Project: Use of Point-of-care testing for health screening by students participating in a medical mission in rural, underserved, and impoverished regions of Guatemala

**Background:**

By recruiting an all-volunteer medical team (dentists, doctors, nurses, and surgeons) the nonprofit organization Hearts in Motion (HIM) provides basic dental and medical care to rural, underserved, and impoverished regions of Guatemala. Several of the medical volunteers are WSU graduates, and helped to establish a collaborative program between HIM and the College of Arts and Sciences (CAS). As a result, the CAS offers students one of the most professionally enriching opportunities - the ability to work side-by-side with doctors and dentists to assist in the delivery of medical care. Of the more than 60 applicants, only 25 of the most qualified are admitted into this highly competitive program. During spring break, Drs Rodriguez-Vivaldi and Beerman travel to Guatemala with the students and oversee the 2 most important components of this program: improved language/cultural proficiency and exposure to medical care in a resource-limited environment.

The 10-day medical mission includes a team of dentists that work tirelessly extracting decayed teeth under the most extraordinary conditions. Students assist the dentists by serving as translators, holding flashlights, sterilizing instruments, and by providing comfort and care to patients. Similarly, the medical team addresses basic health issues with limited resources and medical supplies. There is also a surgical team that repairs cleft palates and performs other types of corrective surgeries, often sparing children a lifetime of disfigurement and isolation. Students are able to observe surgeries and those most proficient in Spanish serve as medical translators (taking medical histories, explaining pre- and post-surgery instructions, etc.). Students return from this medical mission with a greater awareness of global issues and a renewed commitment to the importance of service and compassionate care. Medical missions not only provide students with experiential learning opportunities that promote health wellness and disease prevention, but also help them to learn about health disparities. By serving multicultural, underserved populations, students gain a greater global perspective, solidifying their commitment to pursue medical-related careers.

**Project Overview:**

Remote area medical care is challenging, especially when limited resources and harsh conditions determine the extent of assistance that can be provided. The vast majority of people seeking medical attention have undiagnosed health issues that, with the right equipment, could easily be diagnosed and managed. Point-of-care testing (POCT) is the use of miniaturized devices for medical testing at the site of patient care to provide rapid and accurate evaluations. These battery-operated instruments are easy to use, require minimal training, are not invasive (blood sample volume < 10 μL obtained by Accu-Chek Safe-T-Pro disposable lancets with automatic retraction after use), and provide reliable measures. POCT has dramatically changed health assessment, especially in hard to reach populations that have limited access to medical facilities. POCT technologies can be effectively and affordably implemented, and can overcome many of the barriers that impede the delivery of healthcare in resource-limited environments. Of upmost importance, POCT enables practitioners to make medical decisions based on instrumentation rather than by inference. The use of low-cost diagnostic tools not only eases the burden of diseases in the populations we serve, but also enables students to gain valuable hands-on experience during their 10-day medical mission. We also recognize that putting knowledge into practice requires cultural competence and language proficiency. Even with valid testing measures, limited access to follow-up medical care and associated costs presents other important logistical barriers that must be addressed – inexpensive, culturally appropriate solutions.

The project goals are as follows:

1. Use of POCT during our 10-day medical mission in populations living in rural, underserved, and impoverished regions of Guatemala to assess iron deficiency anemia (hemoglobin g/dL).  
 2. Deliver treatment of impaired iron status in Spanish, and in a culturally-sensitive manner.  
 3. Assist community members by providing culturally appropriate, low-cost solutions to prevent and/or manage a serious health issue – iron deficiency anemia.  
 4. Create a training/treatment plan (model) that can be disseminated to similar non-profit organizations involved in providing health care (in Guatemala or similar countries).

**Description of Proposed Activity:**

A. Iron Deficiency Anemia and Lucky Iron Fish™

Iron deficiency anemia is one of the most common, yet treatable, nutrition-related health problems in developing countries. The consequences of impaired iron status are of particular concern during pregnancy, as well as for women of childbearing years, infants, and children. Yet, one reason that iron deficiency anemia is so pervasive is that it is often difficult to gain access to secluded population groups. Equally challenging is a lack of screening instruments that can accurately and rapidly measure iron status in remote settings.

As a pilot program implemented the March 2015 medical mission, students were trained to by a liscensed phlebotomus to use a POCT (battery-operated micro-centrifuge) to assess iron status. During the medical mission itself, and under the supervision of Dr. Beerman and health-care providers volunteering for the HIM program, small samples of blood (5 μL) were analyzed to measure packed red blood cell volume (hematocrit) of more than 500 women and children in various rural villages around the Zacapa region of Guatemala. Not surprisingly, approximately one-third of those tested had low hematocrits (< 35%); many of which were children and pregnant women. Although hematocrit is a useful indicator of impaired iron status, as a single measure alone, it is not definitive. Therefore, to distinguish true levels of impaired iron status (iron-deficiency anemia) it is important to measure other physiologic parameters such as hemoglobin (g/dL).

HemoCue Hb 301 System provides a quick and accurate point-of-care method to measure hemoglobin. For the 2016 medical mission, we propose to expand the POCT project by providing an additional test to assess iron status. As in the pilot program, CDC guidelines for collecting and safe handling of blood will be presented in class (BIOL 491/ForL 495) by a trained phlebotomist. During the mission, and wearing protective gloves, students will use Accu-Chek Safe-T-Pro disposable lancets that automatically retract after use to obtain a 10 μL blood sample. Normal hemoglobin values vary by age and gender. Hemoglobin concentrations < 11 g/dL for pregnant women and 12 g/dL for non-pregnant women are considered low. The reference range for hemoglobin concentration in children between the ages of 6 to 12 (y) is 11.5 to 13.5 g/dL. Thus, our first objective is to utilize point-of-care testing to better assess the prevalence of impaired iron status in these rural, impoverished areas of Guatemala by measuring hemoglobin in addition to iron assessment by hematocrit.

Our second objective is to provide solutions that are culturally appropriate and can be realistically implemented. Iron supplementation is typically recommended to improve iron status of those with iron deficiency anemia. However, this is not a realistic, long-term solution in populations where both access and cost are significant barriers. A new innovation, Lucky Iron Fish™, has the potential to provide an entire family with up to 75% of their daily iron intake for up to 5 years. This easy, inexpensive, and effective alternative to iron supplementation involves iron-enrichment of the cooking water that is used to prepare the family meal. As the ingredients absorb the iron-rich water, the overall iron content of the meal is enhanced. Thus, our second objective is to distribute Lucky Iron Fish™ to families that are at greatest risk of iron deficiency anemia – those with young mothers and children. Prior to the trip, students will receive teaching modules (in Spanish) to learn best practices regarding how to implement nutrition education guidelines with respect to iron deficiency anemia and the use of Lucky Iron Fish to improve iron status. Students will participate in mock interviews and counseling sessions prior to the trip to improve their Spanish proficiency and cultural insights.

Budget:

HemoCue Hb 301 Analyzer for measuring hemoglobin – $1800.

HemoCue Hb 301 Microcuvettes (4 boxes; 200/box) – $600.

Accu-Chek Safe-T-Pro disposable lancets (2 boxes) – $110.  
GoWise digital scale for measuring weight – $50.  
Mechanical Height Rod Stadiometer for measuring stature – $93.

The HemataStatII for measuring hematocrit – $300.

Lucky Iron Fish (25/fish) – $2000.

Total = $4,953

Description of outcomes expected including any scholarly or creative products

* This project will help further the understanding of a key health issue in rural areas of Guatemala as a microcosm of other, similar underdeveloped countries with a similar diet/ nutritional context.
* A team of trained students under the direct supervision of Drs. Beerman, Rodríguez-Vivaldi, two HIM volunteers (certified health practitioners), and one HIM on-site staff member will participate in the collection of blood samples, the gathering of contact and health data, and the training of patients on the proper use of Lucky Iron Fish.
* Students will be exposed to a hands-on experiential learning activity that will improve their medical expertise and global awareness as well as strengthen their application to medical school.
* Data gathered by the team of students and supervisors will be provided to the HIM organization for follow up on the patients served during the mission. By being made aware of specific needs, HIM on-site heath care staff can provide additional assistance or information as required and, thanks to a planned purchase of a medical facility in Zacapa, HIM will have the capability of providing further care, including transportation, room, and board, if necessary.
* Scholarly products: A description of the project, data collected, culturally-appropriate patient-training modules, and follow-up initiatives will be used to create a testing/ treatment plan that will be made accessible through the HIM network to similar non-profit organizations involved in health-care.