pharmacists group.
15. Dr. Leslie Shimp was part of the team that received the Excellence in Innovation Award for the University of Michigan Patient-Centered Medical Home Pharmacists, with the Michigan Pharmacists Association.

16. Dr. James Stevenson won the 2010 John W. Webb Lecture Award

17. Congratulations to Dr. Burgunda (Gundy) Sweet on her promotion to Clinical Professor! This year, she was also invited to participate in both the Drug Shortage Summit in Washington, D.C., and the USP Medicare Model Guideline Revision. She also received a certificate of appreciation of her work with the Academy of Managed Care Pharmacy for her outstanding work with the editorial board.

18. Dr. Deborah Wagner received the 2010-Evan Newport HOPE Award-The Poke Plan Campaign, FIGS grant, UMHHS; 2011-North American Thrombosis Forum (NATF) DVTeamCare Hospital Award, and is on the VTE Executive Committee, UMHHS.

19. Congratulations to Dr. Paul Walker for his promotion to Clinical Professor! He was also the recipient of the Pharmacist of the Year Award from the Michigan Society of Health System Pharmacists (Nov. 2010).

20. Dr. Trisha Wells was part of the team that received the Excellence in Innovation Award for the University of Michigan Patient-Centered Medical Home Pharmacists, with the Michigan Pharmacists Association.

21. The Department of Pharmacy Services/College of Pharmacy received the 2010 ASHP Residency Excellence Award for the University of Michigan’s PGY1 Residency Program.

22. Dr. Erika Howle was recognized by Valerie Castle, MD, Chair of the Department of Pediatrics for development of standardized service-based guidelines to direct patient care activities on the PHO service.

23. Dr. Linda Stuckey received a Quality Improvement Award for “Breath of Fresh Air: Improving Inhaler Patient Education”. She was also selected to attend the Great Lakes young Pharmacists Leadership Conference.

24. Dr. Pam Walker was accepted into the ASHP Pharmacy Leadership Academy for 2012.

Summary of the Pharmacy International Programs Accomplishments
September 2010- August 2011

Summer of 2010 Faculty and Students:
Faculty:

- Dhanapal C.K., Ph.D. (FIP Pharmabridge Program) Anamalai University Department of Pharmacy, India (July 20 – August 14, 2009)
- Ms. Sabitha Mangalathillum, M.S. (FIP Pharmabridge Program) Amrita School of Pharmacy, Amrita Vishua Vidyapeetham University Kerala, India

Students: (Through IPSF; July 19-August 12; Internship in Pharmaceutical Care)
University of Michigan Students Taking Non Traditional Clerkship Rotations in Foreign Countries Fall/Winter 2010-2011:

- To the University of Bath (England); Rotation 8
  - Jody Gembarski
  - Alice Yi-Li Yeh

- To the University of Barcelona (Spain); Rotation 9
  - Linda Phan
  - Chia Hsu

- To the KNUST (Ghana); Rotation 3
  - Bj Opong-Owusu
  - Brandon Vachirasudlekh

- To the LAU (Lebanon); Rotation 4
  - Jonny El-Chemmas
  - Andrew Clark
  - Bernard Chan
  - Omonyeemwen Osayande

Exchange Students training at the University of Michigan Fall 2010:

- Chirag Patel from the University of Bath; England; September-December; Research Internship in Dr. Bruce Muller’s research Lab
- Ferran Bossacoma Busquets; from the University of Barcelona, Spain; Internship in Pharmaceutical care
- Laura Puignou Alcacer; from the University of Barcelona, Spain; Internship in Pharmaceutical care

Student Committee for International Opportunities (SCIO):
The “Student Committee for International Opportunities” have actively assisted the hosted students find residence, planned social activities for them, and transported some of them from and to the airport.

Center for Global Health (CGH) Internal Advisory Committee (IAC):
The college is represented by the Director of International Programs on the CGH IAC and provides input on the Center’s direction, projects, and review of Faculty and student associate applications and appointments, and review grant proposals.

Council on Global Engagement: This is a policy and a process setting body that facilitates students and faculty travel abroad. The College is also represented by the Director of International Programs.

International Contractual Agreements (or memoranda of Agreement) signed in previous Years:
• We have exchange agreements signed with: 1) University of Bath (England), 2) Kwame Nkrumah University of Science and Technology (KNUST, Ghana), 3) University of Barcelona (Spain), 4) The Lebanese American University (LAU, Lebanon), 5) Doshisha Women's College of Liberal Arts (Japan). A memorandum of agreement was also been signed with the University of Kalamoon in Syria.

International Contractual Agreements in the signature Queue at the University Counsel's office:

• University of Puerto Rico. All other exchange discussions are currently frozen
Appendix A

Department of Clinical, Social and Administrative Sciences
Publications Highlights, 2010-2011

BOOKS and BOOK CHAPTERS PUBLISHED/EDITED


PROFESSIONAL PAPERS PUBLISHED 2010-2011


ARTICLES PUBLISH ED 2010-2011


43. Unni E, Farris KB. Determinants of different types of medication non-adherence in cholesterol lowering and asthma maintenance medications: A theoretical approach. Patient Educ Couns. 2011 Mar 29


45. Schneider EF, Jones MC, Farris KB, Jackson III KC, Hamrick TS, Havrda D. Faculty perceptions of appropriate faculty behaviors in social interactions with student pharmacists. Am J Pharm Educ 2011;75(4).


2010-2011 SCIENTIFIC PRESENTATIONS

Alaniz, C.


Bostwick, J.

1. Characteristics of patient fallers on an inpatient psychiatric unit. 2nd Annual Nursing research Partnership Conference. Ann Arbor, MI.

2. Computerized physician order entry for geriatric patients admitted to a university-based inpatient psychiatry unit. American Association for Geriatric Psychiatry Annual Meeting. San Antonio, TX.

3. Drug Interactions and Beyond: Clinical Pearls for Safe Prescribing in Psychiatry. Core lecture provided to UMHS psychiatry. Core lecture provided to UMHS psychiatry residents. Ann Arbor, MI.

Btaiche, I.

1. Trace elements supplementation and monitoring in home parenteral nutrition patients. [Outstanding abstract]. ESPEN.

2. Drug development and pharmaceutical pricing in the United States: the Influence of drug intended outcomes on drug pricing. ISPOR.


4. Oxandrolone use and liver effects in severe thermal injury adult patients. ASHP.

5. Parenteral nutrition use and outcomes following radical cystectomy. ASHP.
Carver, P.


2. The Role of Trace Metal Ions in Infectious Diseases. [research presentation; session lecturer and session chair]. Eurobic, Thessaloniki, Greece, June 2010.


4. Fungal Research: summary of outcomes of C glabrata, PNA FISH, hi dose fluconazole therapy, fungal antibiogram, and management of voriconazole-sirolimus interactions. Infectious Diseases Research Conference, National Taiwan University Hospital (NTUH), Taipei, Taiwan. November 2010.

5. Summary of research on the Effects of Food and Gastric pH on the Absorption of Drugs in HIV-infected Patients. HIV/AIDS Control and Study Center, Taipei, Taiwan. November 2010.


Chaffee, B.


Ellingrod, V.

1. Mediating Relationships Between Atypical Antipsychotic Associated Metabolic Syndrome, Inflammation, and Folic Acid Metabolism. American College of Neuropsychopharmacology.

2. Pharmacogenetics, Antipsychotics, and Cardiovascular Disease. UM COP Dean Advisory Meeting.

3. Understanding the Metabolic Consequences of Antipsychotic Use in Schizophrenia and Bipolar Disorder. CSAS seminar.


5. A Pilot Examination of Endothelial Function in Schizophrenia. Award Finalist - 2nd place winner at MICHIR Research Symposium.


7. Methylene tetrahydrofolate reductase (MTHFR) 677C/T and catechol-o-methyltransferase (COMT) val158met variants and endothelial functioning in schizophrenia subjects treated with antipsychotics. CPNP meeting.


Erickson, S.


2. Association between summary symptom measures and health status. ISPOR European Meeting, November 2010.


6. Treatment of hypertension in the inpatient setting. ASHP Midyear Meeting, student poster, Alexandra Tungol.

7. Effectiveness of pharmacist interventions in reducing the prescription drug coverage gap for Medicare Part D beneficiaries. ASHP Midyear Meeting, student poster, Elizabeth VanWert.


Farris, K.


2. Effect of pharmacist-based diabetes management on HbA1c and blood pressure in a free medical clinic. APhA Annual Meeting, Seattle, WA.


Johnson, C.


Khanderia, U.


Kraft, M.


Kucukarslan, S.


Kunapuli, A.


Mehta, V.


Mueller, B.


Park, J.

Pharmacokinetics of mycophenolic acid in cystic fibrosis lung transplant recipients. American Transplant Congress.
Redic, K.


Regal, R.


Remington, T.


Stevenson, J.


2. Impact of a Pharmacist-Managed Chemotherapy-Induced Anemia Clinic. 70th International Congress of the International Pharmaceutical Federation (FIP).


4. Overcoming Inertia: Achieving More Rapid Transformation of Pharmacy Practice. John W. Webb Award Lecture presented as a visiting professor at Northeastern University, Bouve’ College of Pharmacy.


6. Intravenous Drug Delivery Systems in the US. Presented at KDA Hospital, Mumbai, India, and the All India Institute for Medical Sciences, New Delhi, India.


10. Assessment of Rates of Adherence and Drug Interactions in Patients With Oral Cancer Therapy. Hematology Oncology Pharmacists Association (HOPA) 7th Annual Conference.
11. Considerations in Selecting Inpatient Pharmacy Automation. 16th Annual Congress of the European Association of Hospital Pharmacists (EAHP).


Stringer, K.


Sweet, B.

1. Enhancing patient safety with the use of clinic formularies. ASHP MCM.

2. Writing and reviewing for medical journals. ASHP MCM.

3. Preliminary results of national drug shortage survey. ASHP MCM.

4. Assessing the impact of drug shortages on US health systems. ASHP MCM.

Wagner, D.


2. A Different Mechanism for Sedation in the ICU and Operating Room. Advocate Christ Hospital.

3. Improved Strategies for Perioperative Pain Management. VHA TV Live satellite broadcast.

4. A Non-opioid , Non-NSAID analgesic for perioperative pain management. Web-based, on-demand program.


6. Clinical Practice Guidelines: Amiodarone for atrial fibrillation following cardiac surgery. 15th World Congress on Heart Disease.


8. Naloxone Utilization and its use as a quality indicator. Quality Poster Month UMHHS.
Walker, P.


2. Clinical Practice Guidelines: Amiodarone for atrial fibrillation following cardiac surgery. World Congress on Heart Disease. Vancouver, British Columbia, Canada, July 2010
The Drug Information Service (DIS) provides pharmaceutical, pharmacological, and therapeutic information to the University of Michigan Hospitals and Health System and to health practitioners in the local area. In FY11, the Service handled over 2,000 questions for health care providers. In addition to providing drug information for patient care, the Service manages all drug shortages that require conversion to an alternative therapy or allocation of existing stock. Other responsibilities of the Drug Information Service include handling of product defects and drug recalls, managing the inpatient, cancer center and ambulatory clinic formularies, and participating in the development of clinical guidelines as requested. DIS staff are very involved with the UM-CareLink physician order entry system, coordinating database integration and ensuring that formulary agents are appropriately entered into the system to accurately reflect restrictions on prescribing or use.

The staff of the Drug Information Service support the functions of the UMHHC Pharmacy and Therapeutics (P&T) Committee and several of its subcommittees. In this capacity, they are responsible for conducting a thorough review of all published information related to safety and efficacy of new drugs, recommending the addition or deletion of products from the formulary, implementing therapeutic conversion programs, and approving policies related to drug use across the continuum of care. The P&T Committee is supported through several subcommittees including the Ambulatory Formulary Committee, Ambulatory Infusion Formulary Committee, Anticoagulant/VTE Subcommittees, Antimicrobial Subcommittee, Cancer Pharmacy Committee, Drug Use Evaluation Committee, Glycemic Management Subcommittee, Medication Safety Committee, Nutrition Advisory Committee, Pediatric Medication Use Committee, and the Product and Vendor Selection Committee. Some of the key accomplishments of the Committee in FY11, either directly or through the subcommittees, include:

- Reviewed 18 new pharmaceutical agents and conducted several class reviews
- Implemented numerous medication line item reviews that resulted in significant savings
- Implemented and/or modified restriction criteria for several agents due to safety concerns
- Managed several critical drug shortages, many of which required identification of alternate therapies
- Established one new subcommittee to standardize practices and ensure safe use for nutritional care: Nutrition Advisory Committee
- Endorsed implementation of a comprehensive adult inpatient anticoagulant service and approved several policies associated with the program designed to standardize care
- Approved expansion of the pharmacist-run anemia program to include all patients receiving erythropoietic stimulating agents prescribed by clinicians in the cancer center
- Approved several clinical guidelines including, but not limited to, management of CINV in pediatric patients, appropriate use of CMV immune globulin, intrathecal analgesia, IVIG dosing and administration, adjunct medications for sleep, and several guidelines related to the antimicrobial program
- Implemented several cost-containment initiatives including a program for pharmacy to draw up doses of Lantus insulin, restricting Reopro use, and restricting several drugs due to economic concerns
- Implemented several safety initiatives including removal of propoxyphene from the formulary, established a system for safe use of pregnancy category X drugs, and improved the CPOE system to enhance safe use of several medications
• Developed and posted several new policies and revised existing policies to ensure safe use of medications
• Reviewed several safety alerts on medications issued by the FDA and implemented appropriate corrective action plans

The **Ambulatory Formulary Committee** is a multidisciplinary group with representation from several physician leaders, pharmacy services, Blue Care Network, and the pharmacy benefits program. It is responsible for determining drug use policy and evaluating drug therapy within the ambulatory practice component of the University of Michigan Health System. Its purpose is to provide a high degree of coordination and seamless care between the inpatient and outpatient environment and to coordinate between health care plans, whenever possible.

Accomplishments of this group in FY11 include:
• Maintained a centralized voucher distribution program run through pharmacy services, and reviewed 24 new vouchers submitted for consideration
• Distributed 5 targeted email communications (FGP-Grams) to medical staff about timely drug-related topics
• Maintained standardized formularies for medication use in the UMHHC primary care ambulatory care clinics (general medicine, family medicine, pediatrics, and ob/gyn)
• Coordinated with the pharmacy benefits program to convert to a new mail order pharmacy
• Worked with others in the institution to move forward with the ePrescribing initiative
• Maintained the BlueCaid product line, reviewing new agents as appropriate, revising the preferred drug list, and establishing prior authorization criteria for select agents

The **Ambulatory Infusion Formulary Committee** is a multidisciplinary group with representation from all of the ambulatory infusion centers that was formed in 2010 after the opening of a new infusion center designed to service the needs of non-oncology patients who require outpatient infusion therapy. The committee is responsible for standardization of care and ensuring consistency of practices across infusion centers. While decisions specific to oncology drugs rest with the Cancer Pharmacy Committee, there is cross-representation between the groups to ensure one continuum of care whenever possible.

Accomplishments of this group in FY11 include:
• Approval of the initial formulary for the non-oncology ambulatory infusion centers
• Developed a policy to define the process for review of new drug requests
• Reviewed 5 new pharmaceutical agents for use in infusion centers
• Approved a policy to standardize management of hypersensitivity reactions
• Reviewed medication safety events to determine whether practice changes are needed to ensure safe use of medications in this environment

Health care staff are kept informed of Pharmacy and Therapeutics Committee decisions and new information regarding medications by means of the monthly, web-based [Pharmacy ForUM Newsletter](mailto:Pharmacy ForUM Newsletter). In addition to announcing formulary changes, each monthly issue includes current news briefs and several articles of interest related to drug therapy or safe use of medications. The table of contents is sent to all UMHHC health-care providers by email, with a PDF version attached and a link to the full online newsletter.
<table>
<thead>
<tr>
<th>Committee</th>
<th>Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pharmacy and Therapeutics Committee</td>
<td>Charged with ensuring safe and effective drug use within the institution. Its activities are supported by several subcommittees</td>
</tr>
<tr>
<td>Ambulatory Formulary Committee</td>
<td>Charged with developing an ambulatory formulary and impacting physician prescribing in the ambulatory environment to reduce ambulatory pharmaceutical expenditures while maintaining optimal clinical care</td>
</tr>
<tr>
<td>Ambulatory Infusion Formulary Committee</td>
<td>Charged with reviewing medications for use in the ambulatory infusion setting that are not used for oncology indications, and to standardize care between the outpatient infusion centers and the inpatient setting, when possible</td>
</tr>
<tr>
<td>Antimicrobial Subcommittee</td>
<td>Advise P&amp;T Committee on issues related to antimicrobials</td>
</tr>
<tr>
<td>Anticoagulation Subcommittee</td>
<td>Advise P&amp;T Committee on issues related to therapeutic uses of anticoagulant therapy</td>
</tr>
<tr>
<td>Cancer Pharmacy Committee</td>
<td>Advise P&amp;T on issues related to cancer therapy</td>
</tr>
<tr>
<td>Drug Use Evaluation Committee</td>
<td>Review drug use within the institution in order to ensure compliance with criteria, and improve medication safety and fiscal accountability</td>
</tr>
<tr>
<td>Glycemic Management Subcommittee</td>
<td>Review medications and treatment protocols designed to improve and standardize glycemic control processes</td>
</tr>
<tr>
<td>Medication Safety Committee</td>
<td>Review the medication use process to improve medication safety</td>
</tr>
<tr>
<td>Nutrition Advisory Committee</td>
<td>Review practices and develop policies specific to safe and effective use of nutritional therapy.</td>
</tr>
<tr>
<td>Pediatric Medication Safety Committee</td>
<td>Review issues specific to medication use in pediatric patients.</td>
</tr>
<tr>
<td>Product and Vendor Selection Committee</td>
<td>Review market changes in formulary products (new formulations, generics or pricing) to continually enhance formulary effectiveness</td>
</tr>
<tr>
<td>VTE Subcommittee</td>
<td>Advise P&amp;T Committee on issues related to VTE assessment and prevention</td>
</tr>
</tbody>
</table>
The goal of the Investigational Drug Service (IDS) at the University of Michigan Health System (UMHS) is to ensure that investigational drug studies and other drug-related research at the Hospitals and Clinics are conducted in a safe and efficient manner. In doing so, the IDS assists investigators in complying with the requirements of the FDA, study sponsors, Michigan State Board of Pharmacy Regulations, The Joint Commission, and hospital and pharmacy policies. The IDS is a part of the Department of Pharmacy Services (DOPS), with oversight by the UM Medical School and the UMHS Pharmacy and Therapeutics Committee, and only manages studies approved by the Medical School Institutional Review board.

The IDS is responsible for developing and implementing procedures for the proper control and handling of investigational drugs, including procurement, storage, medication labeling and dispensing, drug inventory management, and other distribution and control functions. This includes development of the Dispensing Guidelines (which outline the Pharmacy's responsibilities for preparing, packaging, labeling, and dispensing the drug, as well as maintaining dispensing records) and a study-specific prescription ordering template. IDS pharmacists are responsible for direct oversight of all drug dispensing from the central IDS location. In addition, IDS pharmacists are responsible for providing adequate training and support for dispensing of investigational drugs by other DOPS staff in satellite pharmacy locations.

The IDS is located in the central pharmacy, and is staffed Monday-Friday, 8:00 am to 4:30 pm. It is staffed by 5 FTE of clinical pharmacists, 5 FTE of certified pharmacy technicians, and 0.2 FTE pharmacy interns. On-call support is provided for investigators, study teams, DOPS staff, and other UMHS staff 24 hours a day, 7 days a week.

**IDS Metrics Summary:**

<table>
<thead>
<tr>
<th>TOTAL-ALL IDS</th>
<th>TOTAL FY08</th>
<th>TOTAL FY09</th>
<th>TOTAL FY10</th>
<th>TOTAL FY11</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total billed activity</td>
<td>$348,043</td>
<td>$431,263</td>
<td>$482,646</td>
<td>$615,009</td>
<td>27%</td>
</tr>
<tr>
<td>Total core grant/unbillable activity</td>
<td>$145,951</td>
<td>$186,267</td>
<td>$194,777</td>
<td>$211,168</td>
<td>8%</td>
</tr>
<tr>
<td>Total charges</td>
<td>$493,994</td>
<td>$617,530</td>
<td>$677,423</td>
<td>$826,176</td>
<td>22%</td>
</tr>
</tbody>
</table>

**Dispensing by location**

- **B2 IDS**: 4778 - 4738 - 6226 - 8266
- **UH-6th**: 758 - 465 - 249 - 277
- **Mott**: 432 - 195 - 437 - 390
- **OR or CVC**: 1 - 159 - 2 - 4
- **CC OP**: 1605 - 1920 - 1821 - 1685
- **CC Inf**: 2441 - 3769 - 4125 - 4273
- **TOTAL**: 10015 - 11137 - 12860 - 14896 - 16%

<table>
<thead>
<tr>
<th></th>
<th>TOTAL FY08</th>
<th>TOTAL FY09</th>
<th>TOTAL FY10</th>
<th>TOTAL FY11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monthly Avg # Open studies</td>
<td>290</td>
<td>311</td>
<td>318</td>
<td>375</td>
</tr>
<tr>
<td>New studies opened (Initiation)</td>
<td>192</td>
<td>118</td>
<td>101</td>
<td>127</td>
</tr>
<tr>
<td>Closed studies</td>
<td>98</td>
<td>104</td>
<td>98</td>
<td>135</td>
</tr>
</tbody>
</table>

**eResearch activities**

- **Initial reviews**: 190 - 175 - 208 - 216 - 4%
- **Amendments**: 589 - 752 - 587 - 512 - 13%
- **Total**: 779 - 927 - 795 - 728 - 8%

<table>
<thead>
<tr>
<th></th>
<th>TOTAL FY08</th>
<th>TOTAL FY09</th>
<th>TOTAL FY10</th>
<th>TOTAL FY11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitor visits</td>
<td>390</td>
<td>592</td>
<td>613</td>
<td>691</td>
</tr>
<tr>
<td>Inventory &quot;Adjustments&quot;</td>
<td>1470</td>
<td>2119</td>
<td>2479</td>
<td>3495</td>
</tr>
<tr>
<td>Inventory &quot;Receives&quot;</td>
<td>2510</td>
<td>4247</td>
<td>6434</td>
<td>7937</td>
</tr>
<tr>
<td>Inventory &quot;Transfers&quot;</td>
<td>1713</td>
<td>3188</td>
<td>6590</td>
<td>1966</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WebIDS/OPC transaction total</th>
<th>TOTAL FY08</th>
<th>TOTAL FY09</th>
<th>TOTAL FY10</th>
<th>TOTAL FY11</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5868</td>
<td>9554</td>
<td>15503</td>
<td>13398</td>
</tr>
</tbody>
</table>

**IDS Metrics Summary:**

<table>
<thead>
<tr>
<th>TOTAL-ALL IDS</th>
<th>TOTAL FY08</th>
<th>TOTAL FY09</th>
<th>TOTAL FY10</th>
<th>TOTAL FY11</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total billed activity</td>
<td>$348,043</td>
<td>$431,263</td>
<td>$482,646</td>
<td>$615,009</td>
<td>27%</td>
</tr>
<tr>
<td>Total core grant/unbillable activity</td>
<td>$145,951</td>
<td>$186,267</td>
<td>$194,777</td>
<td>$211,168</td>
<td>8%</td>
</tr>
<tr>
<td>Total charges</td>
<td>$493,994</td>
<td>$617,530</td>
<td>$677,423</td>
<td>$826,176</td>
<td>22%</td>
</tr>
</tbody>
</table>
Service Highlights:

- **Continued growth across all service metrics, including dispensing and dose preparation, new study review and implementation, and monitor visits and audits**
  - Hired additional IDS pharmacist (incremental increase in FTE); hired and trained 3 new IDS technicians (to fill vacant positions); hired and trained P1 intern (to fill vacant position)
  - Continued refinement of carousel operations by conversion of all inventory to study-based, rather than drug-based storage (many to one)
  - Implemented new IDS binder labeling and organization
  - Reorganized return shelf and other storage areas
  - Continued implementation of study protocols in UM-CareLink for inpatient studies
  - Revised existing SPGs/SOPs (Temperature Monitoring, Use of Satellites)
  - Developed of new SPGs/SOPs (Document Retention, Training and Delegation, Monitor Visit Guidelines)
  - Developed sponsor and monitor information and SPG packets
  - Completed IDS Operations documents for training and quality assurance purposes
  - Improved and automated monthly billing reconciliation and processes
  - Improved and expanded quarterly workload metrics
  - Assessed hazardous risk categories and implemented UMHS and DOPS hazardous handling processes
  - Implemented Office of Research Compliance recommendations for management of investigator-initiated studies, including chain of custody for courier delivery
  - Continued IDS-Pharmacy-Michigan Clinical Research Unit (MCRU) workgroup to improve pharmacy services to MCRU
  - Completed Industrial and Operations Engineering (IOE) student project on MCRU services
  - Participated in Ravitz Phase I multidisciplinary team
  - Participated in COG Phase I multidisciplinary team
  - Demonstrated regulatory compliance via internal and external audits performed by the following agencies and cooperative groups: FDA; Clinical Trials Network; UM Clinical Trials Office (QARC)
  - Provided representation on the following research oversight committees:
    - IRBMED Boards A2 and B1 (Skyles)
    - Protocol Review Committee (Siden)
    - Cancer Center Pharmacy and Therapeutics Committee (Redic)
    - MICH CTO (Redic and Tamer)
    - eResearch Committee (Tamer)

Medication safety and practice model projects (on-going):

- Internal Error Rates and Types of Dispensing Errors in an Academic Investigational Drug Service; Redic with Remy (UM COP student)
- Protocol Deviation Rates in Investigational Drug Clinical Trials: A Comparison of Drug Ordering Processes and Forms; Redic, Tamer, Skyles with Chen (UM COP student)
- Hazardous Drug Handling Survey; Redic with Vandagriff (UM COP student)
- Hazardous Drug Packaging Wipe Study; Redic, Christen, Chaffee with Fang (UM COP student)
- Hazardous Drug Dispensing in Ambulatory Practice Wipe Study; Christen, Redic, Chaffee with Lander (UM COP student)
- Disintegration of Oral Chemotherapy Tablets in an Oral Syringe, Siden with Wolf (UM COP student)

Staff Education:
• Revised and implemented new DOPS staff training module
• Developed and implemented DOPS annual review and attestation
• Identified CITI course for IDS Pharmacist training in Good Clinical Practice
• Continued Clinical Trials Office new staff training
• Continued Clinical Trials Office training on conducting IDS audit
• Continued MICH Sponsor-investigator training on IDS audits

Teaching (College of Pharmacy):
• Precepted IDS Elective APPE for 4 students (Redic, Siden, Skyles, Tamer)
• Developed MCRU/IDS Institutional APPE for implementation in FY12 (Redic and Skyles)
• Developed IDS Institutional IPPE for implementation in FY12 (Siden and Skyles)
• Developed IDS one-week module for Institutional APPE with Kinsey/Kraft for implementation in FY12 (Siden and Tamer)
• Precepted PGY-2 Hematology/Oncology Resident (Siden)
• Participated in Medication Reconciliation IPPE (Redic)
• Taught P476 Research Methods course (Tamer)

Presentations, Posters, and Meetings:
• Redic KA. “New Kids on the Block: Special Needs for Investigational Drugs” podium presentation at ASHP 2011 Summer Meeting & Exhibition, Denver, Colorado, June 2011.
• Redic KA “Drugs in Development: Accessing Investigational Drugs for Your Patients” podium presentation at Michigan Pharmacists Association Annual Convention and Exposition, Detroit, Michigan, February 2011.
• Redic KA. “Order Up! Using Technology Safely with Investigational Drugs” podium presentation at 45th ASHP Midyear Clinical Meeting and Exhibition, Anaheim, California, December 2010.
• Siden, R. “Tool for preparation of pharmacy records for audit” poster presentation at COG Fall Meeting 2010.
• Siden, R. “Tool for preparation of pharmacy records for audit” podium presentation at COG Fall Meeting 2010.
• Siden, R. “COG Audit Course” presentation at COG Fall Meeting 2010.
• Siden, R. “Creation of patient/caregiver tool for the preparation, administration and safe-handling of oral chemotherapy” poster presentation at 45th ASHP Midyear Clinical Meeting and Exhibition, Anaheim, California, December 2010.
• Siden, R. “QARC audit process” poster presentation at UMHS Quality Fair at UM, October 2010.
• Tamer HR. IDS Networking Session Facilitator, ASHP Midyear Clinical Meeting and Exhibition, Anaheim, California, December 2010.
COMPUTERIZATION AND AUTOMATION

The Department of Pharmacy utilizes and supports computer and automated systems in a number of areas. The Medical Center Information Technology (MCIT) Pharmacy team is responsible for supporting a number of these systems. The department has also utilized its own technical expertise in developing and supporting systems such as LabelSafe, the Reckoning and the Pharmacy external and internal web pages.

MCIT Pharmacy team

The MCIT Pharmacy team is a group within MCIT assigned solely to the support of technology in Pharmacy. This includes support of major pharmacy applications, Pharmacy automated dispensing systems, and other technical responsibilities such as ad hoc report production and desktop support. The team is located in the B2 Pharmacy administrative office area. The group provides Pharmacy systems support 24 hours per day, 7 days per week, 365 days per year. The team responds to an average of 90 MCIT help desk calls per month.

In addition to implementation and support activities, the MCIT Pharmacy team is actively involved in the education of pharmacy informatics professionals through the PGY2 Pharmacy Informatics program and precepting students on rotation from the College of Pharmacy.

Major Pharmacy systems

- WORx – Inpatient Pharmacy system used to support Pharmacy dispensing, clinical and billing activities.
• QS/1 – Outpatient Pharmacy System used to support pharmacy dispensing, clinical and billing activities in the East Ann Arbor, Ambulatory Care and CGC outpatient pharmacies.
• QS/1 – Outpatient Pharmacy Point of Sale system used in all outpatient pharmacies
• Ateb IVR - phone refill system used in the Ambulatory Care Pharmacy
• Omnicell – Approximately 100 automated dispensing cabinets utilized throughout the Medical Center inpatient and outpatient locations.
• Omnicell Workflow Rx – Inventory control carousel system
• SecureVault – Narcotic Vault management system
• ECHO – Amerisource/Bergen purchasing system
• TheraDoc – Clinical pharmacy management system
• WebIDS – Investigational Drug Service management system
• MobileView – RFID based drug box tracking system
• MedNet - PCA pump system
• ROBOT – automated inpatient dispensing system
• ScriptPro – automated outpatient dispensing system
• PACMED - high speed packager
• The Reckoning – 340b tracking system
• Bosswalk – financial crosswalk system
• LabelSafe – safe packaging/labeling system

Pharmacy automated dispensing systems

• **Omnicell** – dispensing system used to secure and manage medication inventory

• **McKesson RxOBOT**
  - UH inpatients only
  - Fills on average 450 drawers/day
  - 4000 - 4500 pics/day
  - 798 line items

• **ScriptPro**
  - Used in Ambulatory Care Pharmacy (ACP)
  - Fills approximately 40-45% of ACP prescriptions
  - Contains 178 Line items
Fiscal Year 2011 Activities

There were a number of significant computerization and automation projects in the department over the past year. This work included the following projects:

- **QS/1 Outpatient system**
  - Performed two QS/1 version upgrades
  - Implemented ePrescribing functionality
  - Implemented system use in the new Kellogg Eye Center

- **Omnicell**
  - Upgraded Omnicell XPC server to version 14
  - Installed additional cabinets in EAAINF, CCB1PRC2, CCB2INF, ANGIO1 (IR#1), MCATH_REC, UH9CW
  - Prepared and deployed anesthesia cabinets in the new Kellogg building and East Ann Arbor Infusion area
  - Planning for Omnicell system implementation in the new Children’s and Women’s hospital
  - Relocated 4 Productions servers from TC to new data center
  - Upgraded all cabinets to Windows SP3
  - Ordered 47 incremental cabinets for use in the new CW hospital

- **ECHO**
  - Performed an upgrade to version 6.0.1

- **MobileView drug box tracking system**
  - Expanded use of the MobileView RFID system to anesthesiology

- **ScriptPro**
  - Implemented a new ScriptPro device in the remodeled East Ann Arbor Pharmacy

**Key Automation projects planned for FY 2012**

Computerization and automation efforts in the Department of Pharmacy continue this year with the following active major projects:

- Implementation of a bedside bar code medication administration system
- Implementation of the EPIC system
  - Support implementation of QS/1 MiChart Charge and ADT interfaces
  - Support implementation of WORx MiChart Charge and ADT interfaces
  - Support implementation of Omnicell MiChart ADT interface
- Opening of the new Children’s and Women’s hospital
  - Installation of 47 additional Omnicell cabinets
  - Installation of Omnicell Workflow Rx inventory carousel system
  - Relocate approximately 25 cabinets from existing Mott to new hospital
  - Configure WORx for the new hospital
- Implementation of smart infusion pump system
Implementation of an HL7 doctor (provider) interface in QS/1 pharmacy system

Implementation of the SystemOne replacement application FastTrack

Perform the following planned system upgrades
  - Upgrade WORx to version 4.x
  - Upgrade Omnicell server and cabinets to version 15
  - Upgrade Omnicell Workflow Rx Inventory control system
  - Upgrade Omnicell SecureVault system
  - Upgrade the ROBOT ConnectRx application to version 7.x
  - Upgrade to the MobileView RFID tracking system
  - Upgrade to the MedNet PCA system
UM-CARELINK PHARMACY TEAM becomes Enterprise Clinical Systems Medication Use Systems Team (ECS-MUST)

During the fall of 2010, the former UM-CareLink Pharmacy Team became the Enterprise Clinical Systems Medication Use Systems Team at Medical Center IT.

ECS Medication Use Systems Team FOR CPOE+CDS, eMAR and BCMA

The ECS Medication Use Systems Team (ECS-MUST) is nationally recognized for its collective expertise in pharmacy informatics, particularly as it applies to computerized provider order entry and clinical decision support. In accordance with the mission and values of the University of Michigan Hospitals and Health Centers, the Department of Pharmacy and the Department of Medical Center Information Technology, the ECS-MUST strives to achieve patient-centric management and optimization of Medication Use Systems as an enterprise component of our Electronic Patient Care Environment (EPCE).

ECS Medication Use Systems Team Members:
Allen Flynn, Manager, Medication Use Systems Team
Susan Crowe, Team Lead, Medication Configuration
Mary Jo Bucrek, Clinical Pharmacist Analyst, Chemotherapy Configuration
Wendy Bussard, Clinical Pharmacist Analyst, Med Use System Projects, BCMA
Kelly Ciarkowski, Clinical Pharmacist Analyst, Medication, Chemo, Investigational Drug Configuration
Jason Matuszkiewicz, Med Systems Analyst, Drug Supply Chain, Pharmacy Systems and BCMA
Lisa Poon-Konrad, Clinical Pharmacist Analyst, e-Prescribing, Medication Configuration
Jennilyn Suhajda, Clinical Pharmacist Analyst, Medication Configuration & Clinical Decision Support
Nancy Whitney, Clinical Analyst, Formulary Alignment and Medication Configuration
Chris Zimmerman, Clinical Pharmacist Analyst, Medication Configuration & Clinical Decision Support

Scope of our work | Team’s Responsibilities

We manage more than 4500 medication order items which may exist independently or within 1800 online order sets and which are ordered and managed online by more than 12,000 CPOE users overall.

We use Allscripts' Sunrise Clinical Manager (SCM) suite of applications, known locally at the University of Michigan as UM-CareLink. We have an electronic interface for medication orders to the pharmacy information management system, Mediware WORx. We provide Computerized Provider Order Entry (CPOE), Clinical Decision Support (CDS), an electronic Medication Administration Record (eMAR) and we are currently implementing new technology for Bar Coded Medication Administration. These four functions are core components of a fully-electronic medication-use data management process.

ECS-MUST is responsible for supporting, maintaining, optimizing and extending computerized provider order entry, clinical decision support, electronic documentation of medication administration and bedside barcode scanning for all inpatients at University Hospital, the Cardiovascular Center (CVC) and the Mott Childrens’ Hospital.
Support
• We provide 24x7x365 3rd and 4th level pager-based, on-call support for medication CPOE, CPOE and BCMA integration issues
• We respond rapidly to troubleshoot newly reported break-fix issues
• We communicate about system issues and planned downtime events
• We monitor a medication-specific issues e-mail box, pharm-cpoet@med.umich.edu
• We monitor an automated interface error mailbox, pharm-must-if@med.umich.edu
• We review responses to phone calls and other documented issues from the UM-CareLink Support Center (6-2222) for quality assurance purposes

Maintenance
• We manage formulary updates in UM-CareLink, editing an average of 20 medication order pathways in CPOE each month
• We respond to drug shortages by making CPOE changes to indicate the shortage and suggest alternatives online to help ordering clinicians
• We update order sets routinely with new and revised drug therapies
• We revise the code of CDS rules and functions called Medical Logic Modules (MLMs) routinely with new and revised drug therapies
• We revise system configuration based on new findings, code updates and upgrades

Optimization
• We complete 5 enhancement requests weekly for revisions to onscreen text and functions within the online drug ordering pathways of UM-CareLink
• We add new order sets to help improve and standardize patient care using UM-CareLink
• We conceive, code, test and implement new CDS rules and functions
• We implement new features and functions for the UM-CareLink software

Platform Projects
• We are actively working on an implementation bar coded medication administration (BCMA) functionality within UM-CareLink

COMMITTEE PARTICIPATION

As a team we participate in the following committees:
• Enterprise Clinical Information Systems (ECiS) Steering Committee
• Enterprise Clinical Systems Leadership Team
• CIO Management Team Committee
• UM-CareLink/Pharmacy Global Issues
• Pharmacy and Therapeutics Committee
• Clinical Decision Support and Outcomes Committee
• Medical Center IT Pharmacy Operations Committee (MCIT Rx OPS)
• Medication Safety, Adult
• Medication Safety, Pediatrics
• Cancer Pharmacy Committee
• Pharmacy UM-CareLink Integration Team (PCIT)
• Pharmacy Operations Committee
• Product & Vendor Selection Committee (PVSC)
• Venous Thrombo-embolism (VTE) Prophylaxis Committee
• Anticoagulation Committee

KEY ACCOMPLISHMENTS, 2010-11
ECS-MUST:

- Chartered and began operations as the Medication Use Systems Team (Nov 2010)
- Implemented Medication Summary Tab in the CPOE system (Jan 2011)
- Implemented electronic prescribing across the UMHHS clinics (Dec 2010-Jun 2011)
- Implemented REMS for ESA configuration in CPOE (Mar 2011)
- Implemented Nutrition Services interface and workflows, including medication order related clinical decision support (Mar 2011)
- Supported the activation of a new Anti-coagulation Service in pharmacy (Winter/Spring 2011)
- Implemented new CPOE pathways for pulmonary hypertension medications (Spring 2011)
- Continued the rollout of the Acute Pain Management order set (2010-11)
- Implemented Hazardous Drug notifications for staff on the eMAR (2011)
- Updated CPOE and eMAR for new pediatric, Childrens’ and Womens’ hospital (Summer, 2011)
- Implemented a new Clinical Practice Guideline for Anti-Emetic drugs within pediatric chemotherapy order sets (Summer 2011)
- Built and tested Allscripts Sunrise Medication Manager (SMM) software (2011)
- Successfully passed Leapfrog Group’s CPOE Evaluation Tool (Jun 2011)
- Matched and welcomed a PGY2 Pharmacy Informatics resident for 2011-12 (Jul 2011)
- Implemented UMHS’ clinician approved enhanced Dose Check Alerts for the CPOE drug catalog (2011)
- Implemented an online Nurse Vaccine Assessment and CPOE order pathway for adult patients (Aug 2011)
- Implemented a new bi-directional interface between the CPOE system and the Pharmacy system to support bar coded medication administration (Aug 2011)
- Implemented TPN electronic order file transfer to Central Admixture Pharmacy Services (Sept 2011)

PUBLICATIONS

Journal of the American Medical Informatics Association, April 12, 2011.

Fox BI, Flynn AJ, Fortier CR, Clauson KA
Technology in Pharmacy Education
Knowledge, Skills and Resources for Pharmacy Informatics Education
PRESENTATIONS


CONTINUOUS QUALITY IMPROVEMENT

Quality Improvement and Regulatory Compliance Committee

The Department of Pharmacy Services Continuous Quality Improvement Program revolves around the departmental mission: excellence in patient care, education, and research. The committee’s specific charge is to ensure the continuous competency of all staff as they perform their care for patients, and a complete compliance of practices and processes with all the safety and regulatory rules and regulations set by regulatory agencies and professional organizations. It is composed of a chair, a medication safety coordinator, manager of ambulatory care, and leads in regulatory compliance and clinical services, staff competency, inpatient decentralized services, and system and technology improvement, and a pharmacist and pharmacy technician staff member. The group is led by the Associate Director of Pharmacy Services.

Primary Activities of the Quality Improvement and Regulatory Compliance Committee

Staff Competency

• Conducted an annual educational competency program in March. Compliance with this competency testing this past year has been at 100%.
• Utilized M-Learning, the computerized administration, correction, collation, and reporting this data to respective staff members, and provided aggregate data to both the department and the institution.
• Media fill testing for all designated staff as required by USP 797 on Pharmaceutical Compounding – Sterile Preparations.

Regulatory Activities

• Extensive planning took place to meet Joint Commission requirements for compliance with the medication management standards and the medication-related National Patient Safety Goals (for 2010 and 2011).
• The recommendations from very successful April 2010 Joint Commission Survey have been implemented.
• Completed a successful ASHP accreditation visit in 2011.

Additional Tasks:

• Departmental QI plan updated (annually)
• Continue to monitor narcotic use in the organization and surveillance
• Implementation of the patient reconciliation process compliant with the patient safety goals
• Participation in hospital-wide surveys and audits of medication storage areas
• E-mail communications to staff and management on compliance issues
• Preparation and dissemination of reports as requested
• Insulin storage compliance audits were tracked
• Medication labeling audits on nursing units were established and completed
• Policy and procedures review and coordination
• IV Clean Room is maintained USP 797 compliant and ensured all regulatory requirements are completed and documented.
• Monitoring for USP 797 compliance in pharmacy satellite areas.
• Drug storage audit occur and are monitored monthly for all inpatient and outpatient areas that have medication storage; focused audits occur on specific questions on the Drug Storage Audit
• Omnicell System:
  o Rate and reasons for overrides
  o Controlled substances discrepancies within pharmacy

Proposed Goals for FY12
• Inspection rate of medication storage areas in Omnicells and outpatient clinics will continue to be measured
• Inventory management improvement
• Develop inpatient operational dashboard
• Areas outside of omnicell use for narcotics will have additional measures developed to prevent diversion
• Work in the development of bar-code medication administration system to ensure compliance with regulatory and safety requirements
PURCHASING AND CONTRACTING

The Department of Pharmacy Services provides direction and oversight of pharmaceutical purchasing and contracting activities for the University of Michigan Hospitals and Health Centers. On an ongoing basis, these activities include:

- Coordination of the biennial pharmaceutical and prime vendor bid processes
- Monitoring purchases for contract compliance, enhanced savings opportunities and correct billing
- Identifying potential purchasing cost reduction opportunities
- Ensuring compliance and identification of potential cost savings in the Public Health Service (PHS) 340B Drug Pricing Program
- Troubleshooting identified product shortages, recalls and market withdrawals

Purchasing Team members include:
Susan Garrett, Inpatient Purchaser
Jeremy Dornbos, Inpatient Purchaser
Brian Brower, Inpatient Purchaser
Elaine Waldrup, Outpatient Purchaser
Timothy Hedglen, Outpatient Purchaser (not pictured)
Steve Zawisza, Outpatient Pharmacist (not pictured)
Sherry DeLoach, Coordinator, Contracting and Purchasing

In fiscal year 2011, the Department of Pharmacy Services (DOPS) experienced a 4% increase in total pharmaceutical expenses over fiscal year 2010. Pharmaceutical purchases (inpatient, outpatient, infusion and ambulatory clinics) for FY11 totaled approximately $139,462,900 as compared to FY10, when purchases totaled, $134,078,800. Outpatient areas (traditional retail, infusion and transplant) accounted for nearly 75% ($104,819,000) of total purchases for FY11, while purchases made for all hospitals and health centers totaled 25% ($34,643,900).

Significant cost saving initiatives implemented in FY10:
- Continued conversion to generic products, from brand-name, in the inpatient and outpatient setting, due to patent expirations. Significant savings were seen with transitions to the following generic injectable products, docetaxel, levetiracetam, meropenem, piperacillin/tazobactam, and topotecan as well as latanoprost ophthalmic solution and voriconazole and tacrolimus oral formulations, among others
- Contracts negotiated and signed with previously non-contracted vendors
- Continued success in the negotiation and access of “inpatient PHS” and “PHS-like” pricing from various pharmaceutical manufacturers for products used in inpatient areas or inpatient-like venues
- Inpatient therapeutic interchange initiatives
- Evaluated drug categories with significant changes in the market place to ensure continued cost savings
- Renegotiated contracts with brand vendors for deeper discounts when generics enter the market (e.g. Lovenox)

340B Drug Pricing Program
- Continued to utilize and maintain software to identify optimal purchases and follow regulatory guidelines
- Monitored and identified drugs for savings potential; especially drugs new to the 340B program, drugs offered on Apexus (340B Prime Vendor) contract as well as a new joint-venture contract with wholesaler (AmerisourceBergen Drug Corporation), and drugs that have taken significant price changes (e.g. Gemzar)
Drug recalls and shortages
• Provided first and second line evaluation of available alternative purchases to ensure continued inventory during stock-out(s)
• Investigated outsourced compounded medications or foreign drug procurement
• Managed critical drug shortages through consolidation of product, therapeutic substitutions and/or alternative therapies
• Evaluated the impact of potential operational changes with available alternatives
• Provided communication to staff regarding drug shortages and recalls
• Tracked spend for substitute products to recoup cost difference (through “Failure to Supply” contract clauses) where applicable
• Significant drug shortages during FY11 included oncolytics, neuromuscular blockers, emergency medications, electrolytes, antibiotics as well as many of the more “common” medications.
BUSINESS OPERATIONS

Size and Scope

- During FY11, Pharmacy Services had total revenue of $382 million and total expenses of $142 million.
- In addition, we purchased and distributed an additional $18 million of pharmaceuticals for administration in our clinic areas.

UMH Pharmacy Services FY11 Revenue and Expenses

<table>
<thead>
<tr>
<th></th>
<th>Hospital</th>
<th>Retail</th>
<th>Infusion</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY11, July 2010 - June 2011 (in 000s)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Revenue</td>
<td>246,960</td>
<td>42,329</td>
<td>93,124</td>
<td>382,413</td>
</tr>
<tr>
<td>Salary/Benefits</td>
<td>19,637</td>
<td>3,086</td>
<td>2,762</td>
<td>25,485</td>
</tr>
<tr>
<td>Supplies/other</td>
<td>46,519</td>
<td>20,021</td>
<td>50,534</td>
<td>117,074</td>
</tr>
<tr>
<td>Total exp</td>
<td>66,156</td>
<td>23,107</td>
<td>53,296</td>
<td>142,559</td>
</tr>
<tr>
<td>Gross margin %</td>
<td>73%</td>
<td>45%</td>
<td>43%</td>
<td>63%</td>
</tr>
</tbody>
</table>

Percent Change from Previous Year

<table>
<thead>
<tr>
<th></th>
<th>Revenue</th>
<th>Salary/Benefits</th>
<th>Supplies/other</th>
<th>Total exp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue</td>
<td>5%</td>
<td>3%</td>
<td>-7%</td>
<td>-4%</td>
</tr>
<tr>
<td>Salary/Benefits</td>
<td>16%</td>
<td>19%</td>
<td>4%</td>
<td>7%</td>
</tr>
<tr>
<td>Supplies/other</td>
<td>24%</td>
<td>13%</td>
<td>31%</td>
<td>33%</td>
</tr>
<tr>
<td>Total exp</td>
<td>10%</td>
<td>6%</td>
<td>9%</td>
<td>8%</td>
</tr>
</tbody>
</table>

- Our staff included 119 pharmacists, 9 residents, 143 pharmacy technicians, 12 management staff and 10 administrative staff. We also began to prepare for the opening of our new Children’s and Women’s Hospital by recruiting and hiring 9 pharmacists and 9 technicians.
Special Projects

Our retail pharmacy area supports two specialty pharmacy initiatives. For our post-transplant patients we provide ongoing financial counseling and provide mail delivery of immunosuppressives and other medications needed by these patients. In addition to improving patient care and patient and staff satisfaction, this program had a net margin of $4.5 million in FY11. For University employees, we provide mail delivery of specialty drugs, with a net margin of $4.7 million in FY11.

Our outpatient infusion services had continued growth in FY11, with the addition of a new infusion clinic at our East Ann Arbor health center. This area had $13.6 million in net revenue in FY11. Our total infusion area net revenue was $93.1 million. Overall our infusion pharmacies provided medications that had a net margin of $39.8 million.

As a disproportionate share hospital, we have been eligible to participate in the 340b discount program since 2004. This participation and the discounts it provides are essential to the financial success of our special projects.

Trends and Metrics

In today’s economic climate, all teaching hospitals face significant reimbursement and cost control challenges. UMHHC is proactive in managing our financial resources to support the highest quality patient care, teaching and research activities. We maintain a rolling six-quarter forecast so that we can plan for change. We measure our revenue and expense in terms of our patient activity, so that we can grow as needed. In addition to evaluating our total dollar revenue and expense, we use unit of service (UOS) ratios to guide our analysis of our performance. For FY11, our hospital services saw a 2.2% increase in revenue/UOS, while decreasing our expense per UOS by 5.0%.

<table>
<thead>
<tr>
<th>Hospital Services</th>
<th>FY11</th>
<th>FY10</th>
<th>Pct Chng</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inpt Adjusted Days</td>
<td>308,134</td>
<td>301,429</td>
<td>2.2%</td>
</tr>
<tr>
<td>Net Chg/UOS</td>
<td>771.11</td>
<td>745.36</td>
<td>3.5%</td>
</tr>
<tr>
<td>Sal &amp; Ben/UOS</td>
<td>54.06</td>
<td>54.24</td>
<td>-0.3%</td>
</tr>
<tr>
<td>Supp &amp; Oth/UOS</td>
<td>141.10</td>
<td>151.12</td>
<td>-6.6%</td>
</tr>
<tr>
<td>Total Expense/UOS</td>
<td>195.16</td>
<td>205.36</td>
<td>-5.0%</td>
</tr>
<tr>
<td>FTE/10k UOS</td>
<td>6.08</td>
<td>6.25</td>
<td>-2.7%</td>
</tr>
<tr>
<td>Mgn %</td>
<td>74.7%</td>
<td>72.4%</td>
<td></td>
</tr>
</tbody>
</table>
HOMEMED FISCAL YEAR 2011 in REVIEW

The pivotal milestone in fiscal year 2011 was the complete restructuring and implementation of our patient care business model. This change was fueled by the need to enhance staff and patient relationships and to introduce measurable staff accountability into workload management.

Operations Metrics

HomeMed supports the continuum of care as a referral recipient charged to provide patients a safe and effective transition to home. HomeMed activity is directly fueled from UMHHC activity\(^1\) which is quantified to include 47,778 annual inpatient discharges, 1,689,021 annual clinic visits, and 80,989 annual emergency services / urgent care visits. This translates into an average monthly census of ~1,800 active HomeMed patients, one-third of whom receive infusion related therapies with enteral nutrition comprising the remaining two-thirds of patient therapies provided.

Referral Capture

HomeMed continues to receive home infusion referrals predominantly through UMHHC Discharge Planning for both inpatients and outpatients receiving ongoing care from UMHHC physicians. Local area physician offices and surrounding regional health care affiliates will occasionally refer patients for home infusion therapy, although to a much lesser extent. The HomeMed service area extends geographically throughout the state of Michigan and into cities housed within the bordering states of Indiana and Ohio.

In FY’11 Discharge Planning referred 1,276 patients to HomeMed for a 72.7% referral capture rate (Graph 6).

Graph 6

Of those patients referred elsewhere (478), a total of 497 therapies (services) were provided by another infusion provider. An overall summary of the reasons referrals were sent outside of UMHHC home care is depicted graphically (Figure 1) and includes: patient/family requests, preferred provider relationships, and previous provider experience. The primary reason selected for referring services elsewhere by discharge planners was not categorized (54%).

Figure 1

---

\(^1\) Data extracted from Hospital Finance Data Mart
In FY’11 HomeMed received (through April 2011) a total of 4,389 referrals, 4,153 (94.6%) of which were accepted with service provided. This is essentially unchanged from the acceptance rate in FY’10 through April where 3,920 referrals were accepted and represented 94.7% of the total 4,134 referrals received.\(^2\)

Referrals received include patients new to HomeMed service, patients returning to HomeMed service, and existing patients beginning new therapies with HomeMed (Figure 2). The distribution characteristics of all referrals accepted closely resemble prior years and are as follows:

The most commonly referred services included Antibiotic (28.7%), Chemotherapy (27.4%), Enteral Nutrition (10%), IV Hydration (10%) and Catheter Care (8%). Multiple other therapies comprised the remaining 15.9% of referrals received.

**Activity**

The average monthly active patient census has increased in FY’11 (1,832 patients) compared to FY’10 (1,500 patients). Unique patient cases are opened and closed when they begin and end a course of service(s). An active patient is counted as such whenever a case remains in an open status for the time period assessed. Of the active patients on service in FY’11, 656 patients received infusion services while 1,176 patients received non-infusion services (enteral nutrition, equipment, ancillary supplies).

Modified infusion days, now defined as service days per prescription (drug and enteral formula), averaged 47,411 days in the latter half of fiscal year 2010. Infusion service days increased in FY’11 to 47,995 (1.2% increase) demonstrating only a modest change. With the HcN™ counting method, a service (therapy type) is potentially linked to multiple drug (and enteral) prescriptions. Modified infusion days serve as the primary HomeMed activity metric recorded in the health system’s Ambulatory Care Activity Report (ACAR). Given the measured increases in number of patients in FY’11 compared with FY’10; the smaller variance in infusion days suggests that patients averaged fewer concurrent services.

**Distribution**

For the purpose of this summary, distribution will include all processes required to pick, pack, and ship an order to a HomeMed patient. These tasks are completed by 11 FTE Home Care Service Technicians (HCST) and 2.4 FTE Allied Health Technical Coordinators (Shipping Coordinators). HomeMed converted 3 FTE temporary HCST positions to regular, permanent positions in FY’11.

---

\(^2\) Referral activity is compared through April. In May, the manually maintained referral database was retired. The replacement electronic reporting mechanism for referral activity is not yet available.
The no-mix prescription picking activity decreased in FY’11 compared to FY’10. This decrease resulted from the consolidation to a single set of catheter flush prescriptions regardless of the number of services. This process change resulted in an 8% decrease in the number of no-mix prescription fills picked (Graph 7). The change did not significantly affect the number of units (doses) required to flush an intravenous catheter, thus only a 1% decrease in the no-mix units (doses) picked was seen in FY’11 (Graph 8).

In FY’11, the average number of monthly patient orders processed were 2,752 up from 2,352 in FY’10 (17% increase). See Graph 9.

Delivery data definition and extraction methodology did not change in FY’11 and provides a valid representation of activity change between FY’11 and the latter half of FY’10. The average number of delivery orders increased from 2,580 to 2,802 in
FY’10 to FY’11, respectively (8.7% increase). For the purposes of this review, same day deliveries will be defined as orders shipped and delivered on the same day (i.e. HomeMed delivered). Next day deliveries are defined as orders shipped on one day and delivered the next business day (i.e. UPS ground or next day air). Same day orders average 77% of all deliveries. The remaining 33% are overnight deliveries. HomeMed completed approximately 91% of the same day deliveries in FY’11 (see Table 2 below for annual monthly average and Graph 10 for monthly trends). A transfer of overnight business from Metro Ground (Other\(^3\) in Table 2) to UPS should be noted in FY’11. HomeMed discontinued use of the Metro Ground overnight courier service due to unreliable customer service and delivery deadline compliance. The percentage of deliveries handled by HomeMed staff decreased slightly in FY’11, which can be explained by the overall increase in volume of deliveries coupled with the dependence on internal resources to accommodate workload demands based on activity.

### Table 2: Delivery Order Summary FY’10 vs FY’11

<table>
<thead>
<tr>
<th>Delivery Order Metric Summary(^2)</th>
<th>FY ’10 Ave</th>
<th>FY ’11 Ave</th>
<th>% Δ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delivery Method</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HomeMed</td>
<td>1740</td>
<td>1862</td>
<td>7 ↑</td>
</tr>
<tr>
<td>Same Day Courier</td>
<td>156</td>
<td>193</td>
<td>23.6 ↑</td>
</tr>
<tr>
<td>UPS</td>
<td>410</td>
<td>742</td>
<td>81 ↑</td>
</tr>
<tr>
<td>Other(^4)</td>
<td>274</td>
<td>5</td>
<td>-5000% ↓</td>
</tr>
<tr>
<td>TOTAL Deliveries</td>
<td>2580</td>
<td>2802</td>
<td>8.7 ↑</td>
</tr>
<tr>
<td>% HomeMed of total deliveries</td>
<td>67.5 %</td>
<td>66.4 %</td>
<td>-1.6 % pts ↓</td>
</tr>
<tr>
<td>% HomeMed of same day deliveries</td>
<td>91.8%</td>
<td>90.6%</td>
<td>-1.3% pts ↓</td>
</tr>
</tbody>
</table>

\(^2\) FY’10 & FY’11 Ave values represent a monthly average  
\(^3\) Other defined as Overnight Courier Service

The average monthly expense for non-HomeMed deliveries was $32,144 in FY’11 (Graph 11), with an average cost per delivery of $34. This average is skewed by a high number of UPS deliveries compared to couriers. The average UPS and courier costs per delivery in FY’11 were $23 and $78, respectively.
Pharmaceutical Admixture

Clean room pharmaceutical admixture activity has increased in FY’11 concurrent with the overall activity increases previously reported. The average number of compounded prescriptions filled in FY’11 was 1,698 and is up from 1,517 in FY’10 (11.9% increase). See Table 3 for annual monthly average and Graph 12 for monthly trends.

Table 3: Clean Room Admixture Summary FY’10 vs FY’11

<table>
<thead>
<tr>
<th>Clean Room Metric Summary</th>
<th>FY’10</th>
<th>FY’11</th>
<th>% Δ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compounded fills</td>
<td>1517</td>
<td>1698</td>
<td>11.9 ↑</td>
</tr>
<tr>
<td>Compounded doses</td>
<td>11,742</td>
<td>12,252</td>
<td>4.3 ↑</td>
</tr>
<tr>
<td>Compounded units</td>
<td>10,967</td>
<td>11,181</td>
<td>1.9 ↑</td>
</tr>
</tbody>
</table>

Another metric definition is acknowledged. An admixed unit in HcN™ references a filled final container quantity, but not necessarily the number of doses in the container. For example, a 24-hour minibag of nafcillin containing 4 doses would equate to 1 filled unit. Containers, units in HcN™, include small and large volume parenterals, and single syringes also, and are electronically tracked and include both compounded and non-compounded (no mix) dispensable units. In FY’11, metrics have been revised to delineate the number of prescription fills, doses, and units that are compounded from those that are not compounded (see distribution section for no-mix activity results). The compounding activity increased by 4.3% and 1.9% for compounded doses and units, respectively, from FY’10 to FY’11. See Graph 13.

In addition to the increased clean room activity described above, the staff have been significantly affected in FY’11 by numerous drug shortages. The clean room staff are impacted negatively by drug shortages due to the increased risk of product selection errors when alternative products are frequently substituted. Also, product substitutions increase the complexity of compound confirmations.

In December 2010, the clean room staff began using a shared inventory adjustment report to deduct shared TPN components from inventory on a weekly

5 Annual averages are based on monthly averages.
basis. The shared inventory adjustments have increased the complexity of order confirmation and clean room responsibility in the inventory management process.

Clean room operations are completed by 7 FTE Pharmacy Technicians [6 regular staff, 1 temporary] and 1 FTE Allied Health Technical Coordinator (Clean Room Coordinator). A temporary to regular FTE conversion has been proposed for FY’12.

**Clinical Care Management**

For the majority of FY’11, the HomeMed business model operated as it had since October of FY’09 with a two team approach, including a Maize Team focused on referral processing and a Blue Team focused on follow-up clinical care management. The Maize team was staffed with pharmacists and pharmacy technicians, while the Blue team was staffed with dietitians, nurses, pharmacists, and pharmacy technicians. On May 2, 2011 a major change was implemented in the HomeMed business model. Specifically, six teams comprised of a dietitian, nurse, pharmacist, pharmacy technician associate and pharmacy technician specialist support clinical operations. Patients are assigned to a team and each team is responsible for all care (referral to discharge) for their assigned patients. The workload was leveled for existing patients prior to beginning the new model, and is routinely reviewed. If re-leveling needs to occur, then the newest patients are moved to the appropriate team so that existing patient-to-HomeMed staff relationships can be maintained. Daily workload of new referrals is also leveled by our Intake staff as it is received. These two methods of workload leveling used in combination have been successful in creating a similar level of workload for each team on a daily basis.

Clinical care management activity summarized herein is reflective of infusion therapies and does not include care interventions made in patients receiving enteral nutrition. Also, un-scheduled care management issues are prioritized and resolved as they occur; this workload is not retrospectively recorded and thus cannot be quantified within the tracking database. In FY’11 a total of 18,333 scheduled clinical interventions were completed on behalf of infusion therapy patients. The total amount of scheduled clinical care activity in FY’11 is difficult to compare to that demonstrated in FY’10 due to the change in work model, and a change in the manner for tracking clinical care interventions for Intestinal Rehab (IR) patients. The change in tracking of the clinical care interventions for IR patients prohibited inclusion in this report. Because the work is no longer divided into Maize and Blue team tasks, it is not possible to simply show FY’10 activity as previously reported vs. FY’11 activity. Table 4 shows a summary of the clinical interventions for FY’10, as reported in the FY’10 Annual Report.
Table 4: FY’10 Care Management Summary

<table>
<thead>
<tr>
<th>Care Management Metric Summary</th>
<th>FY ’10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize Team Infusion Activity</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>2,903</td>
</tr>
<tr>
<td>Check Hospital Status</td>
<td>967</td>
</tr>
<tr>
<td>Obtain / Clarify Prescription</td>
<td>837</td>
</tr>
<tr>
<td>Variable</td>
<td>224</td>
</tr>
<tr>
<td>Total Interventions</td>
<td>4,931</td>
</tr>
<tr>
<td>Blue Team Infusion Activity</td>
<td></td>
</tr>
<tr>
<td>Assessment / Care Planning</td>
<td>1,145</td>
</tr>
<tr>
<td>Care Coordination</td>
<td>658</td>
</tr>
<tr>
<td>Clinical Monitoring</td>
<td>3,452</td>
</tr>
<tr>
<td>Laboratory Analysis</td>
<td>4,878</td>
</tr>
<tr>
<td>Variable</td>
<td>3,225</td>
</tr>
<tr>
<td>Total Interventions</td>
<td>13,358</td>
</tr>
<tr>
<td>Total Clinical Care Interventions</td>
<td>18,289</td>
</tr>
</tbody>
</table>

Table 5 shows FY’10 compared to FY’11 with combining some of the data in Table 4 in order to compare similar activities.

Table 5: Year-To-Year Activity Comparison

<table>
<thead>
<tr>
<th>Metric Summary</th>
<th>FY ’10</th>
<th>FY’11</th>
<th>Metric Summary</th>
<th>FY ’10</th>
<th>FY’11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infusion Activity</td>
<td></td>
<td></td>
<td>Infusion Activity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>2,903</td>
<td>3,034</td>
<td>Other / Referral</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check Hospital Status</td>
<td>967</td>
<td>1,350</td>
<td>Check Hospital Status</td>
<td>4,878</td>
<td>3,916</td>
</tr>
<tr>
<td>Obtain / Clarify Presc</td>
<td>837</td>
<td>1,272</td>
<td>Obtain / Clarify Presc</td>
<td>4,878</td>
<td>3,916</td>
</tr>
<tr>
<td>Assessment / Care Plan</td>
<td>1,145</td>
<td>1,374</td>
<td>Assessment / Care Plan</td>
<td>4,878</td>
<td>3,916</td>
</tr>
<tr>
<td>Care Coordination</td>
<td>658</td>
<td>954</td>
<td>Care Coordination</td>
<td>4,878</td>
<td>3,916</td>
</tr>
<tr>
<td>Clinical Monitoring</td>
<td>3,452</td>
<td>3,342</td>
<td>Clinical Monitoring</td>
<td>3,452</td>
<td>3,342</td>
</tr>
<tr>
<td>Laboratory Analysis</td>
<td>4,878</td>
<td>3,916</td>
<td>Laboratory Analysis</td>
<td>4,878</td>
<td>3,916</td>
</tr>
<tr>
<td>Variable</td>
<td>3,449</td>
<td>3,091</td>
<td>Variable</td>
<td>3,449</td>
<td>3,091</td>
</tr>
<tr>
<td>Total Care Interventions</td>
<td>18,289</td>
<td>18,333</td>
<td>Total Care Interventions</td>
<td>18,289</td>
<td>18,333</td>
</tr>
</tbody>
</table>

Overall, the data indicates a slight increase in clinical interventions in FY’11. All areas of activity show an increase except for clinical monitoring, laboratory analysis, and those interventions lumped under the term “variable”. The decreases in these areas are related to no longer tracking the IR patients in this database, re-education regarding standardizing the entries into the database and no longer allowing free text entries by the user for interventions. There may also be an element of some efficiency gained by the Six Team model, however, this data represents only two months of the new model rendering any efficiency gains difficult to detect or determine.

Figures 3, 4 and Graph 14 show a summary of the activities of the teams.

Blue Team accounted for 8,300 of the clinical interventions. The majority of Blue Team activity was related to initiation of services (including activities related to assessment, and care.
coordination & planning), monitoring labs and discontinuation of services.

**Figure 4: Maize Team Activity**

Maize Team accounted for 3,130 clinical interventions. The majority of Maize Team activity was related to referral processing: new patients, new services for existing patients, or restarting services +/- adding services for existing patients who are discharged from inpatient care.

The initial two months of the Six Team model show that the teams were accountable for 6,901 clinical interventions, and that activity was not level amongst the teams. This can be attributed to varying use of the clinical calendar between employees and between teams. It can also be attributed to the Intake staff becoming familiar with and standardly utilizing the process for level distribution of referral work.

Another means of analyzing clinical work is reviewing activity by service type. The vast majority of the clinical interventions are related to antibiotic service. This is demonstrated in Graph 15 showing many peaks representing various types of interventions. The other most common therapy types related to clinical interventions (antifungal therapy, catheter care, chemotherapy, irrigations, IV hydrations, LMWH and TPN) require significant clinical work, but only for select types of interventions. This is demonstrated in the table showing peaks for only two or three interventions.
Infusion Nursing

In FY’11 HomeMed established and supported nursing services for 640 patients (decreased from 708 patients in FY’10) through the provision of 4,047 nursing visits. The annual amount paid to agencies in subcontracted nursing expenses totaled $445,518 in FY’11. It is acknowledged that visits paid does not equate to visits made given the time lapse between the actual visit and the subsequent receipt and payment of an agency invoice. Additionally, the salary and wage expense incurred for HomeMed In-Home Infusion nursing staff is not included in the above annual expense.

Overall, measured visit activity has decreased compared to prior years. However, in the latter half of FY’10 (with the conversion to HcN™) the methodology for evaluating visit activity changed. Specifically, visit activity is now calculated based on a per single visit specific charge in the system which is strictly defined by receipt of a legitimate agency home infusion visit note (proof of service). It is noted that agencies may have provided nursing visits without providing a visit note to HomeMed, thereby influencing the overall measured visit activity. Prior to November 2009 (the first four months of FY’10) visit activity was measured using a combination of charge information and visit note receipts; however, these activities occurred and were tracked using two separate accounting systems creating the potential for duplicate visit counts. Additionally, there was a lack of charge specificity in the system prior to HcN™ whereby a single visit, exceeding 2 hours in duration, may have been more than once.

The per visit expense associated with providing this service increased in FY’11. The HomeMed paid expense to agencies per visit is greater than the payer reimbursement to HomeMed for providing the contractual service. Michigan Visiting Nurses (MVN) served as the predominant nursing agency (30.9%), although agencies throughout the state of Michigan were employed (Figure 5). A combination of 39 different nursing agencies provided 8.2% of the total nursing visits collectively and less than 1% of the total nursing visits individually. HomeMed In-Home nursing staff provided a greater percentage of visits in FY’11 (27.3%) compared to FY’10 (16.5%). The distribution of activity among agencies is displayed below.
HomeMed nursing staff contributed to the provision of nursing services for patients by completing 1104 (27.3%) of the 4,047 visits provided. Of these, HomeMed nurses completed 367 visits for patients without insurance, without geographical access to a preferred provider agency, and when the established agency for the patient did not have the staffing or training necessary to provide the required service. In sum, HomeMed nursing is reserved for more complex patient cases.

The primary drivers of HomeMed staffed nursing services (Graph 16) consisted of visits for the purpose of drug administration (31.5%), ongoing monitoring and teaching (26.9%), catheter placement (22.6%), and/or initial assessment and teaching (5.8%), respectively.

HomeMed also employs a dedicated group of skilled nurses to provide patient education and training prior to discharge (1,240 training sessions). This staff, known as the HomeMed Training Team, also accommodates chemotherapy connections (1,942 connections) in the Cancer Center, first dose administration of medication in the vascular access unit (64 encounters), and initial assessment with care coordination (1,354 encounters) prior to discharge.

Overall (Table 6) HomeMed provision of nursing services to home infusion patients decreased in FY’11 while the percentage of services performed directly by HomeMed nursing staff increased. The measured decrease in visit activity does not correlate with an overall increase in operational activity and thus, FY’11 visit metrics may represent a new baseline given the greater specificity in capturing visit counts that is now available.
Table 6: Infusion Nursing Activity Summary

<table>
<thead>
<tr>
<th>Metric Summary</th>
<th>FY ’10</th>
<th>FY ’11</th>
<th>% ∆</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home Infusion Nursing Visits</td>
<td>5,587</td>
<td>4,047</td>
<td>27.6 ↓</td>
</tr>
<tr>
<td>Annual Agency Expense</td>
<td>$362,123</td>
<td>$445,518</td>
<td>23.0 ↑</td>
</tr>
<tr>
<td>HomeMed In-Home Nurse Activity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BCBSM HIT Visits</td>
<td>514</td>
<td>737</td>
<td>43.4 ↑</td>
</tr>
<tr>
<td>Non-BCBSM Visits</td>
<td>407</td>
<td>367</td>
<td>9.8 ↓</td>
</tr>
<tr>
<td>HomeMed Total visits</td>
<td>921</td>
<td>1,104</td>
<td>19.9 ↑</td>
</tr>
<tr>
<td>Visits per FTE per Day</td>
<td>0.91</td>
<td>1.04</td>
<td>14.3 ↑</td>
</tr>
<tr>
<td>Training Team Nurse Activity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Training Sessions</td>
<td>1,178</td>
<td>1,240</td>
<td>5.3 ↑</td>
</tr>
<tr>
<td>Cancer Center Connections</td>
<td>1,883</td>
<td>1,942</td>
<td>3.1 ↑</td>
</tr>
<tr>
<td>Vascular Access Encounters</td>
<td>54</td>
<td>64</td>
<td>18.5 ↑</td>
</tr>
<tr>
<td>Assessments / Care Coordination</td>
<td>-</td>
<td>1,354</td>
<td>100 ↑</td>
</tr>
<tr>
<td>Clinic Visits</td>
<td>5</td>
<td>-</td>
<td>100 ↓</td>
</tr>
</tbody>
</table>

Inventory Management

HomeMed employs information technology via use of a software application to accommodate the control, storage and movement of inventory items within our warehouse. HcN™ is the sole source warehouse management system used by HomeMed. HcN™ utilization is augmented by several external reports that analyze patient and product activity, 340B eligibility, and expiring drugs. These reports extract and organize data from HcN™ for specific functions identified by HomeMed staff that were not pre-built into existing HcN™ reports. Data integrity is essential as it is the inventory files which drive HomeMed fiscal planning for reimbursement and cost accounting and also allow electronic lot number tracking in the event of a product recall.

The HomeMed inventory accounting method is perpetual with periodic, individual item cycle counts throughout the year complimented with an annual physical inventory count.

The calculated, overall, average inventory value for FY’11 was $977,541 and was above the desired threshold of $770,000 which is based upon the FY’10 post inventory valuation. An adjusted average valuation from January to May 2011 was $897,353 and reflects the deduction of shared drug items from inventory. The calculated value was mathematically derived from the average value of inventory recorded in HcN™ from multiple data points each calendar month (most business days Monday through Friday). A revised inventory value threshold will be established for FY’12 given consideration for increasing item procurement costs.

In FY’11 Pharmacy and Medical/Surgical Supplies were combined into the overall “Supplies” category for financial planning. This change means that there were not individual spend goals for Pharmacy or Medical/Surgical categories. Pharmacy and Medical/Surgical supplies make up 97% of the total “Supplies” spend and any unfavorable variance in the overall category would likely be attributed to these two categories. The “Supplies” category FY’11 planned spend was $10,346,490 and the year-end actual spend was $10,713,223, which reflects an overall unfavorable variance of 3.5% (see Graph 17). However, when adjusted for increases in activity, the spend for FY’11 was 19% of gross revenue and favorable to the targeted spend set at less than 24% of gross revenue. Other notable subcategories in this group are General & Office Supplies ($366,594),

---

9 Annual expense includes prior period activity and excludes HomeMed In-Home Infusion Nursing salary and wage expenses.
10 Blue Cross Blue Shield of Michigan Home Infusion Therapy

11 Individual item cycle counts occur inherent to specific item inquiries. A distinct all inclusive drug (only) count was performed 12/11/10.
Food ($11,279), Linen & Laundry ($5,849) and contribute 3.6% of the overall category spend. See below for further discussions about Pharmacy and Medical/Surgical supply spend trends in FY’11.

Graph 17: Supplies Category Spend Plan vs Actual

The cumulative inventory spend exclusive to Pharmacy and Medical / Surgical supplies for FY’11 amounts to $10,325,816. This represents 18.5% of gross sales ($55,796,472) and a decrease in the overall percentage of gross sales compared to FY’10, $9,963,361 (23.9%).

HomeMed procures pharmaceuticals through three primary pathways: its primary pharmacy wholesale distributor, AmerisourceBergen (61%), directly from the manufacturer (36%), and from the Department of Pharmacy Services within the health system (3%) (see Figure 6). The there was a 2% decrease in purchasing activity through AmerisourceBergen in FY’11 compared to FY’10. Purchasing activity increased by 1% with manufacturers directly and the Department of Pharmacy Services compared to last fiscal year. This activity transfer is likely a result of the numerous drug shortages that caused last minute drug sharing with the hospital and drug allocation programs managed directly by manufacturers.

Health system financial records (i.e., DataMart™) indicate that the HomeMed spend on pharmaceuticals (Budget Category 4605 Pharmacy Supplies) equaled $9,323,756. Because of the invoice pathway established, the charges for select medical / surgical supplies and enteral products will intermittently be captured within this plan category. Adjusting for the medical / surgical expenses, the actual spend on pharmacy supplies (including enteral products) are calculated to equal $9,303,620. The adjusted pharmacy supplies spend in FY’10 was $8,827,551. The unfavorable variance between FY’10 and FY’11 is driven by an increase in operational activity, therapy mix changes influenced by expensive drug purchases, and suboptimal 340B purchasing practices secondary to numerous drug shortages and the resultant need to access non-contracted procurement pathways.

Overall, 340B purchases comprised 58.7% ($5,463,489) of the total drug spend in FY’11 compared to 37.4% ($3,299,532) of the total drug spend in FY’10. This percentage increase in FY’11 is a favorable trend that represents stabilization of the 340B purchasing pathway post HcN™
conversion in FY’10. The FY’11 340B purchases constitute a FY’11 cost savings of $2,772,493 compared to $1,501,496 in FY’10. There is a current surplus of $8,064,200 (1.97 million eligible units) in 340B purchasing power which will continue to be pursued in FY’12. See Graph 18 for a monthly summary of AmerisourceBergen drug purchases by 340B vs. Non-340B account activity. Increased spending can be seen in December and June and likely reflects increased inventory purchases after the 2 physical inventory counts in FY’11.

Purchasing staff likely “spent down” inventory before the count and then increased purchasing after the count to resume to regular par levels. At this time, the 340B vs. Non-340B purchasing activity is not easily monitored for manufacturer direct purchases. Additional work will be done in FY’12 to capture this data.

The top ten drug purchases by dollar amount in FY’11 closely matches those observed in previous fiscal years and are depicted graphically below. Immunoglobulin, anti-hemophilia agents, along with daptomycin, meropenem, micafungin and piperacillin/ tazobactam are included in this list (Graph 19). Of note, in late FY’11 HomeMed converted to generic meropenem and piperacillin/ tazobactam. These conversions will likely result in these two drugs falling outside the dollar spend range for the Top Ten Drug list in FY’12.

Recalls
HomeMed has experienced numerous drug recalls and shortages in FY’11. Significant recalls involving HomeMed inventory include those associated with:

<table>
<thead>
<tr>
<th>Recalled Item</th>
<th>Notification Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heparin Flush</td>
<td>11/03/10</td>
</tr>
<tr>
<td>Sodium Bicarbonate</td>
<td>12/30/10</td>
</tr>
<tr>
<td>0.9% Sodium Chloride 1000 mL bags</td>
<td>3/14/11</td>
</tr>
<tr>
<td>Triad Alcohol Pads contained in Lovenox Continue Care Box</td>
<td>3/24/11</td>
</tr>
<tr>
<td>Triad Skin Prep Pads</td>
<td>4/15/11</td>
</tr>
<tr>
<td>Potassium Phosphate Filtration Requirement (not an official recall)</td>
<td>6/7/11</td>
</tr>
</tbody>
</table>

In each instance the recall procedure was enacted, an action plan was implemented, and the issue was resolved through use of alternative medication use pathways. In no instance was patient harm appreciated. Documentation of an action plan, staff education, and patient involvement are available for each recall under separate cover.
Shortages

HomeMed was affected by numerous shortages in FY’11. The shortages affected patient care, negatively affected optimal drug purchasing, and increased staff workload. Product shortages require complex inventory and patient order management plans. Shortages can often be managed without complete interruption of service for a patient. Some shortage management strategies that were implemented in FY’11 are summarized in Table 8.

<table>
<thead>
<tr>
<th>Drug Shortage Response (consequences)</th>
<th>FY’11 Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generic Equivalent Substitution</td>
<td>Fluorouracil, Doxorubicin,</td>
</tr>
<tr>
<td>May result in off contract purchasing</td>
<td>Gentamicin, Tobramycin</td>
</tr>
<tr>
<td>Often results in lost 340B eligibility</td>
<td></td>
</tr>
<tr>
<td>Drug in class substitution</td>
<td>Aminosyn II, Liposyn MVI</td>
</tr>
<tr>
<td>Requires physician order change</td>
<td>Adult</td>
</tr>
<tr>
<td>Same additional limitations as above</td>
<td></td>
</tr>
<tr>
<td>Patient Specific Allocation</td>
<td>Amikacin</td>
</tr>
<tr>
<td>Reserve drug supply for active patients and decline new business</td>
<td></td>
</tr>
<tr>
<td>Dose restriction</td>
<td>Dehydrated Alcohol, Most</td>
</tr>
<tr>
<td>Requires physician order change</td>
<td>TPN micronutrients</td>
</tr>
<tr>
<td>May result in adverse clinical outcomes from suboptimal dosing</td>
<td></td>
</tr>
<tr>
<td>Change Unit of Dispensing</td>
<td>Gammagard, Vancomycin</td>
</tr>
<tr>
<td>Change in number of vials dispensed per dose</td>
<td></td>
</tr>
<tr>
<td>Disproportionate 340B eligibility generation</td>
<td></td>
</tr>
<tr>
<td>High Risk Compounding</td>
<td>23.4% Sodium Chloride,</td>
</tr>
<tr>
<td>Significant increases in purchase price</td>
<td>Selenium</td>
</tr>
<tr>
<td>Increased risk to patients</td>
<td></td>
</tr>
</tbody>
</table>

Table 8: FY’11 Drug Shortage Interventions

The most significant shortages in FY’11 were related to TPN macro- and micro-nutrients produced by generic manufacturers. Hospira holds the prime generic manufacturer contract for the University of Michigan Health System (UMHS). Hospira experienced numerous product shortages in FY’11 including the complete interruption of product availability of: Liposyn III, Aminosyn II, MVI Adult, and sodium chloride 23.4% for most or all of the year. Non-contract alternatives were procured for these products. See Table 9 for an estimate of the additional expense associated with these Hospira shortages. Hospira had multiple other drug shortages that were managed with product substitutions within their product portfolio.

<table>
<thead>
<tr>
<th>Primary Product</th>
<th>Replacement Product</th>
<th>FY’11 Annualized Cost Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liposyn III® 20% 500 mL</td>
<td>Intralipid® 20% 500 mL</td>
<td>$42,139.68</td>
</tr>
<tr>
<td>Aminosyn II® 10% 2000 mL</td>
<td>FreAmine III® 10% 1000 mL</td>
<td>$9,198.00</td>
</tr>
<tr>
<td>MVI Adult® 2 x 5 mL dual vial</td>
<td>MVI 12% Bulk 50 mL vials compounded into syringes*</td>
<td>$12,779.28</td>
</tr>
<tr>
<td>MVI Adult® 2 x 5 mL dual vial</td>
<td>Infuvite® Adult 2 x 5 mL dual vial</td>
<td>$5,773.74</td>
</tr>
<tr>
<td>Sodium Chloride 23.4% 250 mL</td>
<td>Numerous manufactured alternatives</td>
<td>$6,413.04</td>
</tr>
<tr>
<td>Sodium Chloride 23.4% 250 mL (Compounded)</td>
<td></td>
<td>$17,146.12</td>
</tr>
</tbody>
</table>

Table 9: Cost Summary of FY’11 Hospira Shortages

*Includes Labor estimates for HomeMed Staff compounding syringes

In late FY’11, a second large generic manufacturer, American Regent Laboratories (ARL), had a several month interruption of product production. ARL was one of the few other generic manufacturers that produce many of the TPN additives. The additional national supply interruption of these additives made it very difficult to procure: concentrated trace
minerals, calcium gluconate, magnesium sulfate, sodium phosphate, potassium phosphate, sodium acetate, and dehydrated alcohol.

<table>
<thead>
<tr>
<th>Metric</th>
<th>FY ‘10</th>
<th>FY ‘11</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Inventory Purchases</strong></td>
<td>$9,963,361</td>
<td>$10,325,816</td>
<td>$362,455</td>
</tr>
<tr>
<td><strong>Medical Surgical Supplies</strong></td>
<td>$1,135,810</td>
<td>($113,614)</td>
<td>10%</td>
</tr>
<tr>
<td><strong>Pharmacy (drug) Supplies</strong></td>
<td>$8,827,551</td>
<td>$9,303,620</td>
<td>$476,069</td>
</tr>
<tr>
<td><strong>340B Purchases</strong></td>
<td>$3,299,532</td>
<td>$5,463,489</td>
<td>2,163,957</td>
</tr>
<tr>
<td><strong>Non 340B Purchases</strong></td>
<td>$5,528,019</td>
<td>$3,470,856</td>
<td>($2,057,163)</td>
</tr>
<tr>
<td><strong>Purchases: Gross Sales</strong></td>
<td>23.9%</td>
<td>18.5%</td>
<td>(5.4 % pts)</td>
</tr>
<tr>
<td><strong>Average Inventory Value</strong></td>
<td>$743,248</td>
<td>$897,353 (adjusted)</td>
<td>$154,105</td>
</tr>
<tr>
<td><strong>Counted Inventory Value</strong></td>
<td>$770,006</td>
<td>$725,437</td>
<td>($44,569)</td>
</tr>
<tr>
<td><strong>Inventory Turnover</strong></td>
<td>13.4</td>
<td>11.5</td>
<td>(1.9 % pts)</td>
</tr>
<tr>
<td><strong>Inventory Shrinkage</strong></td>
<td>-</td>
<td>19.1%</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Table 10: FY’11 Overall Inventory Metric Summary

The inventory turnover (turns, stock turns/turnover) for FY’11 equaled 11.5 and is decreased from FY’10 (13.4 turns). A low turnover rate may indicate that inventory items are not moving, have been purchased in excess, have been discontinued and not removed from stock, or that business activity has diminished. A high turnover rate may indicate insufficient inventory quantities to meet activity demands, or an increase in the number of (manufacturer) product outages and shortages. Logically, a combination of these influencing variables will occur during the course of a fiscal year.

Shrinkage is calculated to be 19.1% using the total of physical count variances in dollars relative to overall estimated inventory value. Effort throughout FY’11 was expended to improve the inventory data accuracy inherent to HcN™. While a 19.1% shrinkage is unfavorable to industry standards, it is explained by data entry inconsistencies and not unlawful diversion of inventory items. Improving inventory data management in HcN™ continues to be a focus in FY’12.

Billing and Reimbursement

Payer Demographics

Blue Cross Blue Shield of Michigan (BCBSM) is the primary payer (27%) to HomeMed. The payer distribution profile excluding charity is below. Figure 7

12 DME pump purchases are excluded.
Overall there were not significant changes in payer distribution from F’10 to FY’11. The Prescription (Rx) Plan category, previously entitled Retail, increased slightly to 18% (FY’10 was 17%) to become the second largest payer for HomeMed.

**Billing Performance**

In FY ’11 Gross Sales were $55,796,476 for an average of $4,649,706 per month, compared to an FY’10 monthly average of $3,468,618; a 34% increase. Increased overall activity, differences in therapy mix, and differences in list price updating and charge capture in HcN™ vs. CHIP™ all contributed to this increase. The percentage of accounts receivable exceeding 120 days was 58% at year-end, up 10% from FY’10 year end. Billing staff shortages and turnover, as well as increased time spent preparing and submitting claims in HcN™ are likely causes of this increase. DSO increased in FY’11 by 13% to 95 days. With the billing department return to full staffing, and ongoing updates to HcN™ to maximize efficiency, a decrease in both of these metrics is expected in FY’12.

Overall cash collections for FY’11 were up by 25% compared to FY’10, while cash collections relative to gross revenue were 43.3%. Cash collections as a percentage of Net Revenue, lag 90 days was 91.76% for FY’11, also up compared to FY’10, by close to 2%. Relatively, it was an excellent year for cash collections at HomeMed.

Also significant for Billing and Reimbursement in FY’11 was the completion of collecting in and the closing of the CHIP™ system. While this resulted in increased bad debt write-offs this fiscal year – up to 2.77% vs. 1.1% in FY ’10 – our billers and collectors did an impressive job of aggressively pursuing all leftover A/R in CHIP™, and were able to bring the system to a very successful close.

**LEAN Performance Improvement Initiatives**

During the past year, much of the Lean improvement project work has focused on the launch of UMHH C Central Discharge Triage (CDT) which occurred in May 2011. CDT is designed to: achieve operational efficiencies, decrease LOS, strengthen the continuum of care, eliminate redundant processes, and better position UMHH C for anticipated healthcare reforms. CDT staff were hired and trained and the new process pilot is underway focusing, first on Home Infusion referrals. Quality measures are being collected to ensure expected outcomes are achieved and to identify areas of the discharge process for further improvement.

In addition to Central Discharge Triage, continuous improvements were made with other existing LEAN improvement projects. The reception and medical records functional areas for three departments (HomeMed, Michigan Visiting Nurses, Michigan Visiting Care) were consolidated to gain efficiency, eliminate redundant processes, and provide for fortified cross coverage in staffing and scheduling. The HomeMed Pharmaceutical Waste Stream was revised to incorporate efficiency in processing, improvement in patient education, and reduction in cost associated with compliant waste stream management.
Patient Care & Satisfaction
The HCS Departmental Performance Improvement Plan outlines annual goals with established outcome measurement criteria. HCS partners with external organizations to benchmark performance, e.g., Strategic Health Care Programs (SHP), Fazzi. The Scorecard of Selected Performance Measures displays key performance that includes ORYX measures, OASIS measures, institutional driven measures, and HCS selected measures. Highlights of these measures are summarized:

Service
The overall HomeMed, average measure of “willingness to recommend” (96% or 4.8 average mean score) was positive to the institutional benchmark (93%).

The overall HCS patient satisfaction measure was changed for FY’11 to “needs and expectations met” to more closely align with the new UMHHC measure of “care experience”. The average FY’11 mean score for HomeMed (4.8) exceeded the UMHHC institutional goal. HomeMed exceeded the external SHP national benchmark (4.7) as well.

Quality Care
The medication error rate average (2.77 errors/1000 Rx filled) was above last year, believed to be due primarily to increased awareness by staff to report & some continued technical challenges of the computer operating system conversion (See Graph 20). Each error is immediately addressed with appropriate remediation and physician/patient/family communication. The HCS Medication Safety Coordinator completed an extensive analysis of the medication error and adverse drug event data and implemented a number of improvements.

Graph 20

This year a multidisciplinary HomeMed Safety Committee was developed to review medication error data & to involve a broader group of staff in the evaluation of data and implementation of risk reduction activities.

Example improvement activities included:
- Process changes for the pick and shipping of drugs & supplies
- Labeling Alert process
- Expired Drug Alert process
- Changes to the management of product shortages and product recalls
- Staff education regarding specific error prevention, reporting, and new procedures
The blood stream infection rate average Jan-June 2011 was (1.10 infections/1000 therapy days) slightly higher than the FY2010 rate (1.01 infections/1000 therapy days). See Graph 21.

- The Infection Control surveillance software tool (Theradoc) implemented in 4th Qtr. 2010 continues to identify HomeMed reported cases. Overall there is improved data accuracy. As a result, a gradual rate increase has been seen since early 2010.
- A consultation was completed with ICE to review the new CDC recommendations for maintenance of central line catheters. Current care practices met all recommendations.

HCS also tracks employee infections as a part of the Health System’s infection surveillance program. The incidence of reportable infections remains low (3 infections/quarter). We continue to educate staff and supervisors to improve reporting. We experienced a low incidence of flu this year, consistent with an overall reduction in the regional incidence of flu.

Work related injuries at HCS are tracked institutionally via the DART reporting process. The UMHHC has recently established a new target of 1.3. HomeMed was already favorable to this target.

For the Event Tracking reporting system, managers and supervisors met to identify specific information tracking needs from each area. With this information, new categories have been developed along with a more user friendly interface design. Next steps will be to build the improved system, train staff on its use, and develop improved data reports that can be used to drive improvement decisions in the future.

Health Care Compliance

This has been a very active year for the HCS Compliance Program. Focused activities were driven by both new regulations and departmental improvement goals: regulation implementation, staff education, risk assessment, and risk reduction strategies implementation.

- Three unscheduled CMS Supplier Standards verification surveys (7/10, 12/10, 1/11) were conducted on-site and the respective HCS businesses were found to be in full compliance.
- Completed the 2011 HCS Compliance Work Plan, including the annual risk assessment and related action plans.
  - It was incorporated as a part of the UMHS Compliance Work Plan.
  - A review of priority work plan items and highlights of the annual HCS compliance activities were presented to UMHS Compliance Committee, 6/11.
A RAC response plan was developed for HCS:

- Risk assessment completed; membership on the UMHS RAC Comm.; external audit response documents reviewed & updated; staff education re: HCS RAC risk areas completed; key billing processes reviewed & modified as needed.
- Will complete the evaluation of MCCM (FY’12) as a possible future audit tracking tool.

Completed mandatory Part D Fraud & Abuse training for applicable HomeMed staff in 12/10 with the MLearning documentation process streamlined.

Implemented the new Medicare DMEPOS Supplier Standards (9/10-10/10 – staff education, updated patient education packets, documents for Required Binder).

Expanded HCS Compliance Workgroup focus/activities:

- Meeting frequency increased to q30-60 days.
- Collaborated across businesses to complete preparation for PECOS implementation (new referral process, existing AR patients).
- RAC response preparation
- Specific risk mitigation activities

Expanded staff education regarding the HCS Compliance Program.

- Held 1st HCS Compliance & Ethics Week (5/11 educational activities each day, e.g., Compliance Director walk-around, Fact sheet, quizlettes)
- Held Compliance webinars for Leadership/core staff, e.g. Changes to federal Health Care Fraud, Abuse & Compliance Laws

Provided consultation, education, and conducted compliance investigations, as applicable, (e.g., vendor interface, HIPAA, MD self-prescribing, patient/caregiver consent). Where needed, risk reduction activities were implemented.

Continued collaborative relationships with key UMHS departments & interdepartmental committee participation (representing HCS issues, e.g., Revenue Integrity Comm., Revenue Cycle & Education Comm. [new], Compliance Comm. [new], and ARRC).

**Employee Engagement**

Employee engagement was surveyed in March 2011. Of 83 participants, 53.5% expressed a willingness to recommend HomeMed to others as a place of employment. This is decreased compared to the previous survey (March 2010) in which 61% of participants expressed the same willingness to recommend. The HCS average for this indicator in March 2011 was 68% and 70.7% for UMHS.

Summarily, overall employee engagement decreased when compared to prior years. The drivers of employee dissatisfaction included a perceived lack of teamwork, inadequate staffing to workload ratios, fragmented communication with leadership, and other issues related to accountability, recognition and motivation.

An employee engagement action plan designed to address and resolve these issues was prepared.

In response to survey scores noted in FY’10, an employee staffed advisory committee was developed.
in FY’11. This HomeMed Leadership Advisory Committee (HLAC) met consistently throughout the fiscal year; committee actions unfortunately were not influential in improving survey scores in March 2011. Additionally, a central communication board was implemented and sustained throughout FY’11 to provide a mechanism by which employees could be made readily aware of department initiatives and announcements.

The launch of the new business model with inherent staff accountability has been positively received by staff members. In the last two months of FY’11, staff members began to voice satisfaction with workload distribution and task assignments, in addition to the sense of accomplishment that is achieved with completing a day’s work. It is anticipated that the new business model will positively influence the employee engagement scores for the March 2012 survey. Additional actions are currently in progress to promote staff recognition of effort.

**Human Resource Management**

HCS structure is designed with a central Human Resources Director for the entire division. Internally within each service line, the management team oversees and provides human resource management on a daily basis. Service line managers and supervisors are responsible for all personnel functions including hiring and termination, performance evaluations and discipline, work place accommodations, etc.

HomeMed continues to have a very low turnover rate in staff. Turnover rate increased this fiscal when compared with FY’10 (3.7% turnover). In FY ’11, the calculated turnover percentage was 6.6% or 6.9 FTEs out of a base FTE of 105. Of these individuals, three employees retired after many years of service. Overall, HomeMed continues to demonstrate a consistently high employee retention rate.

**Community Benefit Initiatives**

Throughout the year HomeMed provided support for a number of community programs that benefited a myriad of diverse populations.

The bleeding disorders community is a population we continue to support through numerous ways such as donating medical supplies and medical support to Camp Bold Eagle – the summer camp for children afflicted with hemophilia. This year our donation of supplies and medical support was over $6,000.

![Camp Bold Eagle Campers](image)

We also provide support each year to bleeding disorder patients who need assistance with transportation to and from their medical appointments. Funds are used to purchase gas cards as well as for cab and bus fare.
The Hemophilia Foundation of Michigan is chartered to help patients with hemophilia as well as other bleeding disorders. Each year this organization sponsors a number of fundraisers we support.

We proudly continue to provide charity care for many UMHS patients who are unable to pay for the therapies provided by HomeMed. This past year we provided over $90,000 of charity care to our patients. Other philanthropic sponsorships included:

- Trail’s Edge Pediatric Ventilator Camp
- Fall Food Program
- Holiday Family Gifts Charity

**Sales & Marketing**

Throughout the year HomeMed supported numerous activities intended to raise awareness of our services within the patient and referring physician community.

Three events in particular were in support of the UMHS Hemophilia Treatment Center (HTC). The first was the SpringFest weekend held each April in Frankenmuth for children with bleeding disorders and their families. Over 400 people attended this popular event at which we had a display highlighting our services.

Another well attended activity was the annual HTC family picnic. This event was held at a local park and provided an opportunity for patients and families to meet one another and share experiences and knowledge. HomeMed was the main sponsor of this event. Another family oriented event sponsored by HomeMed was the group dinner meeting for parents with children with bleeding disorders. This event allows parents time to discuss their respective child’s medical issues with other parents going through the same experiences.

HomeMed also provided the funding for two HTC members to attend the annual Hemophilia Alliance conference.

This conference was attended by members of many other hemophilia treatment centers located throughout the country. During the event both HomeMed and HTC employees learned about the latest medical and reimbursement issues relating to the bleeding disorder community.

HomeMed continues to provide support to industry colleagues through its sponsorship of annual association conferences. Specifically, HomeMed participated in funding conferences for the Brain
Injury Association of Michigan, the Case Management Society of America Michigan Chapter, and the Michigan Home Health Association.

**Academic & Professional Achievements**

HomeMed continues to contribute to the education of Health Science students. There were 9 student placements at HomeMed (i.e., 5 Pharmacy, 2 Nursing, 2 Dietetics) in FY ’11 and 2 staff members presented one or more lectures in the University of Michigan College of Pharmacy, School of Nursing and School of Public Health. Three pharmacy interns were employed at HomeMed. Additionally, HomeMed clinical staff supported the experiential training of students by supporting rotation components for 12 interns educated through the School of Public Health and UMHHC Pediatric Food and Nutrition Services.

Professional staff made presentations at the local, regional, and national level; participated in scientific research as the primary or secondary investigator; and, authored both locally and nationally distributed publications. Three staff members serve as professional association board of directors (MHHA, NHIA, MSPEN, MPA) and three staff members serve on various national professional association committees. Two pharmacists are board certified in nutrition support; all in-home infusion nurses are certified registered nurses of infusion (CRNI).

In FY ’11, HomeMed hosted a group of international pharmacy professionals consisting of students, pharmacists, and professors through the College of Pharmacy International Exchange Program.
FY ’11 Accomplishments
- Exceeded forecasted target for Gross Revenue ($55,796,476)
- Exceeded forecasted target for Net Revenue ($24,150,508)
- Exceeded forecasted target for Net Margin ($2,802,056; 11.6%)
- Exceeded forecasted target for containing supply expenses to less than 24% of gross revenue (19% supply expense)
- Launch of a new business model with six patient care teams designed to foster patient-to-staff relationships and staff accountability for workload
- Realized a substantial increase in percentage of 340B purchasing for inventory procurement
- Participation in a health system LEAN initiative with the implementation of Central Discharge Triage
- Achieved progress toward an electronic HomeMed medical record with the launch of Intake and Dietitian progress notes in HcN™
- Revision of the HomeMed pharmaceutical waste stream to gain efficiency and minimize costs.
- Integration of HomeMed, MVN, and MVC Medical Records and Reception areas

FY ’12 Goals and Initiatives
- Achieve an annual Gross Revenue target of $58,566,145
- Exceed an annual Net Margin target of $2,858,998
- Realize cash collections of 47% of gross revenue with bad debt write-offs less than 1.5%
- Maintain DSO less than 85 days and total A/R >120 days to less than 30% of total A/R
- Increase patient and family satisfaction with services provided by enhancing customer service through use of an engaged, knowledgeable, and service oriented workforce
- Maintain commitment to the implementation of LEAN process pathways to reduce waste and demonstrate measurable improvement through metric monitoring
- Cultivate a culture of safety throughout operations which affords reduction in medication errors, patient events, equipment malfunctions, and staff injury
- In FY’12 HomeMed looks to continue to prioritize HcN™ data integrity to drive improvements in the accuracy of inventory quantity on hand, metric gathering, valuation reporting, and 340B purchasing.
- Physical warehouse and shipping improvements are planned from participation in a redesign project with the College of Engineering.
- Improve patient care delivery by managing a growing demand for special order or LUM products through a direct-to-patient drop ship program with our wholesalers.
- Reduce inventory spend by $250,000 in FY’12
Acknowledgements

Home Care Services (HCS) departments are acknowledged for their commitment to collaborative and coordinated care for our patients served and for the pursuit of excellence both distinctly and collectively.

- HomeMed
- MedEQUIP
- Michigan Visiting Nurses
- Michigan Visiting Care
- Wheelchair Seating Services

HCS Senior Leadership is recognized for their vision and strategic planning for the future.

- Ken Bandy  HCS Administrator
- Karolyn Brewer  Director: Quality & Compliance
- Stephanie Crane  Director: Finance
- Kim Jacobson  Director: Information Systems
- Chris Maksym  Director: HM, ME, WSS
- Wendy Pratt  Director: Human Resources
- Nancy Rose  Director: Nursing

Most importantly, we recognize and applaud the employees of HomeMed who extend a daily effort to the safe and successful provision of our services.