

PARASITOLOGY RESULTS FROM A MEDCAP IN AFRICA

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ABSTRACT

The Medical Civil Action Program (MEDCAP) is an important tool that is utilized to support the larger missions in all areas of current operations. In Ethiopia, MEDCAPs are one of many tools commanders use to earn the trust and confidence of the local population. There are many ways to implement a MEDCAP and this paper will highlight one such successful engagement. This mission was intended to increase the medical capacity of host nation (HN) medical personnel and increase HN confidence in their government to provide for essential services. The mission was broken into four phases similar to traditional MEDCAPs, but with a significant difference.

INTRODUCTION

Earning trust and confidence utilizing MEDCAPs in Ethiopia has been essential in supporting the mission of the Combined Joint Task Force-Horn of Africa (CJTF-HOA). Creating an appropriate MEDCAP that avoids the pitfalls of previous missions is harder than it may seem initially. Many articles exist about accomplishing sustainable and appropriate medical missions. Despite these resources, the reality is that many MEDCAPs become one-shot events once directed by the commander. MEDCAP personnel are well-intentioned, yet long-term outcomes are not considered, which begs the question: did the intervention make a difference? In Ethiopia, MEDCAPs are conducted by Civil Affairs (CA) teams augmented by a Medical Functional Special Team (FxSP) from Camp Lemonnier, Djibouti. This paper will highlight a successful medical engagement along with some reported laboratory findings of significance for personnel operating in Eastern Ethiopia.

BACKGROUND

Mission planning for all medical projects undergo rigorous planning cycles via CJTF-HOA. Missions are often planned months to years prior to execution. Each mission is carefully vetted by multiple agencies, including United States (U.S.) Africa Command (AFRICOM), the U.S. Embassy of the specific country, and the U.S. Agency for International Development (USAID). Once approved, funds are allocated, and each mission is then conducted after extensive coordination within CJTF-HOA. The lead for the medical portion of the mission falls upon the technical expert, usually a medical provider, either a physician, nurse practitioner (NP), or physician's assistant (PA). The CA team executes the tactical portion of the mission.

The Shinile Zone, is a semi-arid desert in eastern Ethiopia. It is a vast region with many remote and small villages. Non-existent roads and narrow dirt paths connect these villages. Shinile borders Somalia, Djibouti, and Eritrea. Few villages have electricity; those that do only have limited connectivity. Most villages have healthcare providers, yet their access to medical supplies is lacking. The most common healthcare providers are health extension workers (HEWs). An HEW is similar to a U.S. certified nursing assistant with more emphasis on health promotion. Shinile is an important passage point for nomads and other people travelling in the area, yet Shinile is remote and medically underserved. Review of the literature reveals inaccurate and scant data from the United States Government (USG) and Ethiopian Ministry of Health regarding diseases prevalent in the area.

U.S. personnel were to train and support Ethiopian nursing students from a local nursing school. The school selected students who spoke English and most importantly, Somali, the local dialect. The students received hands-on nursing and medical training from U.S. personnel, and received instruction on medical aspects of the mission.

The Shinile Health Bureau engaged in the process and was responsible for notifying the villages of upcoming medical activities. The health bureau also provided a representative to work with the team in each village. A local police officer escorted the team and was present to provide crowd control if necessary. We asked the Shinile Health Bureau for villages with the most pressing medical needs and for population estimates, including ages of children, in each village. Resources provided funding and time for ten villages.

PHASES

This mission was compartmentalized into four phases similar to traditional MEDCAPs, but with a significant difference:

Phase 1 involved coordination among the various agencies (HN and USG) to synchronize efforts. The most important planning aspect was to ensure the local health bureau and Ethiopian nursing school were aware of the exact dates for Phase 2. Civil Affairs ascertained travel times and distances to each village, as was necessary for their specific mission. The primary task in Phase 2 was to travel to each of the ten villages to collect stool and urine specimens from samples of children.

An Army parasitologist from U.S. Army Medical Research Unit-Kenya (USAMRU-K) came in for temporary duty. He analyzed stool and urine specimens while evaluating local laboratory capabilities in the nearest major city within the Shinile Zone. Additionally, we planned to partner with a local hospital that had capabilities and personnel to assist the parasitologist. Local, regional, and national health bureaus would benefit from sharing the results of parasitologist's analysis. Medication purchases for the follow-on phase were based on laboratory analysis from Phase 2 thereby allowing targeted treatment of active infections. One of the primary goals of this project was to identify and treat based on actual laboratory findings.

Phase 3 involved treatment. Villages with treatable infections would receive mass medication administration for all children. Villages without treatable infections received information about results and follow-up visits. Phase 4 repeated Phase 1. Again, the results sharing included all the appropriate local and U.S. agencies.

Without a doubt, Phase 2 was essential to mission success. The follow-on phases were all contingent on Phase 2 findings. Phase 2 also turned out to be the most challenging phase. Time constraints from higher echelons required the mission to be conducted during the rainy season. Ethiopian law also required contracted use of local drivers and vehicles. The plan consisted of travel to two to three villages over three days with a one day break and repeated until complete. This allowed for adequate time at each site to establish a baseline level of trust with the village elder, and ideally to collect urine and stool specimens from a pre-set number of children.

Originally, the plan was to travel to the ten villages identified by the Shinile Health Bureau. Due to inclement weather, one village was impossible to reach, despite multiple attempts. Specimens were collected from nine villages. In addition to specimen collection, the team (HN nurses and FxSP) provided preventive medicine assessment and health education to as many villagers as possible.

Due to prolonged travel times and distances, this phase required camping out in the respective villages. A challenge for Phase 2 was to keep the urine specimens cool for return travel back to town. The stool specimens were placed in 10% formalin which did not require special handling. Upon our return, the specimens were delivered to the parasitologist to initiate analyses. It was a challenge to communicate to each village about collection, as villagers frequently requested immediate care from medical *ferengi's* (foreigners). The FxSP planned for these patients of opportunity by obtaining local medications used to treat common illnesses. The nursing students were instructed how to obtain a health history and conducting a problem-focused physical exam.

Discussions of differential diagnoses were followed by the most appropriate assessment and plan. The local nursing students became the "face" of the mission. U.S. military personnel were in the background throughout the mission. Patients who presented with common, treatable illnesses during the mission were afforded treatment if medications were available. During all phases, we told parents that the purpose of our visit was limited and that we help if we could. The resources available did not allow purchase of other medications. Many of the common medications used during this mission leftovers from previous missions, and were purchased at local pharmacies by the FxSP team using personal funds. In Ethiopia, one can purchase almost all medications over the counter at a local pharmacy.

Phase 3 (treatment) turned out to be the easiest phase of the entire mission. The Shinile Health Bureau provided pediatric population estimates and medications were purchased accordingly. Obtaining correct amount and types of medications required was a bit of a challenge due to HN laws regarding purchase and transport of medications. Discussing those challenges is outside the scope of this article. Once obtained, we separated medications by targeted village, with appropriate dosing levels based on ages expected. Since we treated all children ages two to eighteen, a central location in each village was designated for mass treatment.

Most villages had a hard structure health office with a surrounding fence, which provided an ideal location for medication administration and crowd control. Children processed through with a parent, usually their mother, and would transit through several stations.

Station 1 was height and weight, a required measurement for receiving praziquantel. A child's age was confirmed if it was in question. Station 2 was medication information, including common side effects and local remedies in layman's terms. Station 3 was medication administration, utilizing direct observation therapy. Station 4 marked each patient and provided a small (food, gift?) "treat." Children not treated because of age still received a treat and were marked, but were not counted in the treatment totals. We counted all children who received treatment.

The mission originally planned to be a "low-cost" event not exceeding \$10,000 U.S. dollars. After further research on the cost of medications in Ethiopia, we determined more funds were needed. Albendazole is very inexpensive, virtually pennies per dose. Praziquantel, however, is expensive at around \$2.00 per dose. We allocated additional funds to offset the price of medications, which had to be purchased in Ethiopia, but were limited to an additional \$15,000, for a total cost of \$25,000.

Water treatment and purification was not built into the original plan. Facilities were not available to test water samples from the respective villages in Shinile. We decided not to treat the common infections, such as *Giardia lamblia* and *Entamoeba histolytica/dispar* since reinfection was assured shortly after treatment. Also, additional monies beyond \$25,000 weren't available to augment the treatment plan. We provided information to the villagers regarding infection control measures that could decrease transmission of all organisms identified.

Villages we identified as having helminth infections (roundworms, tapeworms, and hookworms) received albendazole. The dose for all children was 400mg orally x 1 dose.¹ Villages endemic with *Schistosoma mansoni* received praziquantel; 20mg/kg X BID x 1 dose was given for treatment of those children.² The following guideline was used to determine of praziquantel dosage:

10-20kg: ½ tablet BID
21-40kg: 1 tablet BID
>40kg: 1 tablet BID

RECOMMENDATIONS

We considered continuity of personnel between missions an important aspect of execution. However, personnel changes are almost inevitable. The mission commander remained the same as well as the Ethiopian Civil Affairs Team. The nursing school schedule prevented the exact same students rotating, so a few substitutions were made by their faculty for all phases. The same parasitologist was involved in Phase 4, but worked from Camp Lemonnier, Djibouti due to the timing of the actual phase and US-AMRU-K mission scheduling. The "technical" lead for the mission had to redeploy, but was afforded left seat/right seat time with his replacement.

The Phase 4 playbook was a repeat of Phase 2. Several personnel changes were made but did not impact the overall mission. The villages were prepared and expected a return trip from the team. Since the completion of Phase 2 was relatively quick, we planned Phase 4 accordingly. We visited one to two villages a day and collected stool samples from a cohort of children. Our team hoped to collect specimens from the same children. After collecting all samples, the samples were transported to Camp Lemonnier for analysis.

The following is a brief discussion regarding Phase 2 & 4 results:

1. Introduction/Methodology

- a. 91 stool and 17 urine samples were collected from 9 villages from children of various ages in Phase 2. In Phase 4, 60 stool samples were collected from 9 Conferences villages from children of various ages.
- b. Briefly, stool was collected in 10% formalin. Wet preps were prepared by diluting a small portion of the stool in a drop of 85% saline and mixing on a microscope slide. A coverslip was placed on the sample and analyzed using a phase-contrast microscope. In Phases 2 and 4, analysis of samples took place at the ARTS Hospital located in Dire Dawa, Ethiopia and at the Camp Lemonnier microbiology laboratory respectively. In Phase 2, urine samples were briefly centrifuged, sediment was collected, and analyzed by microscopy at the same location mentioned above.

2. Results/Discussion

- a. In Phase 4, *G. lamblia* (36/60; 60%) and *E. histolytica/dispar* (22/60; 37%) had the highest incidences. Both of these protozoans are transmitted through contaminated water via feces due to inadequate sanitation. Both have a number of animal reservoirs in the wild.^{3,4} Additionally, the number of patients with co-infections of both of these pathogens was 11/60. In Phase 2, the number of cases of *G. lamblia* and *E. histolytica/dispar* were 45/91 (49%) and 35/91 (38%).
- b. *Hymenolepis nana* (1/60), a tapeworm, can be acquired through ingestion of infected beetles which serve as the intermediate host. Rodents serve as reservoirs and the infection is very common in children.⁵ In Phase 2, the number of cases of *H. nana* was 11/91 (12%). This decrease may be due to treatment or fewer samples being collected and examined.
- c. There were no cases of *Schistosoma mansoni* in Phase 4 as opposed to Phase 2 in which five cases of *S. mansoni* (5/91; 5.5%) were detected. Again, this decrease could be due to treatment or fewer samples analyzed. For an accurate representation of the incidence of schistosomiasis, stool samples would have to be gathered over three to four consecutive days to get an accurate level of infectivity. Females produce only 300 to 400 eggs per day and only 25 to 50% are excreted in the feces.⁶ Therefore, the number of cases of schistosomiasis could be possibly underestimated due to collection of only one stool sample.
- d. There was one case of hookworm (*Ancylostoma duodenale* or *Necator americanus*) in Phase 4. Species of hookworm cannot be determined via egg diagnosis by microscopy.⁷ In Phase 2, there were four cases (4/91). Again, this decrease could be due to treatment or fewer samples analyzed.

- e. There were several cases of *Entamoeba coli* which are considered to be non-pathogenic.⁸
- f. There was one case of *Strongyloides stercoralis*. *S. stercoralis* is a parasitic roundworm that can infect humans via penetration of human skin by larvae when in contact with contaminated soil. This parasite is cosmopolitan in distribution and is prevalent in countries with poor sanitation.⁹
- g. Discussions with local laboratory microbiologists and analysis of laboratory records in Phase 2 revealed that *G. lamblia* and *E. histolytica/dispar* are the most prevalent parasites that patients harbor in the local and surrounding areas.

Note: All urine samples were negative for *Schistosoma haematobium* in phase 2 so no urine was collected in Phase 4.

3. Recommendations/Conclusions

- a. In Phase 2, we recommended treatment for *G. lamblia* and *E. histolytica/dispar*. However, due to the high incidence of both and the lack of clean water and proper sanitation, it is highly likely re-infection with both would occur very soon after treatment which is evident in those that were tested in Phase 2 and 4.
- b. Conversely, we could have accomplished treatment and community education on proper sanitary and water purification techniques in select villages where incidence was highest. However, this could be costly both in terms of finance and time. For long-term effects, this would be the appropriate course.
- c. We conducted treatment for helminth infections was conducted in Phase 3 and there was a steep decline in the number of helminth infections detected in Phase 4. There were no cases of schistosomiasis and only one case of hookworm.

We as a team never intended to write about this project during its execution. We assumed lessons learned would be disseminated among those needing to know. Interestingly, a Special Forces (SF) medical provider working in Africa thought this would be a good case history from which many could learn. Although interesting, this project, was by no means perfect. Many challenges we faced required fairly quick decision-making to ensure the project was completed. For instance, the medical team was on a very short timeline to execute the mission since fiscal year funds were expiring and medication costs had increased. Limited money, limited time, and 10,000 children to treat was a serious dilemma. In the end, we decided to treat what we deemed to be the more serious infections with greater probability of long-term success. The numerous other challenges are definitely outside the scope of this article.

Despite these challenges, there were a number of successes. The team involved, especially the FxSP, provided CJTF-HOA many recommendations for improving health outcomes in Shinile while simultaneously achieving CJTF-HOA objectives. We fostered positive relationships between the U.S. Military and HN

personnel involved. Also, we felt that trust was developed with treating the villagers. The Ethiopian nursing students received education and training that they can share and impart with their peers. Most importantly, the population within Shinile might be a little better than it was before.

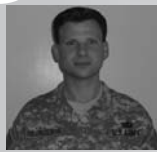
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