Curricular Track III—The Expanding Horizon of Global Health and Clinical Pharmacy in the United States and Abroad
Activity No. 0217-0000-11-068-L04-P (Knowledge-Based Activity)

Monday, October 17
Convention Center: Rooms 319 & 320

Moderator: David R. Foster, Pharm.D.
Associate Professor of Pharmacy Practice, Purdue University, Indianapolis, Indiana

Agenda

9:15 a.m.  The Impact of Clinical Pharmacist Roles in Global Health and Opportunities in the United States
Tina Penick Brock, BSPharm., Ed.D.
Professor of Clinical Pharmacy, University of California–San Francisco, San Francisco, California

10:05 a.m.  The Future of Global Health and the Role of the Clinical Pharmacist in the United States and Abroad. Where Are We Going?
Imran Manji, BSPharm
Adjunct Assistant Professor, Purdue University College of Pharmacy, Indianapolis, Indiana; Pharmacist, Primary Healthcare Program, Academic Model Providing Access to Healthcare; Anticoagulation Program Coordinator, Moi Teaching and Referral Hospital (MTRH), Eldoret, Kenya

Faculty Conflict of Interest Disclosures
Tina Penick Brock: no conflicts to disclose.
Imran Manji: no conflicts to disclose.

Learning Objectives

1. Describe how migration and travel to the U.S. has affected opportunities for pharmacists to engage in global health on a local level.
2. Provide several examples of the types of disease states that are likely to be encountered by pharmacists in the U.S. that have a more global face (e.g. TB).
3. Discuss outbreak alert systems available for limiting spread of disease globally.
4. Describe disease state detection and awareness strategies that currently exist in the U.S. and their limitations.
5. Describe the current supply and demand for clinical pharmacists globally.
6. Compare and contrast the role of the clinical pharmacist in global health in the U.S. and abroad.
7. Describe current challenges involving use and access to essential medications to underserved populations.
8. Give an example of how clinical pharmacy access can impact the care of a community in another country.
Self-Assessment Questions

Self-assessment questions are available online at www.accp.com/am
The impact of clinical pharmacist roles in global health and opportunities in the United States

Tina Penick Brock
Professor of Clinical Pharmacy

What effect does global disease have on pharmacy practice in the US?

Tina Penick Brock
Professor of Clinical Pharmacy

Learning objectives

At the conclusion of this session, the participant will be able to:
1. Describe how migration and travel to the US has affected opportunities for pharmacists to engage in global health on a local level
2. Provide several examples of the types of disease states that are likely to be encountered by pharmacists in the US that have a more global face
3. Discuss outbreak alert systems available for limiting spread of disease globally
4. Describe disease state detection and awareness strategies that currently exist in the US and their limitations

Global village

• What happens in the US affects the rest of the world’s community and vice versa.

• There are enormous opportunity costs if we don’t share our knowledge and skills.

Global health refers to health problems that...

- Transcend national borders
  - Infectious and insect-borne diseases
  - Problems of such magnitude that they have global political and economic impact
- Are best addressed by cooperative action
  - Teamwork across countries is essential if viable solutions are to be realized
  - Countries can learn a lot from one another’s experiences: re how disease is spread, treated and controlled

Why is global health important in the US?

1. Humanitarian reasons
2. Equity reasons
3. Indirect reasons
  - Rising incidences of diseases like HIV/AIDS, malaria, and tuberculosis are increasing poverty and political instability in many countries. This can result in political and economic consequences worldwide.
4. Direct reasons
  - In an increasingly connected world, diseases such as SARS, avian flu and drug-resistant TB can move as freely as people and products.
Neglected tropical diseases becoming more prevalent in Europe

- Worm infestations, food parasites, Chagas disease, sand fly-transmitted infections and other neglected tropical diseases usually found in Africa and Asia are turning up more often in Europe.
- The problems appear to be worst in Eastern Europe, Turkey, former Soviet states and the Balkans
  - Weak economies
  - Migratory populations
- Groups found to be particularly vulnerable were Gypsies, African immigrants and children destined for international adoption.

Antibiotic-resistant strains of Salmonella

- S. Kentucky, has spread internationally with almost 500 cases found in France, Denmark, England and Wales in the period between 2002 and 2008
- Earliest infections seemed to have been picked up mainly in Egypt, but since 2006 the infections have also been acquired in various parts of Africa and the Middle East.
- “The absence of reported international travel in approximately 10 percent of the patients suggests that infections may have also occurred in Europe through consumption of contaminated imported foods or through secondary contaminations.”

Tuberculosis

- MDR and XDR TB are spreading at an alarming rate in Europe
  - WHO estimates there are 81,000 cases of drug-resistant TB/year in Europe, although numbers could be much higher as many countries are failing to diagnose it.
    - Eastern Europe has the highest level of infection
    - In Western Europe, London has the highest rate of any capital city.
    - Treatment fails in 23 percent of patients, 26 percent are lost to follow-up, 19 percent die -> only 32 percent are successfully treated.

International Health Regulations (IHR)

- An international legal instrument that is binding in 194 countries across the globe, including all the Member States of WHO.
- Their aim is to help the international community prevent and respond to acute public health risks that have the potential to cross borders and threaten people worldwide.
  - Member States must report to WHO any cases within their borders of specific diseases: smallpox, polio caused by a wild-type poliovirus, human influenza caused by a new subtype, and SARS.
  - In addition, Member States must notify WHO in a timely way of any threat that qualifies as a “Public Health Emergency of International Concern” (PHEIC) - whether infectious, chemical, biological, or radiological.

Global Alert and Response Network (GOARN)

- WHO coordinates and provides admin support
- A technical collaboration of institutions and networks who pool human and technical resources for the rapid identification, confirmation and response to outbreaks of international importance.
- Provides an operational framework to keep the international community constantly alert to the threat of outbreaks and ready to respond.
- Detailed standard operating protocols support Guiding Principles to address the broad spectrum of operational issues and the challenges of coordinated international outbreak response.

Global Disease Detection (GDD/GDDER)

- CDC’s principal program for developing and strengthening global capacity to rapidly detect, accurately identify, and promptly contain emerging infectious disease and bioterrorist threats that occur internationally.
- Central focus is the establishment and expansion of Centers in WHO regions around the world.
  - Currently located in China, Egypt, Guatemala, Kazakhstan, Thailand, Kenya, India, and South Africa.
- Identification and control of emerging infectious diseases, otherwise not available, including:
  - Emerging infectious disease detection and response, training in field epidemiology and laboratory methods, pandemic influenza preparedness and response, zoonotic disease expertise, health communication and information technology, laboratory systems and biosafety
India to use mobile phones to track vaccinations

- In 2010, only 72% of Indian babies received the three doses of DPT vaccine as compared to 95% of Bangladeshi babies and 83% of Indonesian babies.
  - “[Improving vaccination status] is not an easy job” and “the only way India could manage it - and exercise some checks on the system - was by leveraging technology.”
- Good news:
  - Since Jan 2011, the Ministry of Health has been collecting the mobile phone numbers of the 26 million pregnant women in India.
  - Plan is for the government to contact new mothers to confirm their babies’ immunization and verify locally-collected data.
- Not-so-good news:
  - “In front of all of the ministers, I picked up the phone and dialed the first 10 numbers. Only six of them were accurate numbers.”

Anand G., Wall Street Journal, 04 August 2011 (online)

Google Dengue Trends

- http://www.google.org/denguetrends/
- Certain search terms are good indicators of dengue activity. Google Dengue Trends uses aggregated Google search data to estimate current dengue activity around the world in near real-time.
  - Indonesia (blue = projected; orange = actual)

Chan EH, PLoS Neglected Tropical Diseases, May 2011 (online)

Brazil screens Tweets to track dengue outbreaks

- Dengue outbreaks occur every year in Brazil, but exactly where varies every season. It can take weeks for medical notifications to be centrally analyzed, creating a headache for health authorities planning where to concentrate resources.
- Software created to mine tweets for the word “dengue” and information on the user’s location.
  - “My mother is suspected of having dengue,” tweets a woman in Rio de Janeiro. “I think I have dengue. Hopefully I’m wrong!” tweets a man in São Paulo, 350 kilometers away.
- Tests on 2,447 tweets containing “dengue” and a location sent between January and May 2009 showed that ‘personal experience tweets’ were highly correlated with outbreaks identified by the Brazilian Ministry of Health.

Corbyn Z, New Scientist, 18 July 2011 (online)

Counterfeit medicines

- In some parts of Africa, where counterfeits are estimated to account for 70 percent of the market, it is difficult to measure counterfeit-related deaths, although some estimate the number to be in the hundreds of thousands per year, mostly related to malaria and tuberculosis drugs.
  - Could it happen in here?
    - Lipitor®
    - Heparin®

Mexico to the rescue in the US venom belt

- ~ 250 severe scorpion stings/year in US
  - US ran out of its supply of scorpion antivenom nearly a decade ago
  - US PhRMA has little incentive to make antivenom; expensive and there aren’t enough patients to ensure a profit
  - In Mexico, 250,000 people experience scorpion stings/year; some clinics see dozens of cases/eight in summer
- FDA approved a new drug (Anascorp®) made in Mexico (by Instituto Bioclon) for use in the US to treat severe scorpion stings
  - Two additional antivenoms from Instituto Bioclon in US clinical trials
    - black widow spider bites
    - rattlesnake bites

Anascorp approval letter; www.fda.gov

Global village

- What happens in the US affects the rest of the world’s community and vice versa.
- There are enormous opportunity costs if we don’t share our knowledge and skills.
This IS a clinical pharmacy meeting...

The challenge of polio

- Polio persists in 4 countries
  - Afghanistan, India, Nigeria and Pakistan
  - One of the great barriers to vaccination campaigns in these countries has been a persistent rumor that the polio vaccine is a western plot to sterilize Muslim children.
    - "When they come to my house, I will tell them there are no children in this house. If they insist, I will not let them in." (politician in Kano)
    - "I sent my children to their grandparents in another state so that they would be skipped." (farmer in Kano)
  - These psychosocial phenomena have implications globally but also among populations emigrating to or with relatives in the US.


Osama bin Laden & global polio

- The CIA used a fake Hepatitis B vaccination campaign in an attempt to collect DNA from Bin Laden's children.
- Working with a Pakistani doctor, they administered the first dose (of the 3-dose series) in poor neighborhoods as a cover, and then moved on to the area where Bin Laden lived.
  - Posters for the program (featuring a vaccine made by a local manufacturer) were displayed around Abbottabad.
- What might be the consequences of this fake program?


Madelyn Badji

- Born in Michigan to US citizens who work at the US Embassy in Burkina Faso
- At 2 months, family needs to begin antimalarial prophylaxis for the return trip
- Father and 2 year old brother taking atovaquone + proguanil (A + P)
- Mother has been off A + P (in US) since 2 months before birth
- Who can help Maddie?

Keeping Maddie malaria-free

- According the CDC Yellow Book, infants weighing 5 - 8kg can use A + P - ½ pediatric tablet daily (crushed and mixed with “milk”).
  - But Maddie only weighs 9 pounds (and she’s leaving in ~1 week)
- "Atovaquone safety unknown; mefloquine preferred to A/P for infants <5 kg"
  - But mefloquine has a bad rep in the field. Mother may need convincing… and dosage availability is a challenge
  - Chen, et al suggests the risk of permanent neurologic sequelae from mefloquine is very low.
- Result: RPh compounded a supply of mefloquine 5mg (dose is 5mg/kg /week up to 9kg) capsules that can be used (and weight-adjusted) until Maddie grows to 5kg.

Chen LH. JAMA. 2007;297:2251-2263

Related concerns

- Water security
- Food integrity
- Air pollution
- Global R&D funding (NTD)
- Preventative strategies for chronic health concerns
  - Hypertension, diabetes, hypercholesterolemia, cancers
- Human resources for health
Other resources

- e-drugs listserv
  - http://list.healthnet.org/mailman/listinfo/e-drug
- Lancet global health portal
- Kaiser Family Foundation
  - http://globalhealth.kff.org/
- Resistance Map
  - http://www.cddep.org/ResistanceMap/
- Global Alliance for Vaccines & Immunisations
  - http://www.gavialliance.org/

When it comes to global health, there is no ‘them’... only ‘us.’

- Global Health Council

brockt@pharmacy.ucsf.edu
The Future of Global Health and the Role of the Clinical Pharmacist in the U.S. and Abroad. Where are we going?

Imran Manji, BPharm
Pharmacist, AMPATH & Moi Teaching and Referral Hospital
Eldoret, Kenya
Adjunct Assistant Professor
Purdue University College of Pharmacy

Objectives

- Describe the current supply and demand for clinical pharmacists globally.
- Compare and contrast the role of the clinical pharmacist in the U.S. and abroad.
- Describe current challenges involving use and access to essential medications to underserved populations.
- Give an example of how clinical pharmacy access can impact the care of a community in another country.

Global Pharmacy Workforce – a geographical representation

Source: 2009 FIP Global Pharmacy Workforce Report

Global Pharmacy Workforce

- Pharmacy workforce density is associated with economic development
- African countries have both low densities of pharmacists and pharmacies
- As low as 55% of the pharmacy workforce is actively practicing
- Pharmacy technicians comprise up to 75% of the pharmacy workforce in many countries

Pharmacist Employment Distribution

Source: 2009 FIP Global Pharmacy Workforce Report

The Purdue-Kenya Program

Source: 2009 FIP Global Pharmacy Workforce Report
**Development of the Program**

- Academic Model for Prevention and Treatment of HIV/AIDS
- USAID AMPATH Partnership
- Academic Model Providing Access to Healthcare

**USAID-AMPATH Program**
- Initiated in November 2001
- 55 care sites in Western Kenya
- Catchment population ~ 2.5 million
- HIV Prevalence 2-30%
- > 130,000 patients enrolled; 87,000 active patients with 53,000 on HAART
- Focus has now shifted from HIV care to include primary healthcare and chronic disease management

**Purdue Kenya Program Timeline**

- 1989: USAID collaborates with MSM and MTRH to enhance medical education and develop healthcare leaders
- 2001: Purdue faculty visit the practice site in Kenya
- 2002: Provision of pharmacy support begins with rotating volunteer faculty
- 2004: Eight-week advanced pharmacy practice experiences begin
- 2005: Establishing a full-time faculty position based in Kenya
- 2006: Dr. Sarah Fociota begins as a full-time on-site faculty member in Kenya
- 2007: A 2nd full-time Purdue University faculty member begins in Kenya
- 2011: Global Pharmacy Residency begins in Purdue and 2 Kenyans to begin training

**Vision, Mission and Values**

- **Vision:**
  - Innovate, provide, and enhance quality care for all people through teamwork and dedication
- **Mission:**
  - To provide and expand sustainable access to high quality care through:
    - Providing excellent healthcare for individuals and populations
    - Developing passionate leaders in pharmacy
    - Performing research focused on local needs and global solutions
    - Establishing critical healthcare infrastructure and systems

**Values**

<table>
<thead>
<tr>
<th>Patients first</th>
<th>Excellent patient care is the first priority and the focus of all activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investing in future leaders</td>
<td>Develop global health champions in pharmacy through mentoring and training</td>
</tr>
<tr>
<td>Bilateral collaboration</td>
<td>Work together in a collaborative, goal directed, supportive environment of trust, encouragement, and accountability</td>
</tr>
<tr>
<td>Sustainable impact</td>
<td>Establish programs lasting beyond the tenure of any individual and independent of any single funding source</td>
</tr>
<tr>
<td>Sharing best practices</td>
<td>Disseminate knowledge and experience through scholarly activities</td>
</tr>
</tbody>
</table>

**Activities of the Purdue-Kenya Program**

- Pharmacy Team
  - Clinical Care
    - Diabetes
    - Anticoag
    - Medicine
    - Wards
    - Mother Baby
    - Hospital
    - Oncology
    - Psychiatry
  - Management
    - AMPATH Pharmacies
    - Pharmacovigilance
    - Drug Information Center
    - Lilly Drug Donations
  - Access to Medicines
    - CDM
    - PNC
    - HIV/OT
  - Teaching
    - Student Program
    - Residency Program
  - Research
    - All areas
Non-Communicable Disease - Facts

- 36 million people die annually from NCDs
- 63% of all global deaths are due to NCDs
- 90% of premature deaths due to NCDs occur in developing countries
- Four types of NCDs make the largest contribution to mortality in the majority of countries:
  - Cardiovascular disease
  - Diabetes
  - Cancers
  - Chronic respiratory diseases
- UN General Assembly in September on NCDs

Cost of One Month of Daily Treatment for Coronary Heart Disease for the Lowest-Paid Government Worker

AMPATH Chronic Disease Management Program

- FLTR - Find, Link, Treat and Retain all patients
- Village and Home based screening and referral to care
- Chronic disease centres of excellence

Workforce Design

Chronic Disease Management Sites

Innovation Sites

Specialty Referral Centers of Excellence

Turbo

Chulaimbo

396 patients

Mosoriot

Teso

Port Victoria

Kisii

Busia

Webuye

MTRH

396 patients

1350 patients

2011 ACCP Annual Meeting

Curricular Track III—The Expanding Horizon of Global Health and Clinical Pharmacy in the United States and Abroad
1. Written clinician encounter on standardized forms
2. Scanning and entry of encounter form into network server
3. Filing of form within local medical record
4. Generation of summary sheets for subsequent visits and quality reporting

Mobile Electronic Medical Record

Cell Phone Based Diabetes Care

Web-based Network Server
- Connect to any of the satellite clinics where chronic disease care is provided
- Potential for real-time Telemedicine with access to patient data

A. Database identification of high-risk patients with subsequent enrollment into home glucose monitoring program
B. Patients sent home with glucose meter and cell phone access
C. Patients receive weekly phone calls from community workers to facilitate rapid insulin titration
D. Scanning and entry of results from phone call encounters.
E. After entry, glucose summaries are generated for clinicians
F. Clinician review and communication of new insulin dose to patients

Comprehensive Care Pilot in a Resource-Constrained Setting

Preliminary Results from Home Glucose Monitoring Program


Home Glucose Monitoring Program Results

<table>
<thead>
<tr>
<th>Patients with at least 3 months of follow up HbA1c data</th>
<th>101</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active patients</td>
<td>135</td>
</tr>
<tr>
<td>Mean HbA1c at enrollment</td>
<td>13.2</td>
</tr>
<tr>
<td>95%CI (12.8-13.6)</td>
<td></td>
</tr>
<tr>
<td>Mean HbA1c after at least 3 months</td>
<td>10.2</td>
</tr>
<tr>
<td>95%CI (9.7-10.9)*</td>
<td></td>
</tr>
<tr>
<td>Mean HbA1c after at least 6 months</td>
<td>9.8</td>
</tr>
<tr>
<td>95%CI (9.2-10.5)*</td>
<td></td>
</tr>
<tr>
<td>% of patients with an improvement in HbA1c after at least 3 months</td>
<td>95%</td>
</tr>
</tbody>
</table>

*P<0.01 via t-test comparison with Mean HbA1c at enrollment

Preliminary Results from Home Glucose Monitoring Program

Anticoagulation Monitoring

- High incidence of rheumatic heart disease and DVT
- Warfarin requires close INR monitoring
- Pharmacist managed clinic offers point-of-care INR testing
- Protocol based warfarin dose adjustments

- Time intensive work done by pharmacy technicians, e.g. INR testing, filling of pillboxes, filling encounter forms etc.
Preliminary Results of the Anticoagulation Clinic Pilot

<table>
<thead>
<tr>
<th>Anticoagulation Clinic Pilot Evaluation</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Patients Enrolled (since December 2008)</td>
<td>178</td>
</tr>
<tr>
<td>Number of Patient-Years</td>
<td>80.0</td>
</tr>
<tr>
<td>Mean Percent Time in Therapeutic Range (TTR)</td>
<td>64.6%</td>
</tr>
<tr>
<td>Major Bleeding Events, N (%)</td>
<td>1 (0.56)</td>
</tr>
<tr>
<td>Number of Major Bleeding Events per 100 patient-years</td>
<td>1.25</td>
</tr>
<tr>
<td>Embolic Events, N (%)</td>
<td>4 (2.2)</td>
</tr>
<tr>
<td>Rate of Thromboembolic events per year</td>
<td>5%</td>
</tr>
</tbody>
</table>

Comparison with Published Metrics

<table>
<thead>
<tr>
<th>Performance Metric</th>
<th>Published range*</th>
<th>Sample range</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time in Therapeutic Range (TTR)</td>
<td>63.5% (95% CI [61.6-65.6]) (Composite range for community based, anticoagulation specialty clinics, and clinical trial based care)</td>
<td>64.6% (95% CI [57.6-71.6])</td>
<td>P=0.76</td>
</tr>
<tr>
<td>Major bleeding rate per year</td>
<td>2.15% (adjusted composite rate for all indications)</td>
<td>1.25% (95% CI [1.18 - 3.70]) (N=1)</td>
<td>P=0.56</td>
</tr>
<tr>
<td>Rate of thromboembolic events per year</td>
<td>3.2% (adjusted composite rate for the indications)</td>
<td>5% (95%CI [2.24-9.78]) (N=4)</td>
<td>P=0.35</td>
</tr>
</tbody>
</table>

Access to Quality Medicines

- Focus of AMPATH has expanded:
  - HIV and opportunistic infections
  - Primary Healthcare – partnership with govt
  - Chronic disease management
- Up to 70% of essential medicines can be stocked out in public health facilities
- Demand is expected to rise due to home based screening for chronic diseases

How does one sustainably improve access to medicines?

- Provide free drugs through donations? – concern of sustainability
- Refer patients to private community pharmacies? – much more expensive than government facility; questionable quality of medicines
- Charge patients for drugs? – issue of transparency and misappropriation of collections

Community Revolving Fund Pharmacies

1. **One Time Donation From Industry**
   - AMPATH
   - Community Revolving Fund Pharmacy
   - Patients

   - Pharmacists supervise running of CRFPs
   - Ensure transparency and security
   - Procure drugs to restock CRFPs
   - Drugs sold to patients
   - Community involved in management
   - More drugs purchased from AMPATH
   - Run by government staff
   - Ensure sustainability by paying for drugs
   - Waiver system for very poor patients

Student Program

- 8-week clinical experience for Purdue pharmacy students
- 6-month experiential placement site for University of Nairobi pharmacy interns

- Preceptors:
  - Two American faculty – based full time in Kenya
  - Five Kenyan Pharmacists
  - Residents
Inpatient Clinical Rounds
- Moi Teaching and Referral Hospital
- Daily multidisciplinary clinical rounds
- Activities include
  - Product selection
  - Medication dosing
  - Patient monitoring using monitoring sheets
  - Utilization of treatment guidelines
  - Adverse drug reaction prevention and monitoring
  - Patient education

Ambulatory Clinics
- Urban and rural settings
- HIV/AIDS clinics
- Anticoagulation Service
- Cardiology Clinic
- Diabetes Care Clinics
- Oncology Clinic
- Mental Health Clinic

Additional Activities

<table>
<thead>
<tr>
<th>Inpatient Pharmacy</th>
<th>Outpatient Pharmacy</th>
<th>Public Health Activities</th>
<th>Cultural Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical Pharmacy Rounding</td>
<td>Electronic Prescription Entry</td>
<td>Farming</td>
<td>Swahili lessons</td>
</tr>
<tr>
<td>Inpatient Dispensing</td>
<td>CE Lectures</td>
<td>Public Health Topic Discussions</td>
<td>Excursion trips</td>
</tr>
<tr>
<td>Formulary Development</td>
<td>Adherence Counseling</td>
<td>Pediatric day care center</td>
<td></td>
</tr>
<tr>
<td>Case Conferences</td>
<td></td>
<td>Community Mobilization’s HIV prevention</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Outreach efforts for orphaned and vulnerable children</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>HIV education sessions</td>
<td></td>
</tr>
</tbody>
</table>

Role of Preceptors
- Supervise pharmaceutical care in the wards
- Patient case discussions – 3 times/week
- Create a rotation schedule for all activities
- Evaluate students during and after the rotation
- Supervise research projects

Student interventions

<table>
<thead>
<tr>
<th></th>
<th>Americans</th>
<th>Kenyans</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Students</td>
<td>7</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>Total Days</td>
<td>46</td>
<td>73</td>
<td>119</td>
</tr>
<tr>
<td>Total Student-Days</td>
<td>159</td>
<td>292</td>
<td>451</td>
</tr>
<tr>
<td>Total Interventions*</td>
<td>1,604</td>
<td>4,876</td>
<td>6,480</td>
</tr>
<tr>
<td>Total Interventions Per Student-Day*</td>
<td>10.09</td>
<td>16.7</td>
<td>14.37</td>
</tr>
<tr>
<td>Total Interventions-Tx Class Documented*</td>
<td>117</td>
<td>528</td>
<td>645</td>
</tr>
<tr>
<td>Total Time, in minutes*</td>
<td>3,525</td>
<td>10,387</td>
<td>13,912</td>
</tr>
</tbody>
</table>

Interventions per Student-Days: Therapeutic Area

*p<0.05, Wilcoxon Rank Sum Test
Residency Program

- Creation of a first-ever clinical pharmacy residency program in Kenya
- **Vision:** Provide the premiere global health residency program for international pharmacy leaders who will establish sustainable healthcare services
- **Mission:** To educate pharmacy residents in a diverse, collaborative environment resulting in innovative healthcare enhancement and expansion of clinical pharmacy services

Questions??

**Residency Program**

- Clinical:
  - Includes inpatient and outpatient services in communicable and non-communicable diseases
- Management:
  - Clinic pharmacy management, outpatient program management (anticoagulation, diabetes, etc.)
- Teaching:
  - PUCOP and UNSOP experiential learning
- Research:
  - Each resident will have at least one research project (informatics, pharmacovigilance, diabetes, etc.)
- Didactic education:
  - Review of public health cases, focus on research methodology, and preceptor development