

# Research & Reviews: Journal of Hospital and Clinical Pharmacy

## Medication Utilization Pattern Relative to the Most Common Medical Conditions In An Underserved Population In Hinche Haiti - A Global Health Pilot Project

Ombengi David N<sup>1\*</sup>, Babineau Terri W<sup>2</sup>, Stradford Tiffany C<sup>2</sup>, Marquis Naomi<sup>1</sup>, Howell Brittany D<sup>1</sup>

<sup>1</sup>Hampton University School of Pharmacy, Hampton, VA, USA

<sup>2</sup>Eastern Virginia Medical School, Norfolk, VA, USA

### Research Article

Received date: 02/05/2016

Accepted date: 09/05/2016

Published date: 16/05/2016

#### \*For Correspondence

Ombengi David N, Hampton University School of Pharmacy, Hampton, VA, USA.

**E-mail:** david.ombengi@hamptonu.edu

**Keywords:** Medication utilization, Drug formulary, Haiti, Interdisciplinary practice, Primary care setting, Medical conditions.

#### ABSTRACT

**Objectives:** (1) Determine evidenced-based medication utilization pattern relative to the most prevalent medical conditions, (2) Develop a drug formulary based on the disease prevalence in study population (3) Assess the perceptions of the health care team towards interdisciplinary practice in a global primary care setting

**Methods:** A retrospective cohort study of data from 430 patients that were treated during a mission trip to Hinche, Haiti between March 15<sup>th</sup> and 22<sup>nd</sup>, 2014. To be included in the study the patient must have been diagnosed with a disease using the International Classification of Diseases-10 codes, received drug therapy, or referred to a local hospital/clinic. 246 patients met the inclusion criteria. Each patient chart was manually reviewed to obtain demographic information; medical diagnosis and drugs prescribed. A survey was conducted to assess the perceptions of the health team on the mission trip. The data was analyzed using descriptive statistics with Microsoft excel 2010.

**Results:** The average age of the subjects was 20.13 years old of which 53.44 % (n = 129) were females. The leading medical conditions were intestinal parasite infestations (22.86%), Gastroesophageal reflux disease (8.55%), and abrasions secondary to trauma (7.48%). The most commonly utilized drugs were Albendazole (42.40%), Ranitidine (24.26%), and Acetaminophen (15.41%). Ninety-eight percent (n = 39) of the team members completed the survey on their perception of the mission trip. All the respondents stated that the interdisciplinary experience was positive and it will impact their future practice.

**Conclusion:** The most prevalent medical conditions in the Hinche, Haiti patient group were intestinal parasite infestations, gastroesophageal reflux disease, and abrasions secondary to injury. The drug utilization pattern was positively correlated with the most prevalent diseases. This information will be helpful in creating an appropriate drug formulary for the target population. All the respondents stated that the interdisciplinary experience was positive and it will impact their future practice.

### INTRODUCTION

The Haiti HOPES Global Health Pilot Project<sup>[1]</sup> consists of a multidisciplinary health care team of approximately thirty Eastern Virginia Medical School (EVMS) Medical, Public Health, and Art therapy students and six physicians in partnership with 2 Doctor

of Pharmacy faculty and 2-4 Doctor of Pharmacy candidates from Hampton University School of Pharmacy<sup>[2]</sup> who travel annually to Hinche, Haiti to provide comprehensive health care services to indigent residents in the community. The goal of the project is to improve the overall public health of the region through a collaborative effort between the health providers, community leaders and residents of Hinche and beyond<sup>[1-8]</sup>. Based on the World Health Organization data, Haiti is the poorest country in this hemisphere with 80% of the population living on less than \$2.00 per day<sup>[8]</sup>. Additionally, housing is primitive, access to clean water is minimal, and healthcare remains elusive for the vast majority of the population. Our trips to the country started three years ago after the massive earthquake hit Haiti in 2010 when the medical needs of the country grew drastically.

The home base for Haiti HOPES in Hinche is Maison Fortune Orphanage, which is the home to 250 orphans many of whom arrived there after the 2010 earthquake<sup>[1]</sup>. One of the primary goals of our group is to provide primary care for the children living at Maison Fortune on a frequent basis and improve their nutritional status. On this most recent trip, March 15<sup>th</sup> - 22<sup>nd</sup> 2014 we had a team of 40 which consisted of 5 physicians, 1 Doctor of Pharmacy faculty, 30 medical, 2 Doctor of Pharmacy, 1 art therapy, and 4 public health students. We examined 430 patients with acute, chronic and infectious disease of all ages. Care was provided at three locations which included Masion Fortune orphanage, the town of Fort Resolu and Azile a center for Mother Teresa's Home for the needy.

## METHODOLOGY

This is a retrospective cohort study of data that was collected from a sample of 430 patients that were treated by a multidisciplinary team of physicians, clinical pharmacy faculty, and students (medical, public health, art therapy and pharmacy) from Eastern Virginia Medical School and Hampton University School of Pharmacy, during an annual mission trip to Hinche, Haiti between March 15<sup>th</sup> and 22<sup>nd</sup>, 2014. The patients were recruited on a voluntary basis to receive free medical care. During the visit, each patient's treatment data was documented in a medical chart. Prior to the study, an institutional review board approval was obtained. To be included in the study the patient must have been diagnosed with a disease using International Classification of Diseases-10 (ICD-10) codes, received drug therapy and/or was referred to a local hospital/clinic for care. Each medical chart was manually reviewed and data was collected including demographics, medication history, medical conditions diagnosed according to ICD-10 codes, active medications, progress notes, and discharge summary. Of the 430 patients treated, 246 met all the inclusion criteria. The medications utilized by each patient were identified by drug class and product name, and evaluated for indication, effectiveness and safety by using pharmacotherapy references including Lexi-comp online<sup>TM</sup> database, 1978-2014<sup>[3]</sup>, The Eighth Joint National Committee (JNC8) guidelines for Management of hypertension<sup>[4]</sup>, Infectious Disease Society of American (ISDA) treatment guidelines<sup>[5-6]</sup>, and The Washington Manual of Infectious disease subspecialty consult, 2<sup>nd</sup> Edition, 2012<sup>[7]</sup>. The patient data was de-identified and transferred into a Microsoft Excel 2010 database and analyzed using descriptive statistics. An online participation survey of the health team was conducted two weeks after arrival from Haiti HOPES trip to determine the perceptions of faculty and student members of the health care team towards the interdisciplinary practice delivery of care in a global primary care setting<sup>[9,10]</sup>.

## RESULTS

### Demographic data

**Table 1** shows the demographic variables of the study population. Of the 430 patients that were treated at Hinche, Haiti, 246 met the inclusion criteria and were eligible for analysis. The average age of the patients in the study was 20.13 years old with the youngest being two months old and the oldest 79 years old; of which 52.4% (n = 129) were females and 47.6% (n = 117) were males. Notable from the study, the majority of the patients were under 21 years old (63.82% (n = 157) while only 3.6 % (n = 9) of the patients treated were over 60 years old.

**Table 1.** Descriptive demographic information.

Variable	No. of Patients N=246	Distribution (%)
<b>Age (yrs.)</b>		
≤ 20	157	63.82
21-40	53	21.54
41-60	27	10.98
≥ 61	9	3.66
<b>Gender</b>		
Male	117	47.56
Female	129	53.44

### Distribution of the medical conditions

Table 2 shows the distribution of the medical conditions that was encountered among the target population. A total of 538 medical conditions that were experienced by the target patients with an average of 2-3 conditions diagnosed per patient. The study identified 30 different types of medical conditions using ICD-10 Codes. The top six medical conditions that were diagnosed included intestinal parasites/worms infestations (22.86%), Gastroesophageal Reflux Disease (GERD) (8.55%),

abrasions secondary to trauma (7.43%), and quartet of dehydration, malnutrition (4.65%), and musculoskeletal pain with or without knee, elbow or ankle pain secondary to injury (4.46%). Parasitic infestations and musculoskeletal pain were almost double the rates especially in patients 21 years of age and under. This high incidence of parasitic and musculoskeletal pain secondary to trauma medical conditions is expected in those less than 21 years old is similar to the World Health Organization report on disease prevalence in Haiti <sup>[8]</sup>. The types of parasitic infections were not specified in the patient data as differential tests were not performed during the trip **(Table 2)**.

**Table 2.** The distribution of medical conditions experienced by patients.

Disease Identified	ICD-10 Code	No. of patients diagnosed	% of Patients diagnosed N = 246	Distribution of % of conditions diagnosed N = 538
Intestinal parasites, unspecified	B82.9	123	50.00	22.86
GERD	K21.9	46	18.70	8.55
Abrasions	S00.81	40	16.26	7.43
Dehydration	E86.0	25	10.16	4.65
Malnutrition	E46	25	10.16	4.65
Injury pain (knee, leg, ankle)	S80	24	9.76	4.46
Lacerations/Injuries	S01.81604	24	9.76	4.46
Allergic rhinitis/Seasonal Allergies	J30.9	23	9.35	4.28
Tinea capitis	B35.0	22	8.94	4.09
Gastroenteritis	K52.9	20	8.13	3.72
Generalized pain	M79.60	19	7.72	3.53
Musculoskeletal pain	M79.1	19	7.72	3.53
Hypertension	I10	17	6.91	3.16
Lower Back pain	M54.56	15	6.10	2.79
Headache	G44.011	14	5.69	2.60
Cellulitis	L03.90	10	4.07	1.86
Dermatitis	L23	10	4.07	1.86
Eczema/Blisters	L20	10	4.07	1.86
Urinary Tract Infection	N39.0	10	4.07	1.86
Sexually Transmitted Disease	A64.727/757	7	2.85	1.30
Vaginal Candidiasis	B37.3	7	2.85	1.30
Insect bites	S30.860A	5	2.03	0.93
Acute Bronchitis /URI	J20.9	4	1.63	0.74
Asthma	J45.901	4	1.63	0.74
Constipation	K59.00	4	1.63	0.74
Angina/CP	I20.9	3	1.22	0.56
Viral conjunctivitis	B30.9	3	1.22	0.56
Chronic obstructive pulmonary disease	J44.9	2	0.81	0.37
Otitis Media	H66.0	2	0.81	0.37
Pneumonia	J18.9	1	0.41	0.19

### Common medications utilized by the target patients

Table 3 shows the medications that were dispensed to target population after a medical condition was diagnosed. The most commonly selected drugs for treatment were the antiparasitic Albendazole (42.26%), Ranitidine (24.40%), Acetaminophen (15.41%), triple antibiotic (12.24%), Oral rehydration fluids (9.71%). Selection of pharmacotherapeutic agents was based on product availability and evaluation of appropriated medical indication, effectiveness, and safety by using pharmacotherapy references sources and practice guidelines **(Table 3)**.

### Formulary development

Table 4 shows the medical conditions that were diagnosed among the target population, the medications that were

selected to treat the diagnosed medical conditions, the recommended and alternative drug therapy based on the evaluation of the pharmacotherapy reference sources and practice guidelines. Twenty-six (78.79%, N=33) of the recommended drugs were dispensed for the correct diagnosis compared to 4 (12.12%) medication that were not. The remaining 3 (9.09%) drugs were not available for selection even if they were appropriately indicated. The drug dispensed was defined as the drug product that the health care team dispensed to the participants at the time of diagnosis. We defined the recommended drugs as the medications that are recommended as the first-line choice for treatment of the medical condition by the practice guidelines and reference drug information resources such as Lexicomp, Micromedex, and textbooks of pharmacotherapy. Alternative drugs were defined as other medications that can be used to treat the medical condition if the drug of choice is not available or may cause an undesirable event to the patient. Some of the diagnosed medical conditions were not treated because the appropriate drug medications were not available. The diseases that were not treated included constipation, malnutrition, vaginal candidiasis and viral conjunctivitis. Based on the most prevalent medical conditions the recommended and alternative drug formulary list was developed based on the clinical and pharmacotherapy references annotated on **Table 4**.

**Table 3.** Medications dispensed to the target population.

Drug Product Dispensed	No. of patients given N = 246 (%)	Percentage of the Medications (%) N = 441
Albendazole	187 (76.0%)	42.40
Ranitidine	107 (43.5%)	24.26
Acetaminophen	68 (27.6%)	15.41
Triple antibiotic	54 (22.0%)	12.24
Oral rehydration fluid	42 (17.1%)	9.71
Selsun blue	24(9.8%)	5.44
Amlodipine	16 (6.5%)	3.62
Azithromycin	12(4.8%)	2.72
Amoxicillin	10 (4.1%)	2.26
Loratadine	9 (3.7%)	2.04
Aspirin	9 (3.7%)	2.04
Cephalexin	8 (3.3%)	1.81
Ceftriaxone	6 (2.4%)	1.36
Hydrocortisone 1% cr.	6 (2.4%)	1.36
Albuterol HFA	6 (2.4%)	1.36

**Table 4.** Medical conditions, medications dispensed, and Recommended drug therapy.

Medical Condition Diagnosed	Drug Dispensed	Recommended Drugs	Alternative drug(s)	Pharmacotherapy/Clinical Reference
Abrasions	Acetaminophen	Wash wound	Only provide antiseptic or topical antibiotic if signs of infection	Koda-Kimble MA. Young LA Traumatic Skin and Soft Tissue Infections <sup>[11]</sup> .
Acute Bronchitis /URI	Azithromycin	Albuterol, antihistamines, antitussives, mucolytics, NSAIDS	Acetaminophen, Aspirin Antibiotics should only be prescribed if definite bacterial infection	Koda-Kimble MA, Young LY. Respiratory Tract Infections <sup>[12]</sup> .
Allergic rhinitis/Seasonal Allergies	Loratadine	Loratadine, Cetirizine, fexofenadine, fluticasone	Leukotriene receptor antagonists	Wallace DV, et al <sup>[13]</sup>
Angina/Chest Pain	Baby Aspirin 81	Baby Aspirin Referral	Clopidogrel, beta blockers, calcium channel blockers, Nitrates	Koda-Kimble MA, Young LY. Chronic Stable Angina <sup>[14]</sup> .
Asthma	Albuterol HFA	Albuterol HFA, Inhaled Corticosteroids	Anticholinergics, leukotriene modifiers	Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma <sup>[15]</sup> .
Cellulitis	Triple Antibiotic	Cloxacillin Dicloxacillin	Cephalexin	Koda-Kimble MA, Young LY. Traumatic Skin and Soft Tissue Infections <sup>[16]</sup> .
Constipation	-	Bulk forming agents: Psyllium Stool softeners: docusate	Lactulose Polyethylene glycol	Lexicomp. Wolters Kluwer Health, Inc. <sup>[17]</sup> .
Chronic obstructive pulmonary disease (COPD)	Albuterol HFA	GOLD Stage I: Short-acting beta-agonists (albuterol, ipratropium) GOLD Stage 2: Long acting beta agonist (Tiotropium +albuterol or Tiotropium +formoterol or salmeterol) GOLD Stage 3: Tiotropium + formoterol or salmeterol + inhaled corticosteroids	GOLD stage 2: Formoterol or salmeterol + albuterol, ipratropium, or combination	Fromer L, Cooper C. A Review of the GOLD Guidelines for the Diagnosis and Treatment of Patients with COPD <sup>[18]</sup> .

Dehydration	Oral rehydration Fluids	WHO formula (containing sodium (90 mEq/L), potassium (20 mEq/L), bicarbonate 30 (30 mEq/L), chloride (80 mEq/l), 2% glucose.	Zinc supplementation (10-20 mg for 10-14 days)	Koda-Kimble MA, Young LY. Common Pediatric Illnesses <sup>[19]</sup> .
Dermatitis	Barrier Cream	Moisturizing cream, topical steroids	-	Arkwright PD, Motala C, Subramanian et al <sup>[20]</sup> .
Eczema/Blisters	Hydrocortisone 1% Cr.	Topical steroids	-	Koda-Kimble MA, Young LY. Dermatotherapy and Drug-Induced Skin Disorders <sup>[21]</sup> .
Gastroenteritis	Oral hydration fluids	Supportive therapy (treat electrolyte deficiency)		Lexicomp. Wolters Kluwer Health, Inc. <sup>[22]</sup> .
GERD	Ranitidine	H2-Antagonist:Ranitidine Proton pump inhibitors: omeprazole, pantoprazole	Magnesium citrate Magnesium/Aluminum hydroxide	Koda-Kimble MA, Young LY. Upper Gastrointestinal Disorders <sup>[23]</sup> .
Generalized pain	Acetaminophen	NSAIDs, acetaminophen	Opioids	Koda-Kimble MA, Young LY. Pain and its management <sup>[24]</sup> .
Headache	Acetaminophen Aspirin	OTC analgesics Ibuprofen, acetaminophen	Triptan class: sumatriptan, zolmitriptan, naratriptan etc	Koda-Kimble MA, Young LY. Headache <sup>[25]</sup> .
Hypertension	Amlodipine	Thiazide diuretic, CCB, ACEI, ARB	Beta blocker, Aldosterone antagonists	Koda-Kimble MA, Young LY. Essential Hypertension <sup>[26]</sup> .
Injury pain (knee, leg, ankle)	Acetaminophen	Acetaminophen Ibuprofen	Muscle relaxants Opioids	Koda-Kimble MA, Young LY. Pain and its management <sup>[24]</sup> .
Insect bites	Hydrocortisone 1% cream.	Diphenhydramine (topical)	Pramoxine Hydrochloride	AHFS Lexicomp <sup>[27]</sup> .
Intestinal parasites	Albendazole	Albendazole	Mebendazole Pyrantel pamoate	Koda-Kimble MA, Young LY. Parasitic Infections <sup>[28]</sup> .
Lacerations/Injuries	Amoxicillin	Aggressive wound care (irrigation, removal of foreign bodies) Carbapenem (if signs of infection) and anti-MRSA antibiotic like vancomycin or linezolid	Penicillin G with clindamycin if gram stain is positive for gram-positive cocci	Koda-Kimble MA, Young LY. Traumatic Skin and Soft Tissue Infections <sup>[29]</sup> .
Lower Back pain	Acetaminophen	Acetaminophen, Aspirin	Second Line: NSAIDs Third Line: muscle relaxants, opioids, antidepressants, anticonvulsants	Koda-Kimble MA, Young LY. Pain and its management <sup>[29]</sup> .
Malnutrition	-	oral nutrition supplementation	Parenteral supplementation if GI rest or dysfunction	Koda-Kimble MA, Young LY. Basics of Nutrition and Patient Assessment <sup>[30]</sup> .
Musculoskeletal pain	Acetaminophen	NSAIDs, acetaminophen, Opioids	-	Koda-Kimble MA, Young LY. Pain and its management <sup>[31]</sup> .
Otitis Media	Amoxicillin	Amoxicillin	Ceftriaxone IM; Penicillin Allergy: Cefdinir, Cefpodoxime, Cefuroxime, Azithromycin, Clarithromycin	Natal, BL. Pediatric Otitis Media Empiric Therapy <sup>[32]</sup> .
Pneumonia	Azithromycin	Beta-lactams and macrolides (e.g. Azithromycin and ceftriaxone)	fluoroquinolones (e.g. levofloxacin)	Koda-Kimble MA, Young LY. Geriatric Drug Use <sup>[33]</sup> .
Preeclampsia	Methyldopa	Methyldopa	labetalol or calcium channel blockers	Koda-Kimble MA, Young LY. Obstetric Drug Therapy <sup>[34]</sup> .
Sexually Transmitted Disease	Azithromycin, Ceftriaxone	Azithromycin, Ceftriaxone Doxycycline	Cefixime, Erythromycin, Levofloxacin, Ofloxacin	Center for Disease Control and Prevention: Sexually Transmitted Diseases Treatment Guidelines <sup>[35]</sup> .
Tinea capitis	Selsun blue	Griseofulvin, Terbinafine	Itraconazole, Ketoconazole, Selenium Sulfide	Gold Standard, Inc. Drugs indicated for tinea capitis <sup>[36]</sup> .
Urinary Tract Infection	Amoxicillin, cephalixin	Bactrim, Ampicillin, Amoxicillin, 1st generation cephalosporin		Koda-Kimble MA, Young LY. Urinary Tract Infections <sup>[37]</sup> . Pappas P, et al. Clinical Practice Guideline for the Management of Candidiasis

Vaginal Candidiasis	-	Fluconazole	For <i>C. glabrata</i> vulvovaginitis unresponsive to oral azoles, Topical intravaginal boric acid	Pappas P, et al. Clinical Practice Guideline for the Management of Candidiasis
Viral conjunctivitis	-	Symptomatic relief- cold compress or artificial tears		Scott, IU. Viral Conjunctivitis Treatment and Management <sup>[38]</sup> .

### Haiti hopes feedback survey 2014

Thirty-nine (97.50%) of the health care team members consisting of faculty and students completed the post-trip online survey [41] on their perception of the trip and role of interdisciplinary practice in the delivery of care in a global primary care setting. Without exception, all the responded stated that they had a positive experience using the interdisciplinary practice to deliver care during the mission trip. Thirty-six (92.30%) of the respondents stated that trip had an impact on how they would practice in the future. The majority of the participants (82.05%) recommended increasing the number of supervising clinicians and making a drug formulary with recommended and alternative medications available for planning purposed and use by the medical team in future trips to Haiti.

## DISCUSSION

The analysis of the data obtained from the chart review met its stated primary objective of identifying the evidence-based medication utilization pattern relative to the most prevalent disease conditions, as demonstrated by the positive correlation of the rate of utilization of medications by indication and the most prevalent medical conditions diagnosed in the study population. With regard to the medication utilization pattern, the antiparasitic drug albendazole had the highest utilization rate (42.44%) for the treatment of intestinal parasite infestation which was also the most prevalent disease condition (22.86%) diagnosed in the population. This was followed by ranitidine for the treatment of GERD, acetaminophen for the treatment of musculoskeletal pain with or without injury, triple antibiotic for the treatment of skin abrasions, and oral rehydration fluids for treating dehydration. The triple antibiotic cream utilization rate was lower than acetaminophen even though skins abrasions were more prevalent than musculoskeletal pain because of a limited supply of the cream at the time of the treatments. The patients were not provided any proton pump inhibitors (PPIs) as recommended by practice guidelines for treatment of GERD due to cost and limited local supply. The medical team did not provide any dietary or nutritional supplements to the patients that were diagnosed with malnutrition as the supplements were not part of the formulary. The patients were, however, given health education on the importance of eating a balanced healthy diet and referred to the local health centers for follow-up. Drug therapy was selected based on current practice guidelines evidence on indication, effectiveness and safety of the intervention. Because of the limited supply of medications a pharmacotherapy consultant was conducted and documented for every patient to determine the most effective and safest possible drug among the medications that were available to the team <sup>[11-20]</sup>.

The medical team used ICD-10 codes for documenting the diagnosis to ensure correct identification, treatment, and monitoring of the diseases. Thirty medical conditions were diagnosed. The disease prevalence in Hinche from the study showed an almost similar disease pattern reported by the World Health Organization (WHO) in the country of Haiti adjusted for age. The WHO reports communicable disease, maternal, perinatal, nutritional conditions combined (53%) as the leading cause of death followed by cardiovascular diseases (20%) and other non-communicable diseases without cause-specific mortality (10%), injuries are reported as 5% in comparison to 7.48% in this study.

The secondary objective of the study was addressed by a post-trip feedback survey that demonstrated a positive experience of all the participants on the perception of an interdisciplinary approach to delivering global primary health care. There was a 97.5% response rate on the online survey to determine the perception, concerns and satisfaction level of the team member of using an interdisciplinary approach in providing the health care services the patients. A very high number (92%) of the respondents said that they were extremely satisfied and to have students and faculty from other disciplines working as a medical team. All the respondents reported a preference to participate in an interdisciplinary team in their future practice. Availability of the collective expertise of the team members and timely consultation in clinical decision making for student learning and provision of care were may be the contributing factors for the reported positive experience during the mission trip.

There were, however, several limitations despite the positive feedback, one of which was the limited supply of medications that resulted in fewer patients being treated and selection of alternatives rather than the most effective drugs for treating the conditions that were diagnosed. Secondly, since every patient had to be seen by a physician with the students there weren't enough clinicians to supervise the treatment teams and instruct the students resulting in longer waiting periods and fewer patients receiving treatment Third, whereas some of the patients received diagnosis through history and physical examination, relevant laboratory tests to confirm or rule out some of the conditions were not done due to cost and may have underestimated or overestimated the disease burden <sup>[21-27]</sup>.

## CONCLUSION

The study identified the evidence-based medication utilization pattern in relation to the medical indication and the leading

medical conditions in an underserved population in Hinche, Haiti. The most prevalent medical condition in the Hinche community in Haiti and the surrounding areas was intestinal parasite infestation which was followed by GERD, abrasions secondary to injury, dehydration, malnutrition and musculoskeletal pain or pain to the extremities secondary to trauma especially in patients 21 years and younger in age. The drug utilization pattern was positively correlated with the most prevalent indications in part due to the interdisciplinary approach of care and the timely pharmacotherapy consult that was available to the medical team. The study findings can help primary care providers to focus on the most prevalent medical conditions and utilize evidence-based formulary to optimize drug therapy and improve the health outcomes of the underserved populations. A post-trip survey conducted by the researchers on the team consisting of physicians, clinical pharmacists, and medical, public health, art therapy and pharmacy students demonstrated a positive perception on the utility of an interdisciplinary approach in student clinical skills training and providing primary care. We believe that the service learning trips make a tremendous difference in clinician training, quality of delivery of care and reduction of disparity of the underserved in Haiti [26-38].

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