

**A Lay Training Program in Basic Emergency Care and  
Danger Sign Recognition in Rukungiri District, Uganda:  
Recommendations for Global Emergency Care Collaborative's  
Prehospital Emergency Resources Project**

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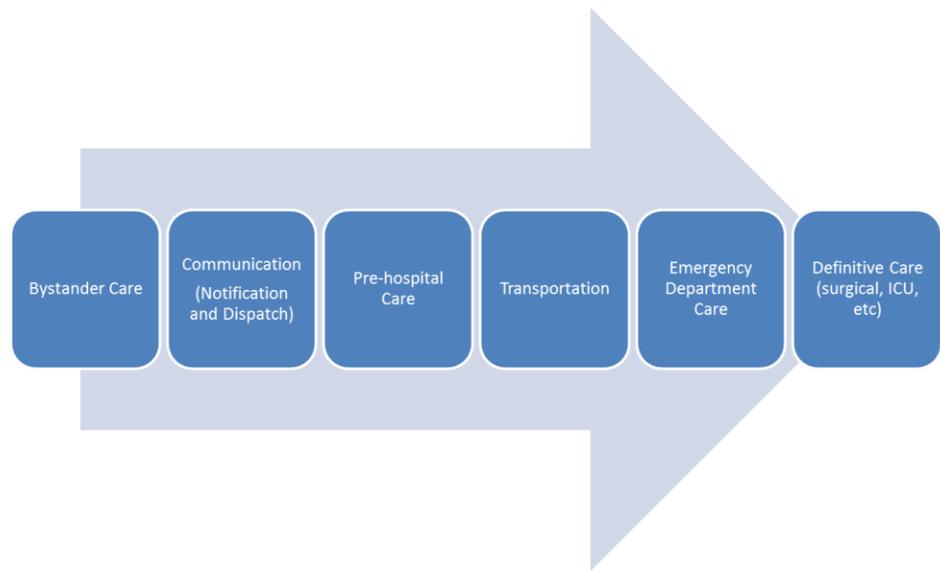
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**I. Introduction to Global Emergency Care Collaborative and the Prehospital Emergency Resources project**

Global Emergency Care Collaborative (GECC) is a United States-based non-governmental organization (NGO) that was founded in response to the lack of emergency care services in rural southwestern Uganda. GECC’s vision is “to improve global health by creating or improving access to quality emergency care in the developing world,” which the organization strives to do by creating sustainable emergency care systems with the ultimate goal of transferring educational and clinical responsibilities to local providers.<sup>1</sup> GECC’s first step in this direction was the establishment of the first emergency department (ED) in rural Uganda at Karoli Lwanga Hospital (commonly known as “Nyakibale Hospital”) in Rukungiri District.<sup>1,2</sup> This was followed in 2009 by the implementation of an Emergency Care Practitioner (ECP) training program, in which local midlevel providers are trained to treat patients with emergent symptoms and manage the ED.<sup>1,2</sup>

While both of these developments at Nyakibale ensure the availability of definitive emergency care for patients actually presenting to the ED, access to emergency care continues to be a challenge for residents of Rukungiri District who are unaware of the ED services at Nyakibale, unable to reach the ED in a timely manner, or unsure of when definitive emergency care is required. The goal of a comprehensive emergency care system is to reduce morbidity and mortality of medical or traumatic emergencies.<sup>3</sup> Most of the time, such emergencies occur outside of a health care setting<sup>3</sup>, especially in resource-limited or rural areas where health centers or health professionals are sparse. Thus, a truly comprehensive system incorporates multiple pre-hospital components in addition to definitive

care at a hospital or health center (Figure 1). Pre-hospital components include notification of authorities/health center when a severe illness or injury occurs, dispatch of resources to the



**Figure 1:** Comprehensive Emergency Care Continuum. Adapted from Sikka and Margolis<sup>3</sup> and Hammerstedt<sup>4</sup>

patient's location, provision of rapid out-of-hospital care (bystander and pre-hospital care), and transportation of the patient to a facility where definitive care is available.<sup>3</sup>

Although it is ideal to have each of these four pre-hospital components in place, for resource-limited areas such as Rukungiri District the complexity of such a formal system (ambulance transport, response by professional emergency medical technicians, etc.) exceeds the infrastructure and financial means of the region.<sup>3</sup> In such cases, informal interventions (such as the use of taxis for transport or first aid/trauma training for lay first responders) can effectively improve pre-hospital care at relatively low cost.<sup>3</sup> In order for GECC to realize the vision of creating a comprehensive continuum of emergency care in rural Uganda, efforts need to be extended beyond the hospital walls to include pre-hospital interventions that enhance emergency care at an earlier point in the continuum and increase the accessibility of emergency care in rural areas.

In 2011, an effort in this direction was taken by GECC with the initiation of the Uganda Pre-hospital Emergency Resource (PER) Project. The aim of the PER pilot program is to “develop a cost-effective and efficient pre-hospital educational intervention geared toward decreasing the time it takes for patients to present to appropriate emergency care.”<sup>2</sup> The PER program seeks to address a combination of steps one and three of the continuum, namely bystander care and pre-hospital care, by training laypeople to recognize emergent signs/symptoms and provide initial first aid/stabilization and by teaching community members about available health care resources (community health centers and the emergency department).

At this time, Phase I of the PER project is complete and involved initial outreach and a needs assessment of the community. This phase included an exploration of the educational needs of various potential lay responder groups, assessment of the feasibility of options for educational programming, characterization of various elements of the current informal pre-hospital care system, and identification of factors that affect decision making regarding emergency care seeking behavior.<sup>2</sup> The above information will serve as a cornerstone of Phase II, informing the design of an educational program targeting specific community groups that are best positioned to effect change in emergency response and health-seeking behaviors in Rukungiri District.<sup>2</sup> The ultimate goal of the project is to build-up the front end of the continuum in order to reduce the morbidity and mortality from treatable emergent conditions by improving the rapidity with which people receive emergency care.

Lay first responder programs have been used around the developing world in varying forms, ranging from training of taxi drivers in basic first aid and obstetric care<sup>5</sup> to teaching local non-

graduate health care workers to provide basic life support and trauma care.<sup>6</sup> Other pre-hospital interventions focus more on changing health-seeking behavior and recognition of danger signs. These have largely been utilized for childhood illnesses<sup>7</sup> and obstetric emergencies.<sup>8</sup> With respect to emergency care, few interventions have combined both approaches. This report will evaluate the successes and challenges of both types of pre-hospital interventions and, in combination with the results of Phase I of GECC's PER project, use this information to inform the design of a pre-hospital emergency care education program specifically suited for the local context in Rukungiri District.

## II. Status of emergency care in the developing world

Low- and middle-income countries (LMICs) are disproportionately burdened by conditions requiring emergent care, including traumatic injuries, acute medical illnesses, obstetric emergencies, and exacerbations of chronic disease. While there are few empirical data regarding the effect of emergency care on reducing mortality or disability-adjusted life-years (DALYs), many of the leading causes of death and DALYs in LMICs are conditions that can be alleviated through urgent/emergent treatment (Table 1).<sup>9</sup> The effects of trauma and injury in particular on mortality and long-term disability in developing countries are often overlooked because of the emphasis placed on communicable diseases and malnutrition.<sup>10</sup> However, each year 1 in 10 deaths worldwide are due to injury, and nearly 90% of the worldwide deaths due to injury occur in LMICs, making injury a significant burden in these countries.<sup>10,11,12</sup>

**Table 1:** Leading causes of deaths and DALYs in LMIC. Adapted from Razzak and Kellerman<sup>9</sup> and Hammerstedt<sup>4</sup>.

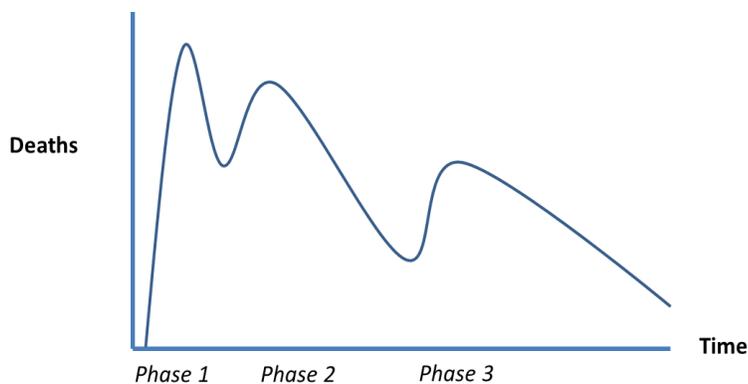
Causes of Death	% of total deaths	Causes of DALYs	% of total DALYs
<b>1. Ischemic heart disease</b>	<b>11.5</b>	<b>1. Lower respiratory infections</b>	<b>6.8</b>
2. Cerebrovascular disease	8.9	<b>2. Perinatal conditions</b>	<b>6.7</b>
<b>3. Lower respiratory infections</b>	<b>7.3</b>	3. HIV/AIDS	6.6
4. HIV/AIDS	6.1	<b>4. Meningitis</b>	<b>4.6</b>
<b>5. Perinatal conditions</b>	<b>5.1</b>	<b>5. Diarrheal diseases</b>	<b>4.6</b>
6. Chronic obstructive pulmonary disease	4.7	6. Unipolar depressive disorders	4.0
<b>7. Diarrheal diseases</b>	<b>4.4</b>	<b>7. Ischemic heart disease</b>	<b>3.5</b>
8. Tuberculosis	3.4	8. Malaria	3.0
<b>9. Road traffic accidents</b>	<b>2.4</b>	9. Cerebrovascular disease	2.9
10. Malaria	2.3	<b>10. Road traffic accidents</b>	<b>2.8</b>
11. Hypertensive heart disease	1.7	11. Tuberculosis	2.6
<b>12. Measles</b>	<b>1.6</b>	12. Congenital anomalies	2.3
13. Trachea, bronchus, lung cancers	1.6	13. Chronic obstructive pulmonary disease	2.3
<b>14. Self-inflicted injuries</b>	<b>1.5</b>	<b>14. Measles</b>	<b>2.0</b>
15. Cirrhosis of the liver	1.4	15. Cirrhosis of liver	2.0

Bolded and shaded cells represent conditions for which evidence shows early/emergent treatment can save lives

Historically, global health policy has placed priority on disease- or condition-specific vertical programs, especially in the arenas of maternal and child health.<sup>9</sup> This in turn has discouraged the creation of horizontal health care delivery systems, a problem that is magnified during emergencies when appropriate, efficient, urgent care is unavailable.<sup>9</sup> The development of trauma systems in high-income countries in recent decades has successfully reduced preventable deaths by approximately 50% and it is estimated that, in a similar manner, improvements in emergency medical systems in LMICs could prevent between one and two million deaths.<sup>12,13</sup>

However, most LMICs, especially those in Africa and Asia, do not have even a basic emergency medical system in place.<sup>14</sup> Emergency medical care is intended to overcome the factors that are most likely to lead to preventable mortality—delay in seeking treatment, access to appropriate care, and adequate care once at a health facility.<sup>9</sup> As mentioned previously, although the ultimate solution is the development of a formal and comprehensive emergency care system, for many LMICs and particularly rural areas, limitations in funding and infrastructure make this an unlikely reality in the near future. In LMICs without formal emergency systems, nearly 80% of deaths due to injury occur in the pre-hospital setting,<sup>13</sup> during the periods when care in the community (bystander/pre-hospital care) and care during transport to a health facility are potentially lifesaving.<sup>9</sup>

Provision of prompt, effective pre-hospital care may lessen the consequences (morbidity and mortality) of serious injury or illness.<sup>15</sup> The World Health Organization (WHO) has issued guidelines on the development of pre-hospital care systems and supports the implementation of first responder programs as the most fundamental step in the creation of such a system.<sup>5,15</sup> In order to highlight the potential of first responder training, the WHO guidelines present a trimodal



**Figure 2:** Trimodal distribution of deaths following injury. Adapted from World Health Organization<sup>15</sup> and Dobson and Wilkinson<sup>16</sup>

distribution of deaths from severe injury and explain how first responder skills fit into this three phase model to prevent deaths (Figure 2).<sup>5,15</sup> In Phase 1, the injury is overwhelming and death is immediate.

In Phase 2, death occurs subacutely, within several hours of the event, and is the result of treatable conditions. Finally, in Phase 3, death is delayed and occurs during the days to weeks after the initial injury. These deaths are usually due to late complications such as infection or organ failure. Deaths during Phase 1 are not preventable with pre-hospital interventions. The majority of deaths that occur during Phase 2 are due to airway compromise, uncontrolled hemorrhaging, or respiratory failure—all three of which are treatable with basic first aid methods. Pre-hospital care may also be useful in preventing deaths during Phase 3 if measures such as proper wound/burn care or fracture immobilization are utilized.<sup>15</sup>

Thus, even in countries with limited resources, lives may be saved and disability averted by training lay people to serve as first-responders in the event of an emergency.<sup>15</sup> The likelihood of survival after a serious injury depends on the timeliness of intervention; thus, action by bystanders may greatly enhance the odds of survival.<sup>15</sup> Since most emergencies start at or near home, community-based interventions to promote early recognition of emergent conditions and teach basic first aid skills are ideally situated at the epicenter of the issue.<sup>9</sup> Such strategies can also be tailored to the particular community, building on existing patterns of pre-hospital care and social structures. It engages citizens in the care of their community and can build community capacity to provide assistance to ill or injured individuals.<sup>15</sup> Selecting motivated volunteers and providing them with basic training is a low-cost alternative to a formalized system.<sup>15</sup> For these reasons, the remainder of this paper will consider training programs for lay first-responders and the applicability of such programs in Rukungiri District, Uganda.

The following sections evaluate various pre-hospital interventions implemented in developing communities in the Middle East, Africa, and Asia. First, interventions that involve the training of laypersons to provide basic first aid or trauma care are discussed. This is followed by a discussion of interventions utilized to teach community members to recognize signs and symptoms of severe illness or injury that require emergent care. Many of the latter type of interventions are specific to recognition of life-threatening emergencies in maternal and pediatric populations and few data exist beyond these groups.<sup>9</sup> However, if community members can be trained to recognize signs of blood loss or breathing difficulty in post-partum women or children, it can be reasonably assumed that they can also be taught to recognize these general signs in other adult populations.<sup>9</sup> The analysis of the advantages and challenges of each of these programs will then be used to inform the design of a training program tailored to the local context and state of emergent health care utilization in Rukungiri District.

### III. Lay first responder trauma care interventions

#### *The Village University Experience – North Iraq and Cambodia*

Between 1996 and 1999, a first-responder training program known as the “Village University experience” was conducted in North Iraq and Cambodia.<sup>17, 18</sup> The program enrolled 22 non-graduate village health workers from each target area and provided them with three 150-hour intensive courses over the course of three years, with 6-12 month working periods between courses. Each consecutive course increased in complexity and skill level. Trainees were selected based on hands-on experience with landmine casualties, educational background/literacy, and respect in the community. The Village University program was based on four core principles—confidence building, which was accomplished by providing training in villages to maintain local context; troubleshooting, which was instilled through a circular approach to trauma care (survey, identify main problem, solve main problem, repeat); learning by hands-on experience with limited lectures; and local control, in which the trainees were expected to eventually serve as the trainers and run local training programs on their own. Training modules utilized real-life case scenarios, locally appropriate illustrations, and local supplies. Following the first training session, trainees were provided with a medical backpack kit with basic equipment and drugs. During the 6-12 month working period, trainees used their new skills in the field and were also expected to train lay people in their community to serve as first responders via locally organized, two-day training sessions in basic first aid.<sup>17, 18</sup> The program was monitored through video documentation and review of training sessions by the authors of the paper; collection of data on treatment and outcome of all patients, including photo documentation of injuries; monthly meetings with local coordinators to review cases; and interviews of survivors of mine accidents.<sup>17</sup>

The advantages of the Village University experience are the comprehensive skill set taught to trainees, the maintenance of local context and community ownership by holding training sessions in local villages and requiring trainees to work in their communities between sessions, and the training-of-trainers approach to making the program sustainable. However, there are some aspects of the “Village University” that may be difficult to replicate in other rural, low-resource areas. First, the trainees were selected based on experience and education, which may be challenging in other communities where low-level health care workers are limited or are already overburdened with responsibilities. Second, while the training methods used were practical and hands-on, the level and complexity of the skills being taught required some medical background and were time-intensive. This may not be feasible in areas where these resources—medically-educated individuals, funding,

and time—are not as readily available. The design used for the aspect of the program in which the “Village University” trainees in turn train lay persons is more applicable to low-resource, low-education, low-technology areas. Additionally, this program was designed for a conflict setting which calls for a different skill set than may be required in non-conflict areas.

### *Commercial Driver Training – Ghana*

In Ghana, the recognition that pre-hospital trauma mortality, especially due to road traffic injuries, was increasing in the absence of a formal emergency medical system led to the development of a low-cost solution for providing pre-hospital trauma care.<sup>14,19</sup> As the majority of victims of trauma in Ghana were already being transported to hospitals by taxi and bus drivers, commercial drivers were the target group for this intervention given their proximity to many of the events requiring emergency care.<sup>14,19</sup>

Thirteen separate 6-hour course sessions were offered and 335 drivers participated in training. The training program contents were based on high-yield, low-tech interventions as found in background literature regarding first aid training, including *Where There Is No Doctor*<sup>34</sup> and material from the Red Cross of both the United States and Ghana. The course was specifically oriented to the generally low educational level of Ghanaian commercial drivers and literacy was not assumed. The course also emphasized practical, real-world circumstances that were likely to be encountered by commercial drivers, such as long transport times and a lack of formal equipment. The methods used to teach emergency skills included didactic lectures in the native language, pictures and diagrams, hands-on skills stations (using other trainees to practice on), and American Red Cross first aid videos. Cost per participant was approximately US \$3. The following first aid principles were the focus of the training sessions: (1) airway management, specifically lateral decubitus positioning (“recovery position”), (2) bleeding control using direct pressure, elevation of the extremity, and application of pressure dressings, (3) splinting using readily available materials, (4) simple spine precautions and proper patient movement/lifting, and (5) triage principles, specifically recognizing severely injured but salvageable patients in a mass casualty (bus crash) situation. At the end of the course, drivers were encouraged to put together their own first aid kit for their vehicles using materials such as cloth/rags, materials for making splints, and rubber gloves.<sup>14,19</sup>

The advantages to the commercial driver training program are that the program built upon existing patterns of informal pre-hospital care, was low-cost and low-tech, did not require a certain level of educational attainment, focused on training within the local context (language, location, real-

life scenarios), and limited the scope of training to skills deemed to be high-yield for the situations likely faced by drivers. A limitation to this program is that local control/sustainability is not built into the planning, and continuing the program to train additional drivers is reliant on foreign assistance.

### *Taxi Driver Training – Madagascar*

Given the large burden of emergent conditions in Africa and other low-resource settings, transportation of patients often falls to taxi, bus, or truck drivers.<sup>5</sup> For this reason, Geduld and Wallis chose taxi drivers as the focus of their first-responder training program in Madagascar. The training program used by the authors was based on the validated models of Tiska,<sup>19</sup> Wisborg and Husum,<sup>17, 18</sup> and Jayamaran,<sup>12, 20</sup> but on request of the target population, maternal care and delivery were added to the program. The program consisted of four workshops that incorporated hands-on training in pre-hospital scene management, bleeding and broken bones, immobilization and patient movement (including patient transfer and cervical spine immobilization), and labor and delivery. The workshops taught fairly basic skills using readily available items, such as the use of safety pins and newspapers for splinting fractures, and participants were encouraged to create their own First Aid kit made of everyday items to keep in their taxis. University doctors and nurses served as trainers, and local doctors were invited to also become instructors in order to promote sustainability of the program and provide local cultural input. Translators were used to allow for first language understanding of the material by participants. Twenty-six taxi drivers attended the one-day course. Pen and paper were provided for note taking and the day ended with a question and answer session to facilitate any necessary clarification of concepts and the receipt of feedback from participants.<sup>5</sup>

The advantage of the Madagascar program is that it can be used virtually anywhere given its low-cost, low-technology approach to teaching first aid. The target training group was chosen based on their critical position in the preexisting pattern of pre-hospital care—transportation to health facilities. Thus, this is a group likely to near the scene of an emergency soon after it occurs. The involvement of local instructors also helped to ensure that the course was culturally appropriate and understandable. The program also focused on a few basic concepts with ample hands-on practice, rather than trying to cover a broad range of topics. One drawback to the program is that many of the taxi drivers were concerned about how others in the community would react to them when they put their new skills into practice, calling into question the drivers' perceived self-efficacy and the likelihood that their new skills will actually be put to use.<sup>5</sup>

*Kampala Pre-hospital First Responder Initiative – Uganda*

Uganda, like many other LMICs, does not have a formal emergency medical system and suffers from a burden of injury and preventable deaths. The national referral hospital, Mulago, is located in the capital city of Kampala and sees about 6,000 injured patients yearly and it is estimated that an additional 4,000 are too severely injured to make it to the hospital for care.<sup>12,21</sup> As in many other developing countries, most injured patients arrive to the hospital via personal/commercial vehicles or by foot. The pre-hospital trauma care program designed for Kampala took advantage of this informal pre-hospital transportation pattern and modified the Ghanaian program to fit a Ugandan context.<sup>12, 14, 19</sup> Local stakeholders involved in providing health services and informal pre-hospital care assisted in the design of the program. Three hundred taxi drivers, police officers, and community leaders (Local Council officers) were enrolled in one of five one-day training sessions, conducted in both English and Luganda (50-100 participants per session). Training methods used included a daily didactic lecture followed by hands-on skills sessions and some videos demonstrating skills. There was a minimal literacy requirement for participation in the course due to distribution of lecture slides.<sup>12, 20</sup>

Skills sessions covered scene safety and universal precautions, bleeding control, airway management (recovery position), splinting, safe movement and transportation of patients, and basic triage principles. Each trainee was required to demonstrate mastery of skills using the medical first aid kit provided to them by course organizers. The first aid kits were stocked with locally available supplies and cost approximately \$16 per participant. After completing the course, each trainee received a certificate, an arm band and identity card, and a card with tips and reminders to place in their vehicle. These benefits were provided in order to promote identity and credibility within the community. The total cost of the training program per participant was around \$27.<sup>12, 20</sup>

The advantages of the Kampala program are that, like other programs, trainees were selected based on their positions within the existing informal system and their proximity to injuries and emergencies. The program also focused on high-yield skills, used hands-on experiences during training, provided a first aid kit to participants which could be restocked, and worked within the local context to make the program relevant (involvement of stakeholders, language). Aspects of this particular program that stand out in comparison to the others previously discussed include the requirement for participants to prove skill mastery and the attention given to providing trainees with ways to be identified in the community and a sense of pride in their accomplishment and skills.

Limitations to this program include the relatively high cost per participant due to the purchase of supplies rather than using readily available materials. Additionally, there was not a component of sustainability built into the program to allow for full local control at a later date. However, involving stakeholders in program design is a step in this direction as it gives community members some oversight in the program.

### *African First Aid Materials Guidelines*

The African First Aid Materials (AFAM) Guidelines were developed by the Belgian Red Cross-Flanders following the widespread use of a similar project in Europe, the European First Aid Manual. After several African Red Cross societies expressed interest in and need for first aid materials adapted to fit an African context, and both the WHO and World Bank advocated for basic first responder training in regions without formal emergency medical systems, the Belgian Red Cross took up the endeavor. The result is a comprehensive evidence-based reference for training first-responders in basic first aid skills in an African setting.<sup>22,23</sup>

The Belgian Red Cross defines first aid as “appropriate and beneficial help to a suddenly ill or injured person which is initiated as soon as possible and continued until that person has recovered or medical care is available.”<sup>22</sup> The goal of the guidelines is to serve as the basis for didactic materials that provide a low-cost way to reduce delays in recognition of danger signs, delays in seeking definitive care, and more efficiently and appropriately assist people in the absence of medical care, thereby reducing the burden of emergent injury and illness. Placing basic first aid training within an African context makes the skills more relevant to the intended communities and is critical given the prevalence of limited access to health care, prominent role of cultural medicine and healing, and constrained resources across the continent.<sup>22</sup>

AFAM is organized into five sections: (1) basic principles for management of an emergency, (2) sudden illness (diarrhea, fever, not breathing, etc.), (3) injuries (includes bleeding, burns, other wounds, etc.), (4) poisoning, and (5) emergency childbirth. Rather than classifying conditions based on technical diagnosis, AFAM classifies conditions by signs and symptoms to make the materials more user-friendly. Each section contains a list of criteria delineating when medical care should be sought for a given condition, a caution section describing actions to avoid that may make the condition worse, ways to prevent the condition, and simple instructions and illustrations describing what to do to care for an individual with the condition. For each condition, cultural remedies or other preferences are also included for reference. AFAM addresses not only essential trauma care,

but also recognition of danger signs, serving as a comprehensive approach to pre-hospital care. AFAM is considered to be generic information that must be further modified and adapted according to the specifics of each local community's beliefs, culture, explanatory models/perceived disease causality, and terminology.<sup>22</sup> These materials serve as a foundation upon which local pre-hospital training programs can be built throughout Africa in areas where formal systems are absent.

#### **IV. Interventions for recognition of emergent symptoms and health-seeking behavior**

##### *Barriers to seeking care*

While providing rapid and adequate first aid and trauma care is essential to the development of a pre-hospital emergency system, it is also important for programs to address barriers to seeking formal health care among community members. The factors influencing when and how people recognize when illness or injury is severe enough to warrant care at a medical facility is an issue that has been most often discussed with respect to childhood illnesses and complications during childbirth, but many of the barriers to seeking care are similar. Thus, these barriers are also likely to be important among the general community when it comes to utilization of emergency care services for other illnesses.

In studies conducted in Nigeria<sup>7</sup>, South Africa<sup>24</sup>, and Zambia<sup>25</sup> regarding health care-seeking behavior for danger signs in children, the most commonly cited reasons for abstaining from or delaying formal medical care were accessibility issues, perception of illness severity, availability and acceptability of alternative sources of care outside of the home, advice and influence of family and neighbors, decision making capacity of the mother, and prior negative experiences with health care workers. Issues with accessibility of health care resources were related to both distance to a health facility and to cost of transportation, difficulty finding transportation, and the opportunity costs associated with lost work time.<sup>7, 24, 25</sup> In the Nigerian study, care was sought more often for fever than for diarrhea or cough because mothers believed fever to indicate illness of greater severity that required attention.<sup>7</sup> Such perceptions may become life-threatening if other danger signs are overlooked. Caregivers' explanatory models for illnesses also factor in to the perception of illness severity. Attribution of illnesses to externalizing causes, such as evil spirits or angry spirits, was often associated with consultation of traditional healers rather than use of orthodox medical care.<sup>24</sup> Other caregivers believed some danger signs, such as refusing feeding or floppiness, to be normal problems associated with teething.<sup>24</sup> Many caregivers are able to recognize danger signs, but it is their interpretation of those signs that prevents them from seeking appropriate care.

History with successful treatment of illness by traditional healers, drug vendors, or other non-orthodox local sources of care also factors into the decision of where to seek care.<sup>7,24</sup> This is similarly influenced by the advice of family and neighbors and the capacity for decision making regarding health care allowed to mothers. Some women cited the inability to make a decision regarding care of their children without seeking input from family members, while others were unable to afford care unless they convinced their husband to pay for services.<sup>7,24</sup> Finally, demeanor of health care workers during previous experiences with orthodox medicine was a very important factor in determining where later care was sought. Poor experiences at health facilities or negative attitudes of workers were barriers to subsequent care.<sup>7,24</sup>

With regard to the use of maternity services during labor and delivery, a study in Uganda found that socio-cultural beliefs and gender roles/power relations greatly influenced the likelihood of a woman utilizing health facilities during pregnancy.<sup>8</sup> Both in Uganda as well as in other sub-Saharan African countries, pregnancy and childbirth are believed to be an “inevitable burden” and a necessary occurrence for the continuation of a lineage. Death during childbirth is often viewed as being sad but normal; it is merely but one of two possible outcomes—death or survival.<sup>8</sup> For this reason, danger signs may be noted but are considered expected and therefore do not require medical attention. When danger signs, such as fever or hemorrhage, became severe many women were particular about to whom they would communicate their discomfort. Health workers were often considered outsiders and, especially if previous experiences with workers were negative, they were not trusted. As with childhood illnesses, some women who wanted to use formal maternity services had to negotiate with their husbands for the money to pay for the care.<sup>8</sup> Thus, as with danger signs in children, explanatory models and gender roles play an important role in determining how and when health care is sought.

### *Examples of interventions*

Interventions implemented to address the recognition of danger signs and teach people when Western medical care is necessary are most frequently targeted toward childhood illness and maternity. However, it can be reasonably assumed that such interventions can be extended to cover general danger signs that may occur in all age groups, as there is significant overlap in the presentation of these signs among populations. Thus, if community members can be taught to recognize signs of blood loss in post-partum women, they can also learn to recognize the same signs in an adult male.

In Zambia, a behavior change intervention was implemented to facilitate change in caregivers' behaviors toward timely care-seeking during childhood illnesses.<sup>25</sup> Health education on danger sign recognition was provided to caregivers by a trained community health volunteer. Visual educational aids were used, including both a video and a flipbook with illustrations using local terminologies to keep the material within the local context. This model focused on five danger signs in children: refusing to breastfeed/drink, vomiting everything, breathing abnormally, weakness/sleepiness, and convulsions. Education was provided during routine medical visits for the children. The study found that the distance and monetary barriers to health care-seeking were reduced following this intervention and the most significant improvements were seen among caregivers located a greater distance from the health facility and with lower incomes. These households were more likely to benefit from learning to recognize when health care is necessary given their higher opportunity costs to reach a health facility compared to those living closer to a facility.<sup>25</sup> Thus, this type of health education is likely to be more useful in rural communities with greater barriers to seeking emergency care.

Another community-based intervention implemented in Pakistan was designed to increase awareness of safe motherhood.<sup>26</sup> Based on studies showing the importance of the role husbands play in ensuring better birth outcomes and making decisions about seeking health care for complications, this intervention used a strategy called IEEC—information and education for empowerment and change—geared toward both women and their husbands. The IEEC materials used include illustrated booklets and audiocassettes that were suitable to the local culture. Female volunteers from villages were trained to serve as facilitators for the project. These women then invited other women from their villages to form a support group, during which problems during pregnancy and childbirth were discussed in conjunction with the use of the IEEC materials. The booklet was covered in six 1-2 hour sessions and all participants were given a copy of the booklet and tape to take home. Participants deemed to be “outstanding” were then encouraged to organize and facilitate their own groups in a training-of-trainers approach to sustaining the project. Husbands participated in a separate but parallel IEEC program. Women participating in the intervention had fewer problems during pregnancy, visited a health facility more often for prenatal care, and were more slightly more likely to deliver at a hospital.<sup>26</sup> This intervention took advantage of the critical role that men play in the process of moving from recognition of illness to attainment of medical care.

A similar community-based approach was used in Guinea-Bissau to address both maternal and child health.<sup>27</sup> Health clubs were organized in rural communities, with approximately 60 households assigned to each club. The clubs met regularly over two years and discussed topics such as recognition, treatment, and prevention of malaria, pneumonia and diarrhea; safe pregnancy and delivery; and newborn care. Each community also selected village health workers from among club members, and these health workers receive additional intensive training in the topics to be covered. The village health workers were responsible for attending club meetings, organizing services to be provided for club members (vaccination, antenatal care), assisting with home deliveries, and providing advice on treatment of sick children.<sup>27</sup> The intervention in Guinea-Bissau put ownership of the program into the hands of the community, empowered parents to use clinical services through education, and positioned village health workers at a critical point in the decision making process regarding care seeking. The village health workers were chosen to provide advice by their communities and actively participated in the health care decisions of club members by being present at births and available to assist mothers with sick children.

A few important themes are found among the above examples of danger sign recognition and behavior change interventions. First is the community-based focus of the interventions. All three programs utilized community members to serve as facilitators and trainers and the educational materials used were informed by the local cultural context. Each program also made an effort to strengthen the link between danger sign recognition and the next step of actually seeking medical care. In the case of Zambia, this was done by combining the educational intervention with routine medical care, reinforcing the relationship between the two. In Guinea-Bissau and Pakistan, the interventions addressed decision-making structure in the communities by including families and husbands, respectively, in the training program. Husbands and family members are often a barrier to seeking health care so including them as an integral part of the program helps to provide a common understanding to both mothers/caregivers and the decision-makers in the household. These interventions are useful examples of ways to modify socio-cultural barriers to seeking emergent care, specifically perceptions of illness severity, decision-making capacity, and advice given by family and neighbors.

## **V. Local context of Rukungiri District**

Local context played an important role in each of the first-responder and behavior-change interventions discussed in the previous sections. Thus, before designing an intervention tailored to

Rukungiri District, Uganda it is essential to understand the demographics of the target population, structure of the health care system, barriers to health care seeking, and the unmet need for emergency care in the community. Much of this information was collected by Alex Blake in 2011 during Phase I of the PER project using focus group discussions, interviews, data from GECC, and field observations.<sup>2</sup> Additional information was obtained by Dr. Heather Hammerstedt for her public health thesis project at Harvard School of Public Health in 2008.<sup>4</sup>

### *Rukungiri District Setting*

Rukungiri District is a rural area in far southwestern Uganda.<sup>2,4</sup> The 2002 census estimated the total population of the district to be 275,162, but it is predicted to now be over 300,000.<sup>1,28</sup> More than half of the population is under 18 years of age.<sup>1</sup> The dominant ethnic group in the district is Bahororo and Runyankore is the common language.<sup>2</sup> Rukungiri District is very poor and one-third of residents do not have access to clean water.<sup>1</sup> The economy of Rukungiri District resembles that of the rest of the country and is dominated by agriculture, especially subsistence farming.<sup>2</sup> Bicycles and motorcycles (boda-bodas) are the most common forms of transportation, as the district has an extensive network of unpaved feeder roads and only one main tarmac road.<sup>2</sup> Communication technology is quite limited, with radio serving as the sole means of mass communication.<sup>2</sup>

### *Health Care System*

In Uganda, districts are subdivided into counties, sub-counties, parishes, and villages.<sup>2</sup> Each jurisdictional level is intended to have a corresponding level of health care and this system works largely on a referral basis—if a lower level facility cannot handle a problem, it is referred to the next level up.<sup>2,29</sup> At the village level, the first line of pre-hospital contact are traditional healers, druggists, or community health workers.<sup>2,29</sup> At the parish level is the Health Centre II (HC II), which is staffed by nurses and functions as an outpatient clinic.<sup>2,29</sup> Health Centre IIIs (HC III) are at the sub-county level, are led by a senior clinical officer and have outpatient services in addition to a maternity ward.<sup>29</sup> Situated at the county level are Health Centre IVs (HC IVs). HC IVs are mini-hospitals and provide the same services as HC IIIs, while also having wards for admitting patients and an operating theatre.<sup>29</sup> Finally, each district should ideally have a larger hospital with all the services of an HCIV plus specialized clinics and consulting physicians.<sup>29</sup>

Rukungiri District contains two counties: Rujumbura and Rubabo.<sup>2</sup> Nyakibale Hospital, which is a HC IV, is located in Rujumbura County but it functions as the referral hospital for the entire district.<sup>2,4</sup> Given the size of the catchment area for Nyakibale Hospital, the focus area for this pilot pre-hospital training program will be limited to Rujumbura County. Nyakibale Hospital is well staffed by African standards, with four Ugandan physicians, three clinical officers, forty-eight nurses, and twelve midwives.<sup>1</sup> Although emergency care within the hospital has improved with the development of the first truly functional emergency department in Uganda in 2008, many patients are critically ill by the time they arrive at Nyakibale due to delays in presentation.<sup>1,4</sup>

It is within this setting and health care climate that a pre-hospital training program must fit. The characteristics of Rujumbura County—the complexity of the health care referral system, low socioeconomic status, limited transportation, rudimentary communication systems, and rural location—all play a role in the inability of patients to reach appropriate care during an emergency. These characteristics also highlight the need for expansion of the emergency care continuum in the county/district to include the basic steps of bystander and pre-hospital care. Barriers to seeking health care and factors leading to a delay in presentation will be discussed further below.

#### *Barriers to seeking formal medical care in Rukungiri District*

During Phase I of the PER project, an assessment of the current pre-hospital system was conducted using structured group interviews with lay community members. The group interviews aimed to collect information regarding two areas: (1) general community knowledge about recognition of danger signs and management of emergent conditions, and (2) common explanatory models for injury and illness.<sup>2</sup> Group answers pertaining to these facets of pre-hospital care illustrate some of the barriers to seeking and receiving appropriate emergency care in district villages.

Barriers to care can be classified into three key domains—resource factors, knowledge factors, and sociocultural factors.<sup>2</sup> Resource factors that serve as barriers include a lack of liquid assets, lack of transportation, and a poor communication infrastructure.<sup>2</sup> Many families in the area actually have enough wealth to afford the cost of an average visit to Nyakibale or the emergency department. However, this wealth is often tied up in land, cows, or coffee and cannot be readily used to pay for medical care.<sup>2</sup> Access to transportation to reach higher level health facilities is another resource barrier that was identified by the community.<sup>2,4</sup> Transportation infrastructure, namely paved roads, are rare in the district and there is no formal ambulance system.<sup>2,4</sup> The price of gas, which must be paid by the patient being transported, is also prohibitive if a vehicle can even be

found.<sup>4</sup> The communication infrastructure is similarly poor. Community health centers (HC II and HC III), private clinics, and traditional healers have virtually no way to communicate with Nyakibale Hospital regarding patient referral or transfer.<sup>4</sup> A lack of communication systems also makes it challenging for individuals or families to contact health professionals when an emergency arises.

Knowledge factors identified as barriers to seeking medical care include a lack of knowledge of available options for appropriate care and the inability to recognize emergent signs or symptoms.<sup>2</sup> According to those interviewed, the majority of lay community members are unaware that the ED exists or, if they do know about the ED, they do not understand what services it provides.<sup>2</sup> Without an understanding of the nature of care provided by the ED, lay community members are unable to comprehend when this care may be warranted. There also seems to be confusion as to what care options are available and when these should be utilized. For example, in a 2002 study conducted in Mbarara municipality, which is an ethnically related urban center near Rukungiri, the authors found that more than 70 percent of people with malaria chose not to seek care at public health institutions.<sup>30</sup> Rather, private clinics were preferred (46%) due to perceived higher quality of care.<sup>2,30</sup> Others sought care from drug stores, traditional healers, or self-treated.<sup>30</sup> Due to the prevalence of malaria in the region and the high percentage of patients seeking care from private clinics, these clinics may encounter a great proportion of complicated malaria cases which require emergent care—services private clinics are not prepared to provide.<sup>2</sup> In Rukungiri, there is also a widespread belief that convulsions, a symptom of complicated malaria, are caused by the supernatural. Thus, traditional healers are often used for treatment of convulsions. Like private clinics, traditional healers may also be encountering a disproportionately high number of complicated malaria cases which require emergent care.<sup>2</sup> A lack of understanding of where and when to seek care leads patients to seemingly randomly move between different levels of care, and between modern and traditional providers, which wastes a family's resources and delays arrival at the appropriate level of care.<sup>2</sup>

Difficulty recognizing emergent signs and symptoms was another knowledge factor cited as a barrier to appropriate care by interviewees and confirmed during a danger sign exercise in one of the interviews.<sup>2</sup> Participants were presented with emergent conditions using pictures, demonstrations, and explanations and asked a series of questions about the scenarios. The results of the exercise revealed low community awareness of basic first aid, inconsistent recognition of danger signs, a preference for using alternative providers for some conditions, and little knowledge of modern medical treatment options.<sup>2</sup>

Failure to recognize emergent symptoms may be the result, as illustrated above, of cultural explanatory models that ascribe alternative external causes to a symptom. In other cases, there may be beliefs held by the community about symptom causation that underestimate the severity of the underlying condition, misidentification of one disease for another, or a locally accepted treatment for particular symptoms regardless of disease entity (Table 2).<sup>31</sup> Some examples of this are floppiness in babies being ascribed to teething,<sup>24</sup> dangerous symptoms during pregnancy believed to be part of the birthing experience,<sup>8</sup> and the belief that all fevers are malaria thereby potentially delaying treatment for life-threatening illnesses with overlapping symptoms, such as pneumonia.<sup>32,33</sup> Another example is the illness concept of “enhonhi” (literally “bird disease”) in eastern Uganda, which refers to the symptoms of hot body (fever), yellow-green diarrhea, cold extremities with a warm trunk, and difficulty breathing.<sup>32</sup> This illness is believed to be appropriately treated using herbs and traditional medicine, although it encompasses symptoms of all three major childhood killers (malaria, diarrhea, and pneumonia) and may require emergent care.<sup>33</sup>

Finally, the lay community members also identified sociocultural factors that act as barriers to seeking health care. These include household gender roles and explanatory models or cultural beliefs about disease processes.<sup>2</sup> Traditional decision-making structures in households, in which husbands are responsible for making decisions regarding finances and resource use, can hinder the ability of women to seek care for themselves, their children, or their family members.<sup>2,31</sup> As the traditional caregivers, women are most likely to be the first to recognize the need for care.<sup>31</sup> The power relationship between couples requires women to negotiate with their husbands in order to pay for necessary health

<b>Table 2: Local illness concepts, symptoms, and preferred treatments (Adapted from Hildenwall 2007<sup>32</sup> and Hildenwall 2008<sup>31</sup>)</b>		
<b>Local illness concept</b>	<b>Explanation/symptoms</b>	<b>Treatment preference</b>
Omusudha	Hot body	Herbs, paracetamol, antimalarial drugs
Okuwamu omusayi	Lack of blood, pale palms	Blood transfusion
Lukunsense	Measles (fever, vomiting, diarrhea, rash, coated eyes)	Herbs
Lwenyanja	Diarrhea, fever, desquamation of the skin around the private parts	Traditional care; sometimes also hospital care
Enhonhi	Cold extremities with warm trunk, yellowish diarrhea, tightness in chest, difficulty breathing	Herbs
Lubyamira	Difficult breathing	Hospital care (home care until illness is severe)
Okwesika	Convulsions	Traditional care
Ebiino	“False teeth” (vomiting, diarrhea, high temperature, does not breath well)	Traditional care

care<sup>8</sup>, which may not only delay the receipt of care, but also lead to disagreements and make future negotiations more difficult. Explanatory models, discussed above, are a cultural frameworks used to explain the causality of illnesses. Such models become a barrier to patients receiving emergency care when symptoms are recognized as being the result of witchcraft, angry ancestors, evil spirits or other supernatural forces. Supernatural forces are often believed to be adequately treated only by traditional healers and the need for orthodox medical treatment may be overlooked in such cases, despite severity of symptoms. Convulsions secondary to complicated malaria, but perceived to be the result of supernatural influences, are an example of an explanatory model that becomes a barrier to appropriate care.<sup>2</sup>

#### *Identification of potential target groups for training*

Another function of Phase I was to identify potential target groups for a lay training program. Groups were selected based on the predicted frequency with which they may encounter emergency conditions.<sup>2</sup> Potential groups included boda-boda drivers, community leaders (priests, village council members, teachers), and married couples.<sup>2</sup>

Boda-boda drivers participating in providing taxi services, although organized via a registration process under the District Police Office, are an amorphous group.<sup>2</sup> There is high turnover in the occupation, which is dominated by young males with low levels of education. Support for training boda-boda drivers was mixed among local medical stakeholders.<sup>2</sup> Training drivers may have a positive impact on provision of first aid in road traffic accident trauma, but would miss a critical area of non-traumatic emergencies with such a narrow focus.<sup>2</sup>

Community leaders, because of their variable affiliations, are a less integrated group which would make mobilization challenging.<sup>2</sup> Time required for training may result in a wide range of opportunity costs, especially if leaders must travel to the training from outlying communities. The group is diverse, with both women and men represented as well as a range of educational levels. This potentially makes it more difficult to tailor a training program to meet each person's needs given the variability in education, experience, and exposure to emergency conditions.<sup>2</sup>

Married couples were considered as a way to provide education to the heads of households, particularly the decision makers, to help compensate for culturally defined gender roles and power relationships within marriage.<sup>2</sup> As previously discussed, women tend to be the caregivers and recognize the need for care at an earlier time than their husbands, who ultimately control when care is actually obtained.<sup>31</sup> Targeting male head-of-households addresses their role as a barrier to care,

while engaging them in becoming part of the solution to delayed emergency care. The potential impact of educating married couples is expanded by specifically targeting couples of reproductive age because of their influence over the health decisions of another important group—children.<sup>2</sup> While married couples may be a diverse group given variable occupations and education, there is some homogeneity in that the common denominator is that each person is one half of a married couple. However, they are not an organized group and mobilization may be a challenge.

Despite potential challenges with mobilization and variable education levels, married couples of reproductive age is the target group that was ultimately chosen with local stakeholder input to participate in a pre-hospital training program.<sup>2</sup> Their position as heads of households, proximity to children, influence over medical decisions, and roles as caregivers and providers situates couples where they will likely be exposed to both traumatic and non-traumatic emergency conditions and, with training, can make a significant difference in the health of their communities.

## **VI. Conclusions and recommendations**

In response to the rising burden of injuries around the world, the World Health Organization recognized pre-hospital trauma systems as an important aspect of their goal of mitigating the consequences of injuries. The WHO additionally recognizes that even low-cost interventions can be effective, and where no formal pre-hospital system exists, the first and most basic tier of a pre-hospital system is first-responder care. This can be accomplished by training community members to recognize an emergency and provide basic first aid until more definitive care is available.<sup>15</sup>

The challenges of designing a pre-hospital training program for laypersons in a developing country are multiple. First, interventions with the highest possibility of changing outcomes for injured people have to be identified. Second, methods of teaching such interventions to people with low educational backgrounds in a short period of time must be chosen. Third, the final program design must be tailored to the unique needs of the participants and the resources available in the local environment.<sup>19</sup>

The ideal characteristics of a lay first-responder training course are for it to be interactive and hands-on in nature, educationally appropriate for the target audience, flexible in response to evaluation, financially viable, sustainable, and far-reaching within a population.<sup>4, 15, 19</sup> An additional characteristic missing from some of the example training programs, but critical to ensuring the success of a program, is to also incorporate feedback and evaluation into the design. This allows

adaptation of the program as needs of participants or the community change. Ideally, the effect of the program in the population should also be monitored based on endpoints such as mortality, patient outcome, and first aid skills used in the field. However, this may be challenging in Uganda, as in many LMICs, as accurate data is hard to find.<sup>4</sup> Collaboration with the emergency department at Nyakibale Hospital to encourage complete and accurate record keeping, as well as post-program surveys of participants regarding frequency and comfort with skill use will be essential for determining the efficacy of the program.

A combination of local input and evidence based sources should inform the design of a pre-hospital training program. In this manner, the educational methods of the program can be tailored to fit within local context and culture, while concomitantly focusing high-yield skills to address locally common conditions. Based on the programmatic examples cited here and the health concerns and context of Rukungiri District, the following outlines recommendations for a pilot pre-hospital training program in Rujumbura County. A detailed description of the pre-hospital lay first responder training program for Rukungiri District can be found in the Appendices section, including training narratives, didactic information, case scenarios, some illustrations, and an example certificate of completion.

- ***Target group:*** Married couples of reproductive age will be the focus of the training program. This allows broad reach within the community given their position as heads of households and their responsibility for the care of children. It also facilitates mediation of gender roles as a potential barrier to care. Each training session will be restricted to 10 couples to limit the group size at 20 total trainees.
- ***Duration of training:*** The course will last one day to minimize the opportunity costs of participating, for both community members and trainers. An option for refresher courses should be provided 6-12 months following the initial training.
- ***Training methods:*** The course will utilize short didactic lectures with locally appropriate illustrations, relevant case scenarios, demonstration of skills by trainers, and hands-on skills stations during which trainees must demonstrate skill mastery.

- **Skills:** The training course will teach the following first aid skills—basic emergency management (primary survey, universal precautions, patient movement, seeking help); airway management; hemorrhage control; splinting; burn care; wound care. Recognition of danger signs and next steps to be taken for the following symptoms will be taught using an adaptation of the AFAM model—fever, convulsions, diarrhea, rash, and respiratory distress. Mixing oral rehydration solution will be part of the unit on diarrhea. Finally, recognizing and managing obstetric emergencies (bleeding, fever, belly pain, headaches and blurry sight, etc.) will also be addressed.
- **Supplies:** Participants will be encouraged to make their own first aid kit at home using readily available materials, which will be discussed during the training day. Trainees will be given a one-liter water bottle with a label containing ORS instructions as a gift to take home. Additional materials needed include poster boards with case scenario illustrations; an easel; and newspapers, towels, blankets, plastic bags, cloth strips, bandage material, sticks/branches, clean water, salt, sugar and/or maize flour, bowls, cups, safety pins, pieces of wood (stretcher size) and tarpaulins for first aid demonstrations. Certificates of completion should also be provided to trainees.
- **Behavior change education:** This aspect of training will be integrated into the skills training, particularly with danger sign recognition. In addition to teaching participants how to recognize emergent symptoms, the course will also emphasize recognition of when symptoms have reached a point where a higher level of care is needed and provide information on what health resources are available and the services provided by each.
- **Capacity building:** Using hands-on experience, ensuring skill mastery, and providing trainees with official certificates identifying them as trained village emergency responders all help to build individuals' sense of self-efficacy with using their new skills. An informal celebration open to the community following completion of the training program recognizing the accomplishments of the trainees

may also help garner community acceptance and support. At the celebration, trainees may be granted the official title of “Village Emergency Health Worker” to give them a sense of legitimacy.

- ***Sustainability:*** Eventually the program should become self-sustaining, using a training of trainers model. This may be done first by training hospital staff (ECP nurses) to lead the lay training program and then by identifying outstanding participants in the lay training program and providing them with additional training to prepare them to take on the role of trainer/teacher. Turning over the continuation of the program from GECC to Ugandan hospital staff and community members increases the number of people the program and its effects can reach.
- ***Supervision/monitoring:*** Supervision of the trainees will be accomplished in two ways. First, when a patient is brought to Nyakibale Hospital by a trainee, the emergency room staff will interview the trainee to determine which skills were used and how the skills were performed. Data regarding patient status upon arrival and outcomes should also be collected for each patient transported by a trainee. Second, trainers will meet with trainees every 3-4 months to discuss skills used in the village and the outcomes of skill use, to answer trainee questions, and to refresh trainees on skills. If any skills are being infrequently used, the trainer should also explore reasons for this and continue to work on capacity building during meetings.
- ***Evaluation:*** Evaluation and feedback will be built into the program design. Following each unit, a short and informal Q&A and feedback session will be held. At the close of the program, a formal feedback session facilitated by a neutral party will occur to give participants the opportunity to provide candid feedback without trainers present. This feedback will be used to adapt the program prior to any subsequent training sessions.

## VII. Appendices

### *Appendix A: Training Schedule/Agenda*

Training Day Schedule	
Time	Activity
8:00-8:20	Welcome and Introduction
8:20-9:20	Learning Session 1
9:20-10:20	Learning Session 2
10:20-10:40	Tea Break
10:40-11:40	Learning Session 3
11:40-12:40	Learning Session 4
12:40-1:10	Lunch Break
1:10-2:10	Learning Session 5
2:10-3:10	Learning Session 6
3:10-4:10	Learning Session 7
4:10-4:30	Feedback Session
4:30-5:30	Certificate Presentation and Celebration

- **8:00-8:20:** Welcome and Introduction
- **8:20-9:20:** Learning Session 1—Basic Emergency Management. Trainees will learn the basics of emergency management, including performing a primary survey (with basic airway management), the importance of using universal precautions, and safe patient movement/basic spinal precautions. Trainees will also demonstrate the appropriate use of these skills.
- **9:20-10:20:** Learning Session 2—Hemorrhage Control. Trainees will identify dangerous blood loss and demonstrate methods by which to control bleeding in an injured person.
- **10:20-10:40:** Tea Break
- **10:40-11:40:** Learning Session 3—Fracture Splinting. Trainees will demonstrate appropriate splinting of fractures using locally available materials. (Note: there is no case discussion section for this session.)
- **11:40-12:40:** Learning Session 4—Burn and Wound Care. Using pictures of wounds and burns, trainees will describe the varying severities of these two types of injuries. Trainees will also understand how to treat each of these injuries using first aid supplies.

- **12:40-1:10:** Lunch Break
- **1:10-2:10:** Learning Session 5—Diarrhea. Trainees will recognize the signs of dehydration due to diarrhea and understand how to determine who needs oral rehydration solution. Trainees will be able to demonstrate how to make oral rehydration solution using measurements that are appropriate to the community.
- **2:10-3:10:** Learning Session 6—Danger Signs. In this session, trainees will learn to recognize danger signs—fever, convulsions, respiratory distress, and rash. Using case scenarios, trainees will identify common symptoms often seen in critically ill people and will recognize when danger signs that require immediate medical attention at the hospital are present.
- **3:10-4:10:** Learning Session 7—Obstetric Emergencies. Trainees will learn to recognize danger signs that occur during labor/delivery or the post-partum period that require immediate care from a medical facility.
- **4:10-4:30:** Feedback Session
- **4:30-5:30:** Certificate Presentation and Post-Training Celebration

### *Appendix B : Training Supply List*

- |  |   |
|--|---|
| <input type="checkbox"/> Easel   | <input type="checkbox"/> Pieces of wood (stretcher size; approximately the length of an adult)            |
| <input type="checkbox"/> Posterboards with case scenarios, pictures, and ORS instructions either handwritten/drawn or printed/glued on the posters | <input type="checkbox"/> Tarpaulins   |
| <input type="checkbox"/> Newspapers  | <input type="checkbox"/> Safety pins  |
| <input type="checkbox"/> Towels  | <input type="checkbox"/> 1 liter Nalgene bottles with laminated ORS picture instructions                  |
| <input type="checkbox"/> Blankets  | <input type="checkbox"/> Salt   |
| <input type="checkbox"/> Plastic bags  | <input type="checkbox"/> Sugar and/or maize flour   |
| <input type="checkbox"/> Tourniquet  | <input type="checkbox"/> Water  |
| <input type="checkbox"/> Cloth (to cut or tear into strips)  | <input type="checkbox"/> Bowls (bowls similar to those used in the village are preferable)                |
| <input type="checkbox"/> Bandage material  | <input type="checkbox"/> Cups to measure water (cups similar to those used in the village are preferable) |
| <input type="checkbox"/> Sticks/branches   | <input type="checkbox"/> Pre-printed certificates of completion   |

## Appendix C: Training Narratives and Case Scenarios

### ***Introductory Session***

The day of training begins with an introduction by the trainers and GECC coordinators. They say who they are and what their roles are. The trainees are asked to go around the room and share their name and why they chose to participate in this program. The discussion facilitators stress the importance of working as a team and respecting the experiences of the fellow trainees. The trainers/facilitators then formally congratulate the trainees on volunteering for this role, talk about how important their work is for the village, and outline the objectives and tasks for remainder of the day. They answer questions about the structure and logistics. In addition to highlighting the objectives and tasks for the training, the goal of the introduction and welcome session is to create a sense of group cohesion and identity so the trainees will continue to work together and collaborate after they have completed the training. The facilitators should also instill a sense of pride in this role and motivate participants to work hard with their learning so they can achieve the outcome of improved health in their village.

### ***Learning Session 1—Basic Emergency Management***

Trainees will learn the basics of emergency management, including performing a primary survey (with basic airway management), the importance of using universal precautions, and safe patient movement/basic spinal precautions. Trainees will also demonstrate the appropriate use of these skills.

#### *Didactic information*

The trainer explains that the primary survey is used when someone is hurt, very ill, or found unresponsive. The process of the primary survey should be thought of as a cycle—the survey is used to look for the main problem the patient is having; once the main problem is identified, the trainee can take steps to solve or help with the main problem; then, the survey should be repeated to look for the next main problem. The primary survey involves the following steps:

- Checking the ABCs—begins by determining if the patient is responsive (able to wake up or respond to voices). This is done by shouting the person's name, asking if he/she is okay, and gently shaking the person. If the person responds by talking, their airway is open, they are able to breathe, and they have a pulse. Some people may not be able to talk, but if they can move a finger or their eyes when asked to, this is also considered to be responsive. If the person is awake enough to understand you, explain what you are doing and why to help them feel at ease.
- If the person does not respond, the first step is to open the patient's airway ("A") and clear it of any obstructions. The most common obstruction in an unconscious person is the tongue. The safest way to move a person's tongue out of the way is to turn the patient onto one side (called "recovery position"); this also allows fluids to drain from the nose and mouth so that they do not hinder breathing. Make sure to turn the head, neck, and body at the same time as if the person were a log of wood (do not turn the neck alone) in case the person has hurt his/her neck or spine; this will likely require the help of another person. Once the person is on his/her side, you may also make sure there are not any objects in the person's mouth or throat that are blocking the airway. This is done by covering your hand (with gloves, a plastic bag,

- or a handkerchief) and using two fingers to sweep away anything in the person's mouth (demonstrate motion with fingers).
- The next step is to look, listen, and feel for breathing ("B"). This is done by leaning down close to the person with your ear hovering above the person's nose and mouth and your face looking toward the person's chest. Stay in this position for 5-10 seconds listening and feeling for the movement of air through the nose and mouth and watching for rise and fall of the chest wall consistent with breathing. You may also put your hand below the person's nose to feel if air is coming out. If no movement or air is felt/seen in 5-10 seconds, assume the person is not breathing. Keep the person on their side and get help from a nurse, doctor, or paramedic as soon as possible. Ask other people nearby to call or send for help.
  - After the person has been positioned on his/her side and breathing has been checked, if the person is still not breathing, coughing, or responding then the pulse is checked to determine if the heart is pumping and blood is circulating ("C" for circulation). The pulse is checked by placing the first two fingers against the person's neck in the space between the windpipe (trachea) and the muscles of the neck, where the carotid artery is located, and applying slight pressure for several seconds (trainer demonstrates this on self or volunteer). If a pulse is felt and the person is not breathing, the person needs help from a hospital as soon as possible. If no pulse is felt, have someone else call or send for help and stay with the injured person. People cannot live for more than a few minutes without a pulse and breathing; if you cannot get the person to the hospital very quickly, there may be nothing else you can do to help at this point.
  - If the person is not breathing and/or does not have a pulse, this is the main problem and the best next step is to take the person to the hospital.
  - If the person is breathing and has a pulse after the ABCs are checked, the next step is to look at the person's body to find the main problem. If the person is able to talk or point, ask him/her to tell or show you what hurts. Once the main problem is found (a wound, broken bone, etc.), take the appropriate steps to help fix the problem. Then, return to the beginning and make sure the person is still breathing and has a pulse before looking for another problem. Using this cycle to keep checking the person's status makes sure you do not miss a change in breathing or circulation.

The trainer explains to the trainees the importance of making sure they are protected from infections that the sick or injured person may have while providing aid to the person.

- Any time blood, vomit, urine, or other fluid from the body is involved, you should make sure you have protection on your hands. This includes during a primary survey if you will be putting your hands into the injured person's mouth. If disposable rubber or latex gloves are available, this is the best way to protect your hands. A clean plastic bag may be used if gloves are not available. If body fluids or blood are spraying or splashing, wearing a handkerchief tied around mouth and nose or a shirt pulled up to cover the face may serve as additional protection for the mouth and nose. If you have a cut, scrape, or wound on your own hands, arms, or uncovered area of the body, these should be covered with a dressing, tape, glove, or clothing to protect both the injured person and you from passing infections back and forth. If a

you come into contact with an injured person's blood or other fluids, wash your hands well with soap and clean water. If blood or fluids get into your eyes or mouth, wash well with clean water (soap may hurt your eyes).

The trainer then describes the best way to move an injured person to protect the neck and spine. Safety during transport in a vehicle is also described.

- In case a person has injured his/her neck, the neck position should be protected during movement and transport. This can be done by rolling a blanket and placing it around the neck and crossing it at the chest, with the ends tucked under the armpits.
- Moving the person can be accomplished by carrying the person with the help of two to three other people, making sure the body stays in line with the head and neck (as if they are a log of wood). Do not lift a person by their arms and legs; lift them by their torso. You should ask others nearby to help you and instruct them in what to do. Alternatively, a wooden board or tarpaulin may be placed under the injured person and lifted from both ends with the help of at least one other person.
- Once in a vehicle for transport, the person should be placed on a seat in recovery position. If only the person's arm or leg is injured, they may sit on the seat with the arm or leg in a splint (which we will discuss later). Drivers should be instructed to drive carefully and at a safe speed to prevent further injury to the person during transport.

During this session especially, and throughout the subsequent sessions, the procedure for seeking medical help is emphasized. The first aid responder should stay with the injured person and send someone nearby for help. The responder should ask the bystander to find a doctor or nurse, if on is available nearby, or to secure transportation from someone with a vehicle in order to take the injured person to the hospital (or, for some injuries/illnesses, to the health center). Ask the bystander to come back to the scene and confirm that transportation and/or help has been secured.

#### *Skills Demonstration*

The steps of checking the ABCs are demonstrated on a volunteer from the group as each step is explained again to the trainees. This may require assistance of at least one other volunteer to demonstrate putting the injured person into a recovery position. Once all of the steps of checking the ABCs have been described and demonstrated once to the trainees, the entire process is demonstrated again from start to finish to emphasize the cyclic nature of the process. Then the fashioning of a blanket into a basic cervical collar is demonstrated. With the assistance of two to three volunteers, the trainer then shows the group how to pick up and move an injured person once their neck is protected. If a tarpaulin or piece of wood is available, the stretcher technique should also be demonstrated. The trainers should make sure to wear gloves throughout the demonstration to emphasize the importance of universal precautions.

#### *Skills Station*

The trainees are divided into groups of four and each group member first dons either rubber gloves or clean plastic bags for hand protection. Then the group practices the ABCs skills, basic neck protection, and patient movement techniques on each other. The trainer rotates between the groups providing feedback and making sure that each individual understands the concepts and is able to correctly demonstrate the techniques.

*Case Discussion*

The group reconvenes to discuss a brief case scenario. The trainer reads the case and at the places indicated by parentheses, the trainer asks for the input of the trainees on the next appropriate step. The desired answer is given in the parentheses.

**Case Scenario 1:** A man riding a bicycle nearly gets hit by a mini-bus and swerves off the road. When you reach him, he appears to be unconscious. What do you do now? (*Check responsiveness by shouting and gentle shaking*) He does not respond to your voice. What is your next step in assessing this person? (*Place into recovery position and check for breathing and pulse*) He has a pulse and now that he is in the recovery position, he is breathing again. What is your next step? (*Look for injuries on the body and send someone to find transport to the hospital*) He indicates that his neck hurts. A truck has just arrived. What do you do now? (*Protect neck with rolled blanket. Ask bystanders to help you pick him up like a log and move him to the vehicle, placing him back in recovery position*)

**Learning Session 2—Hemorrhage Control**

Trainees will identify dangerous blood loss and demonstrate methods by which to control bleeding in an injured person.

*Didactic information*

The trainer explains to trainees that a person who has an open wound that is bleeding heavily may be in a life-threatening situation and needs immediate help.

- Wounds that are bleeding heavily often spurt blood or the blood continuously flows without stopping. Other signs that might be seen in a person who is losing a lot of blood are rapid breathing, cold/clammy skin, pale or dusky/blue skin, unusual behavior, sleepiness, or unconsciousness (unresponsive).
- If you are with someone who is bleeding heavily, first call for someone else nearby to find help/transportation for getting the injured person to the hospital. Then, before touching the person, make sure you put on gloves or wear clean plastic bags to protect your hands. If the person is awake and able to follow directions, he/she can apply pressure to their wound themselves. If the person is not responsive, place a clean cloth over the wound and apply firm pressure with both hands. Keep applying pressure until the person reaches the hospital. If the cloth becomes soaked, do not remove it. Add another piece of cloth on top and continue to apply pressure.
- If the wound is still bleeding, fold up another piece of cloth and place it over the wound. Then, tear a long strip of cloth or strong tape and wrap it around the wound over the folded cloth. Tie or secure tightly. This is called a pressure dressing. If the body part below the dressing begins to swell or change color, the dressing may be too tight. Do not completely untie or remove the dressing; just loosen it slightly.
- If blood is still flowing profusely from beneath the dressing, a tourniquet may be necessary. A tourniquet is a piece of cloth or elastic that is tied tightly above (closer to the heart) a wound to reduce blood flow beyond the level of the tourniquet. A tourniquet can be used around a leg or arm, but it cannot be used around the abdomen or neck because that would cut off the supply of oxygen to important body parts such as the brain. A tourniquet can also cause harm to an arm or leg if the blood supply is cut off for too long, so once a tourniquet is placed the person should be taken immediately to the hospital for further care.

- Wash your hands well with soap and clean water after aiding someone who is bleeding.

### *Case Discussion*

The trainer presents a case scenario to the group and asks trainees to identify which people in the case have life-threatening blood loss. The group discusses the signs presented in the case helped them decide which cases were severe (soaking through clothing, person who becomes pale, bleeding does not stop with pressure to the area).

**Case Scenario 2:** A mini-bus crashes and several passengers are injured. Some are gushing blood from their arms or legs. The blood is soaking through their clothing at a rapid pace and they are becoming pale. One man is bleeding from the abdomen and blood is soaking through his clothes; another man has blood gushing from his neck and he becomes pale. A few other passengers with gashes are crying in pain, but the blood is not enough to soak through their clothing and the bleeding stops if they hold pressure to the area with a cloth.

Additional case scenarios are then read to trainees. For each scenario, trainees discuss and decide what type of pressure (hands, pressure dressing, tourniquet) should be used. The trainer should emphasize the use of gloves/plastic for protection and the use of a tourniquet as a last resort during this exercise. Appropriate responses are given in parentheses.

**Case Scenario 2.1:** A mini-bus passenger has gushing blood coming from his arm. Holding pressure with hands fails to stop the bleeding (*apply a pressure dressing next*)

**Case Scenario 2.2:** A mini-bus passenger has blood gushing from his neck, it continues to bleed with pressure applied using hands (*do not apply tourniquet to neck, continue to hold pressure as best you can until the hospital is reached*).

**Case Scenario 2.3:** A mini-bus passenger has blood oozing from arm, holding pressure with hands slows the bleeding significantly (*do not apply additional pressure techniques, continue to hold pressure with hands until bleeding stops or the hospital is reached*).

**Case Scenario 2.4:** A passenger has blood oozing from a large wound in her abdomen that cannot be stopped by holding pressure with hands (*do not apply tourniquet anywhere other than a limb; continue to hold pressure with hands as best you can until the hospital is reached*).

**Case Scenario 2.5:** A young girl who was passing the mini-bus accident got a large gash on her leg from a flying piece of glass. The area is too large to hold pressure with hands, but is not bleeding rapidly and not soaking her clothing (*cover with clean cloth, have the girl apply pressure as needed until bleeding stops; take the girl to the hospital; do not apply tourniquet to non-hemorrhagic blood loss*).

*Skills Demonstration*

The trainer emphasizes that most cases of bleeding can be stopped with direct pressure to the wound using one's hands. The trainer demonstrates how to hold pressure on a wound with both hands, wearing gloves or a plastic bag to protect one's hands and placing a cloth over the wound before applying pressure. When bleeding is so severe that the blood continues to gush from under the hands, a pressure dressing can be used. The trainer demonstrates how to apply a pressure dressing using cloth strips. If bleeding continues to be heavy, a tourniquet may be necessary. The trainer then demonstrates how a person can quickly make a tourniquet from a piece of cloth as long as it is tied tightly enough to cut off the blood flow. The trainer demonstrates the proper way to place a tourniquet. Universal precautions should be re-emphasized during this exercise due to likely contact with blood.

*Skills Station*

The trainees then break into small groups of four to practice holding pressure with hands and placing pressure dressings and tourniquets on a partner. The trainer rotates between the groups providing feedback and making sure that each individual understands the concepts and is able to correctly demonstrate the techniques. The trainer should also emphasize at this point that pressure dressings and tourniquets should not be applied to the neck or abdomen. The trainer should also instruct trainees to remove the pressure dressings and tourniquets from their partner's limbs within one minute of placing them to prevent injury to other trainees.

**Learning Session 3—Fracture Splinting**

Trainees will demonstrate appropriate splinting of fractures using locally available materials. (Note: there is no case discussion section for this session.)

*Didactic information*

The trainer describes the signs of a fracture and the steps that should be taken if a broken bone in the arm or leg is suspected.

- The signs of a fracture include pain at affected area, deformity (limb appears misshapen/odd), inability to bear weight with affected limb (someone with a broken leg usually will not stand on the leg), and a grating sensation or sound with movement of injured area. Some fractures may be "open," which means there is a cut in the skin that exposes the bones below (i.e. the bone is sticking out of the skin). This type of fracture is an emergency and the injured person needs to be taken to the hospital as soon as possible.
- If a fracture is bleeding, apply pressure or a pressure dressing as previously discussed.
- Do not try to straighten a limb that looks odd or dislocated. This may cause greater injury.
- If you suspect a broken arm, have the person hold his/her arm close to the body and turn up the bottom edge of his/her shirt or clothing and pin it above the arm to fashion a sling.
- If you suspect a broken leg, do not let the person stand on it. Keep the leg still by splinting it. This can be done by bringing the injured leg close to the other leg, filling the gaps between the legs with fabric/cloths/padding and use strips of cloth to tie the legs together. Alternatively, pieces of cardboard or folded newspaper can be wrapped around the leg (extending above and below the injured area) and secured by wrapping tape, cloth strips, or string around the splint and tying the ends. The goal is to prevent the injured person from moving the limb until he/she has reached the hospital for additional care.

*Skills Demonstration*

First, the trainer demonstrates how to fashion a sling for an arm using the shirt a person is wearing and a safety pin. Then the trainer demonstrates making a splint out of cardboard or newspaper and tape, cloth strip, string, or whatever else is available to secure the splint. To make a splint, a piece of stiff cardboard is cut long enough to cover both the joint above and below the fracture site. It should be wide enough to wrap about  $\frac{3}{4}$  of the way around the person's leg. A thick stack of newspapers can also be folded to form a splint. Once the cardboard piece is ready, it is placed underneath the leg. Two pieces of duct tape (sticky side facing up) or two cloth strips/strings are placed under the cardboard on either end, about 3-4 inches from the end of the splint. Then the cardboard piece is wrapped up around the limb and secured either with the tape or by tying the ends of the cloth strips/strings.

*Skills Station*

The trainees are divided into small groups of four to practice making slings and splints on each other. The trainer rotates between groups to give feedback and to make sure each participant understands the techniques and is able to correctly demonstrate the skills.

**Learning Session 4—Burn and Wound Care**

Using pictures of wounds and burns, trainees will describe the varying severities of these two types of injuries. Trainees will also understand how to treat each of these injuries using first aid supplies.

*Didactic information*

- *Wound care:* The trainer shows the trainees pictures of varying degrees of lacerations. Cuts with separated edges that are not easily pinched together, deep enough to see yellow fatty tissue (subcutaneous tissue), or those resulting from injury with dirty objects may require additional medical attention such as stitches or tetanus vaccines. People with these types of wounds need to be taken to the clinic or hospital. More superficial cuts/scrapes can be cared for in the village. Wound care involves a five-step process: (1) the person providing first aid washes his/her hands and puts on gloves or plastic bags for protection, (2) pressure is applied to the wound if it is bleeding, (3) the cut is washed with clean water until you cannot see any foreign material (dirt) in the wound, (4) antibiotic ointment is applied if available, and (5) the cut is covered with clean cloth or gauze and taped to the skin. The bandage should be changed every 2-3 days and the wound rinsed with clean water to keep it free of dirt and infection. Once covered with a bandage or dressing, the wound should be kept dry.
- *Burn care:* The trainer shows the trainees pictures of varying degrees of burns and explains that burns can be very serious if not properly cared for. First degree burns, or superficial burns, are red and painful with some swelling. These can be treated in the village. Second degree burns have a deeper, more intense redness along with blistering of the skin and swelling. These burns are extremely painful. Second degree burns can also often be treated in the village with some exceptions, which are listed below.
- Third degree burns may be painless despite being much more serious. The area may appear charred (black) or ash-colored (white and dry), and blistering may be present around the edges (this area may be extremely painful if it is less severely burned). People with third degree burns should be immediately taken to the hospital. Do not remove burned clothing

(as long as it is no longer on fire) and do not submerge a third degree burn in water. Cover the burn with a moist, cool, clean cloth or bandage if possible.

- Medical attention at the hospital should be sought immediately if any of the following conditions are met:
  - The injured person is less than 5 years old or over 65 years old
  - The burn is on the face, ears, hands, feet, sexual organs, or joints
  - The burn circles the entire limb, body, or neck
  - The burn looks black, white, papery, hard and dry (third degree)
  - The injured person has no feeling in the wound itself (third degree)
  - The burns were caused by electricity or chemicals
  - The injured person inhaled flames or heat, or breathed in a lot of smoke
  - Clothing or jewelry is stuck to the skin
- Treatment of burns involves first making sure the injured person is no longer on fire. If clothing is on fire, you may douse it with water. Having the injured person roll on the ground will also put out a fire on clothing. Keep the person from running around. Then, use cool clean (if possible) water to cool off the burn. Pour water on the burn for 15-20 minutes or until it stops hurting. Remove clothing and jewelry if it is not stuck to the skin. Put a damp or wet dressing (clean cloth, gauze, etc.) over the burn and secure with tape or a bandage. The dressing should be changed daily; soak the dressing in clean water before removing it so that it does not stick to the wound.

### *Skills Demonstration*

The trainer demonstrates the five-step process of caring for a cut or a wound on a volunteer trainee. First, the trainer washes his/her hands and then puts on gloves or plastic bags for hand protection. Then, pressure is applied to the cut with a gauze pad or clean piece of cloth to stop any bleeding. Then the cut is flushed out with clean (boiled and cooled) water until there is no longer visible dirt in the wound. Once the cut has dried, antibiotic ointment is applied. Finally, the cut is covered with a gauze pad that is taped or bandaged to the skin. The dressing should be changed every 2-3 days and the wound rinsed with clean water to keep it free of dirt and infection.

Next the trainer demonstrates treatment of a minor (first degree, mild second degree) burn using a trainee volunteer. The trainee demonstrates rolling on the ground to extinguish a fire. Then the trainer holds the burn under clean cool running water, explaining that in a real-life situation this should be done for 15-20 minutes or until the pain subsides. The burn is loosely with a wet gauze or cloth to keep air off the burn.

### *Skills Station*

Once all of the skills are demonstrated, the trainees divide into small groups of four. Each group receives first aid supplies and practices wound and burn care on each other, using the provided materials. The trainer rotates through each group to ensure they are on the right track and to give feedback.

### *Case Discussion*

Using two contrasting case scenarios, the trainer leads a group discussion about the severity of the wounds/burns presented in the cases, the signs that are concerning (if any) in each case, and the appropriate treatment. (Note: Points that should be made during the discussion follow each case in bullets)

**Case Scenario 4.1:** A farmer cut his hand on a rusty nail two days ago. The bleeding stopped soon after he was cut but now he notices that the area is red, hot, and painful. His body starts feeling hot and he shivers. He notices that some green/yellow fluid seeps out of the wound.

- Rusty nail—the farmer needs a tetanus shot or else his whole body may tense to the point where his bones could break and he might not be able to open his mouth
- Red, hot, painful—signs of infection
- Feeling hot and shivering—signs of infection
- Green/yellow fluid—sign of severe infection that needs to be drained
- Treatment—this man needs hospital care now (antibiotics for the infection, tetanus shot, and cleaning and draining of the wound); at the time of the cut, should have washed the cut with clean water and bandaged it; cuts with rusty or dirty metal may require tetanus shot from the health center or hospital

The trainer then presents the second case for comparison. Trainees describe how the events of this case differ from the previous case and what the appropriate treatment is for this type of wound.

**Case Scenario 4.2:** A woman cuts her finger on a clean knife while preparing food for her family. The cut stops bleeding within a few minutes and is not very deep. Within one day it has formed a scab. She is able to move her hand and it is not warm, tender, or red.

- No signs of infection
- Object of injury (knife) was clean, without rust or dirt
- Treatment—wash the wound with clean water, apply dressing and change every 2-3 days

### ***Learning Session 5—Diarrhea***

Trainees will recognize the signs of dehydration due to diarrhea and understand how to determine who needs oral rehydration solution. Trainees will be able to demonstrate how to make oral rehydration solution using measurements that are appropriate to the community.

#### *Didactic information*

The trainer explains the causes of diarrhea, the signs of mild, moderate, and severe dehydration, and when oral rehydration solution (ORS) is necessary.

- Diarrhea is usually caused by an infection. This type of infection can be caught by not washing your hands, touching feces, eating unsafe food, drinking unclean water, eating food prepared with unclean water, or eating food that has gone bad.
- Diarrhea causes dehydration because too much water and nutrients are leaving the body through the stools. Dehydration can be dangerous if not treated.
- Signs of mild to moderate dehydration include dry mouth, sleepiness, thirst, decreased urine output (no wet diapers for >3 hours in infants, >8 hours without urination in older children), few/no tears when crying, dry skin, headache, constipation, dizziness or lightheadedness, and fussiness or irritability.
- Severe dehydration is an emergency and the child/person should be taken immediately to the hospital. Signs of severe dehydration include extreme thirst, extreme fussiness or

sleepiness, very dry mouth/skin, lack of sweating, little or no urination (dark/amber colored urine if any), sunken eyes, shriveled skin that “tents,” sunken fontanel (infants), rapid heart rate, rapid breathing, no tears when crying, fever, and unconsciousness.

- Medical care should be sought immediately if any of the following signs are present:
  - Very bad diarrhea or blood in the diarrhea
  - Great sleepiness, difficulty waking up, confusion
  - Vomiting everything
  - Convulsions or fits
  - Breathing seems wrong
  - Dark urine, sunken eyes, dry mouth, and crying without tears
  - Not drinking anything
  - Fever with the diarrhea
- At the first signs of diarrhea, dehydration can be prevented by giving the ill child/person plenty to drink. Oral rehydration solution (ORS) is a special rehydration drink that can be purchased from a pharmacy in sachets, or can be made at home if sachets are not available.
- Homemade ORS can be made by combining two fistfuls of maize flour (60g) with one bowl (1 liter) of **clean** (boiled and cooled) water, plus two pinches of salt. Alternatively, one fistful of sugar can be combined with one bowl of **clean** water and one pinch of salt. Mix the solution well. The maize solution can be stirred continuously until boiling, then cooled and given to the ill person.
- ORS should be started after a child/person has 3 or more loose stools in one day. Administer ORS by spoon or small sips and offer child as much as he/she will accept (1 spoonful every minute if tolerating). If the child vomits, wait 10 minutes and then try again, offering 1-2 spoonfuls every 3-5 minutes. Even when a child is vomiting, continue to give ORS because there is enough time between vomiting episodes for some of the solution to be absorbed.
- Solution should be given after every loose stool. Children under 2 years old should get about  $\frac{1}{4}$  to  $\frac{1}{2}$  a large cup per serving. For children 2-10 years old, the goal is  $\frac{1}{2}$  to 1 large cup per serving. For older children and adults, at least one large cup per serving is ideal. Adults may require up to 3 liters/day.
- If the child is breast feeding, continue to breast feed in addition to providing ORS. If the child is eating solid foods, continue to feed the child as he/she tolerates in addition to providing ORS. ORS does not provide enough calories alone to sustain life.
- A new batch of ORS should be made each day. Throw away unused solution at the end of the day.
- Continue ORS until diarrhea has stopped. ORS does not make diarrhea stop. It prevents the dangerous dehydration that can result from diarrhea.
- If zinc is available at the pharmacy, adding zinc to the ORS solution may shorten the duration of the diarrhea episode.

Signs of diarrhea should be monitored for improvement during rehydration with ORS.

- Return of normal frequency of urination (wet diaper less than every 3 hours in infants, urination 4-5 times/day for older children) and urine that is pale yellow to clear in color indicate that the child is hydrated.
- Other signs include return of moistness of mouth and skin, increased alertness, return of tears when crying, and decreased irritability.

- Once rehydrated, pinching the skin should no longer result in “tenting” of the skin. Skin should spring back into its normal position rapidly.
- With rehydration, diarrhea usually resolves in 3-4 days.
- When loose stools stop and bowel movements return to normal, ORS may be stopped.
- If diarrhea increases, stools are bloody, vomiting persists, the child develops a fever, the child is extremely lethargic/unconscious, or the child looks very ill, he/she should be immediately taken to Nyakibale Hospital to receive IV fluids and antibiotics. Continue to provide ORS during transport to the hospital.

### *Skills Demonstration*

The trainer once again explains the purpose of ORS. ORS is a drink that can be prepared at home to prevent the dangerous loss of fluid and nutrients when someone has diarrhea. ORS is better than plain water because it replaces lost electrolytes and makes the water easier for the body to absorb. ORS is not a cure for diarrhea, but it prevents some of the dangerous side effects of dehydration that comes from diarrhea.

The steps for making oral rehydration therapy are first described using the graphics on the ORS poster (Appendix D). Then the measurement of 1 liter of water in the water bottles provided is explained and demonstrated. A second method for measuring one liter of water is to pour 5 cupfuls of water into a bowl. This should also be explained and demonstrated. It should be stressed that hands should be cleaned in preparation of making ORS, the containers to be used for preparing the solution and drinking the solution should be cleaned before use, and the water to be used in making ORS should come from the cleanest source possible. If a safe, clean water source is not available, the water should be boiled and then allowed to cool before mixing the solution and giving it to a child.

Next, the measurement of the sugar and salt, or maize flour and salt, is demonstrated. An open fistful of sugar is picked up using a four-finger scoop and added to the liter of water (two fistfuls for maize flour). The salt is pinched between the first two fingers and the thumb (a three finger pinch) and added to the water (two pinches if using maize flour). Then the solution is mixed, either by shaking the bottle or stirring the water, until the salt and sugar dissolve. If maize flour is used, the solution should be heated in a pan (not in the water bottle) and stirred until well mixed. It is important for the trainees to know that too much salt in ORS can be harmful for a child and too much sugar can make the diarrhea worse. The solution should not taste any saltier than tears.

The trainer should show trainees what an ORS sachet looks like and how to mix it with water. If zinc can be obtained, it should also be added to the solution. A small amount of orange juice (1/2 cup) or a smashed up banana can also be added to the solution for both flavor and potassium, which is also often depleted during episodes of vomiting and diarrhea.

### *Skills Station*

Trainees are then given their own bottles and supplies to practice making ORS. This is done in small groups of four trainees. The trainer observes groups as they practice, gives feedback, and makes sure each participant can appropriately make ORS.

### *Case Discussion*

The trainer presents the following case scenarios to the trainees and initiates a discussion on the severity of the diarrhea in the case and the best next step to take. If ORS is required for a case, the trainer will ask a trainee to volunteer to explain again the process of making ORS and administering

the solution to an ill young child, older child, and adult. (Note: Points that should be made during the discussion follow each case in bullets)

**Case Scenario 5.1:** A child has been having diarrhea for 3 days. She is fussy but continues to make wet diapers, plays with other children, and eats when offered food. How dehydrated is the child? What is the next best step in treating the child?

- Mild dehydration
- ORS should be given after each loose stool
- For a 3 year old, ½ to 1 full cup should be given at each serving
- Continue to offer the child food as usual

**Case Scenario 5.2:** A child with diarrhea is having 5 loose stools per day. The diarrhea started about 2 days ago. The child's mother states that child seems sleepy and she is having difficulty feeding the child because he keeps vomiting. He is irritable and but his mother says she only sees a few tears when he cries. How dehydrated is the child? What other information would you like to know from the mother? When should ORS have been started?

- Moderate dehydration
- Would like to know how often the child is having wet diapers
- ORS should have been started after the child had 3 loose stools in one day (from the beginning of the diarrhea episode)

### **Learning Session 6—Danger Signs**

In this session, trainees will learn to recognize danger signs—fever, convulsions, respiratory distress, and rash. Using case scenarios, trainees will identify common symptoms often seen in critically ill people and will recognize when danger signs that require immediate medical attention at the hospital are present.

#### *Didactic information*

**Fever:** Fevers can be a sign of serious illness. Any person with a fever needs to be seen by a doctor or nurse to determine the cause of the fever. Fevers may be caused by many illnesses, but fevers due to malaria or pneumonia (lung infection) can be particularly dangerous if they are untreated. Medical help for a fever is especially important for babies, children, and women who are pregnant. If the following signs are present, take the ill person **immediately** to the hospital:

- Cannot take medications
- Convulsions/fits (may be the result of the fever or a serious infection such as malaria or meningitis)
- Very sleepy, difficult to wake up, or confused
- Vomiting everything
- Dehydrated (sunken eyes, crying without tears, less urine, dark urine, cannot drink)
- Cannot stand or sit up (weak)
- Baby is floppy or too weak to be carried
- Fast breathing
- Difficulty breathing (worry for pneumonia)

- Whistling noise when breathing (worry for pneumonia)
- Bleeding spontaneously (thin blood—worry for malaria)
- To take care of a person with a fever, encourage the person to rest and drink plenty of clean liquids (water, tea). Babies should continue to breast or bottle feed, and should drink more than usual if they will tolerate it. Seek medical care to determine the cause of the fever. Keep the ill person dressed enough to prevent shivering, but not too warmly or the fever could increase. You may sponge the ill person with lukewarm water if tolerated (do not use cold water). If available, you may give the ill person an anti-fever medication (caution in babies and young children; ask your doctor for medical advice).

***Convulsions/fits:*** A person is having a convulsion or a fit if he/she starts suddenly shaking uncontrollably. This is different than normal shivering or trembling. It may appear in the person's arms and legs, or even just in one limb. A person having a fit will not respond to his/her name being called or questions being asked. During or after the fit, the person may urinate, stool, or vomit without control. Convulsions or fits can be caused by many things—high fevers, malaria infection, alcoholism, or drugs. Any person having a convulsion or fit should be taken immediately to the hospital or health center. This is especially true in the following situations:

- It is the person's first fit
- The fit lasts longer than 5 minutes
- The person has more than one fit and does not wake up in between them
- The person has a high fever
- The person is alcoholic or has taken drugs
- During a convulsion or fit, there are some things that you should absolutely NOT do. Do not try to hold the person down. Do not put anything in his/her mouth. This is dangerous for the person having the fit. A person having a fit may bite his/her own tongue, but this will usually heal quickly. Putting an object or a hand in the mouth may cause the person to choke or cause injury to your hand.
- To help a person having a convulsion or fit, keep the person away from objects that could cause him/her harm. If possible put something soft under his/her head. When the fit stops, place the person in the recovery position (from Learning Session 1) to make sure he/she can continue to breathe freely and prevent any vomit from being breathed in. If the fit was caused by a fever, follow the protocol for caring for a fever AND seek medical care.

***Respiratory distress:*** Fast breathing or difficulty breathing may be caused by multiple illnesses. People with fever will often breath fast. Asthma, pneumonia, tuberculosis, and whooping cough are illnesses that may cause difficulty breathing. Sometimes people with asthma or pneumonia will make a whistling or wheezing sound when they breathe. This sound means that they are having trouble getting enough air into their lungs. People who are having a hard time breathing will often lean forward while sitting and place their hands on their knees (tripod position). You may also see the muscles on their neck or chest moving in and out with their breaths. If a person has trouble breathing and is not getting enough air it can be a life-threatening condition. If the person stops breathing, he/she can only live for a few minutes without air. Any person who is struggling to breathe should be taken immediately to the hospital for treatment. This is especially true if any of the following sign are also present:

- Dusky blue color around lips

- Fever
  - Cough with yellow-green phlegm
  - Rash plus runny nose, cough, or red eyes
  - Weakness, sleepiness, or unconsciousness
  - A child is not interested in eating or drinking
  - Child or baby makes grunting noises while breathing
  - Different illnesses may have different patterns of unusual breathing. Some examples include:
    - Asthma—rapid, shallow breathing with wheezing when air leaves lungs
    - Pneumonia—rapid, shallow breathing with coughing; this person would also likely have a fever
    - Apnea (interrupted breathing)—gasping followed by long periods without breathing (occurs in people with decreased consciousness, meningitis, severe malaria, or other illnesses affecting the brain)
- (Note: The trainer may demonstrate these breathing patterns for the trainees so they understand what an unusual breathing pattern looks and sounds like)

**Rash:** Rashes are common in many childhood illnesses. The illness we worry about the most when a rash shows up on a child is measles. If a child has a fever, a rash, and any of the following signs, he/she may have measles:

- Runny nose
- Red eyes
- Cough
- Measles can cause death or other complications such as blindness, malnutrition, deafness, lung disease, or brain damage. Immediate medical care should be sought at the hospital if any of the following signs are also present:
  - Child is not drinking
  - Vomiting everything
  - Diarrhea
  - Very sleepy, difficult to wake up
  - Fast breathing
  - Child will not open eyes in the light
  - Earache, ear drainage
  - Eye infection
  - Sores in the mouth
  - Spontaneous bleeding or small spots of blood in the skin
- A child with a fever and a rash should be kept away from other children. First aid for fever may be given. If the child develops diarrhea, begin giving ORS. The child should be taken to a doctor or nurse to determine the cause of the fever and rash, and to be treated with appropriate medications if necessary. If the list of dangerous signs above are not present, the child can be taken to a health center instead of the hospital.

*Case Discussion*

The trainer presents cases to the group that reflect each of the danger signs discussed. For each case, trainees identify the danger signs, why they are concerning, and what should be done for the ill person. (Note: Points that should be made during the discussion follow each case in bullets).

**Case Scenario 6.1:** A young child has stopped eating and playing. He appears very pale and seems too weak to make very many movements. His body feels very hot and sometimes he is seen shivering. He is very fussy and cries easily but over the course of the day he is so weak he stops crying. His neck is stiff and he does not move his head much.

- Stopped eating and playing—child is showing that he feels too sick to act like other babies
- Appears pale—may be anemia from malaria, bleeding, or dehydration.
- Too weak to make movements—the child is very sick and will need medical care to regain strength
- Body feels hot and is seen shivering—child has a fever and may need antibiotics
- Fussy and cries—may be a sign that the child is sick, possibly dehydrated
- Too weak to cry—sign that the child is very ill and likely dehydrated
- Stiff neck—very concerning and severe symptom that could mean a life-threatening infection in the brain or spinal cord or a life-threatening case of malaria.
- This child should be immediately taken to the hospital. Fever treatment may be tried on the way to the hospital.

**Case scenario 6.2:** A child has started to complain of feeling hot and shivering and has severe body aches everywhere. She continues to play but is less active than usual and starts sleeping more.

- Feeling hot and shivering—sign of a fever
- Body aches—may be from an infection, possibly malaria
- Less active—child may be sleepier than usual or feeling weak. This may be due to an infection or dehydration.
- This child should be taken to the hospital for medical care and to determine what is causing her fever. Fever treatment may be given on the way to the hospital.

**Case Scenario 6.3:** A young boy complains of feeling hot, weakness, and vomiting everything. During the day, he becomes sleepy and is difficult to wake up. His mother suddenly notices that his arms and legs are jerking and shaking. He does not respond to her when she calls his name. He shakes for about one minute. When the shaking has stopped, he does not wake up and respond right away. His mother notices that he urinated during the episode.

- Fever, weakness, vomiting—concerning for an infection, possibly malaria
- Sleepiness and difficulty waking—may be from dehydration (from vomiting), the fever, or from malaria complications. Complications of malaria may affect the brain; this is very concerning and requires immediate medical care.
- Extremities jerking, unresponsive, uncontrolled urination—these are all signs of convulsions or fits; this may be the result of the fever alone, complications of malaria, or a serious infection in

the brain called meningitis. Anyone with convulsions or fits should be taken quickly to the hospital.

- Place something soft under person's head during the episode if possible. Once the fit ends, place the person in the recovery position. Take the person to the hospital as soon as possible for care.

**Case Scenario 6.4:** An adolescent is having a very hard time breathing and wheezing sounds are heard from her chest. She is initially red from all of her work breathing hard but her lips start turning a dusky blue color.

- Hard time breathing—this is an emergency and she needs to get to the hospital immediately
- Wheezing sounds—the girl is not moving air in her chest and will need assistance only available in the hospital
- Lips turning a dusky blue—she is getting close to not breathing. This is a sign that she might not survive unless she gets to the hospital immediately.
- With fever present—concerning for pneumonia, which requires antibiotic treatment at the hospital.

**Case Scenario 6.5:** A young child feels hot to the touch, has a cough, and a runny nose. During the day, her mother notices that her eyes appear red and she becomes very fussy. Three days later, the child is still not feeling well. The mother sees red spots along the child's hairline that spread over the next few hours onto her face, neck, and chest. The child feels even hotter to the touch, is crying more, and develops diarrhea.

- Combination of fever, cough, runny nose, and red eyes—concerning for measles. This child should be kept away from other children.
- Rash on face that moves toward the body—this is typical of a measles rash. The rash usually appears a few days after the fever and other symptoms start.
- Increased fever—the fever often spikes higher once the rash appears.
- Diarrhea—may occur with measles infections; prevent dehydration with ORS
- The child should be taken to the health center to determine the cause of the fever and rash definitively. Anti-fever treatment may be given prior to reaching the health center.
- If the child gets any worse or has any of the danger signs discussed previously (fast breathing, extreme sleepiness, vomiting, diarrhea, earache, avoiding light, etc.), or the if the fever gets worse, the child should be taken immediately to the hospital for emergency care.

#### *Resource Discussion*

At the end of the session, the health care resources available to the community are discussed. This includes the services provided by the community health centers (HC II and HC III), as well as their locations within the county. The services provided at Nyakibale Hospital's emergency department are also described and explained. The trainer emphasizes that all of the conditions discussed thus far in the program that require immediate transfer to the hospital should be taken specifically to the emergency department, where the staff is prepared to quickly care for people with life-threatening problems.

### **Learning Session 7—Obstetric Emergencies**

Trainees will learn to recognize danger signs that occur during labor/delivery or the post-partum period that require immediate care from a medical facility.

#### *Didactic information*

The trainer explains that although pregnancy is a very common occurrence for women and giving birth is a natural part of life, sometimes the delivery of a baby can threaten the life of the mother. Serious problems that can occur during delivery or soon after the baby is delivered include the following:

- Fever and weakness, due to infection of the womb or bloodstream
- Pain in the belly/low back and/or bad smelling substance coming from birth canal
- Heavy bleeding from the birth canal
- Convulsions/fits
- Severe headaches with blurry vision
- The mother feels her heart beating too hard or with an unusual/irregular pattern
- Nausea and vomiting
- Fainting or dizziness
- The afterbirth is incompletely delivered or has not been delivered within one hour of the birth of the baby

If any of these danger signs are noticed during or shortly after the birth of a baby, the mother should be taken immediately to the emergency department at the hospital. Anti-fever treatment or care for convulsions may be given during transport to the hospital if possible. If the baby must travel with you and the mother to the hospital, make sure to keep the baby warm, covered with a blanket and a cap, and protected from sunlight. Encourage the mother to breast feed during the journey.

The baby may also have serious problems that require immediate medical care. If any of the following symptoms are present in the baby, take him/her to the emergency department:

- Baby is very small
- Difficulty breathing
- Convulsions/fits
- Fever
- Feels cold
- Bleeding from cord stump
- Is unable to breast feed

#### *Case Discussion*

The trainer reads the following cases to trainees. Trainees identify the concerning symptoms in each case and discuss the next best steps to take in each case. The trainer provides additional information about the conditions presented in the cases as outlined in the bullet points.

**Case Scenario 7.1:** A pregnant woman is nearing the expected birth of her baby. She complains of headaches, blurry vision and dizziness. She spends the day in bed, but begins to feel worse and starts to have pain in her belly and vomiting.

- Worrisome signs—headache, blurred vision, dizziness, vomiting, belly pain
- Next step—take the woman to the hospital

- These are signs of a condition called preeclampsia. If not treated immediately, this may develop into eclampsia and the mother may have convulsions/fits or heavy bleeding. This is very dangerous for both the mother and the baby and needs to be treated immediately at the emergency department.

**Case Scenario 7.2:** A mother gives birth to a healthy baby. She is awaiting the delivery of the afterbirth, but it is taking a longer time than expected. When it is finally delivered, a part of it appears to be missing. The next day, she complains of feeling hot, vomiting, weakness, and belly pain. She has also noticed a foul-smelling substance coming from her birth canal.

- Concerning symptoms—fever, vomiting, weakness, belly pain, and vaginal discharge
- Next steps—anti-fever treatment may be given if available; the woman should be taken to the hospital immediately
- The afterbirth took a long time to be delivered and was incompletely delivered. This led to an infection of the womb that made the mother very ill. She should be taken immediately to the emergency department for treatment.

**Case Scenario 7.3:** A mother has just given birth to a healthy baby. The afterbirth also appeared to be delivered successfully. However, the mother continues to have blood flowing out of her birth canal. She starts to feel dizzy and weak and her skin looks pale and feels clammy.

- Concerning symptoms—blood loss, weakness, pale skin
- Next steps—This woman is bleeding heavily and needs immediate medical care at the emergency department.
- Bleeding after the birth of a baby may be due to a tear in the womb or birth canal, part of the afterbirth still in the womb, or a womb that has trouble tightening back up to its normal tone (demonstrate muscle contraction of arm to explain tone) to stop the bleeding. Heavy bleeding is a life-threatening condition, especially when the blood is coming from an area where pressure cannot be applied. Emergency medical care is needed.

### ***Feedback Session***

The feedback session is led by GECC volunteers and interpreters. They start by explaining that the session is a chance for trainees to talk about what they want to improve in the training, what they like about the training, and if they can see themselves performing the tasks they are learning. The trainees may be broken into five smaller groups of four people each (two couples) and discuss the questions among themselves; this may provide a more comfortable environment for expressing opinions. The GECC volunteers/interpreters walk around to each group, making note of the feedback from the group.

### ***Certificate Presentation and Post-Training Celebration***

Trainees are honored at a certificate ceremony followed by a celebration. All of these events are open to the entire village to serve as a promotion of the program so villagers will look to the new Village Emergency Health Workers as authorities on emergency care. The trainer will give opening

remarks and tell the villagers about the goals of the program to train Village Emergency Health Workers to be a first line for treating emergency conditions and helping transfer patients to the Nyakibale emergency department. Then, each trainee is named individually and given a certificate of completion of the program (Appendix E). The trainer announces congratulations to each newly qualified Village Emergency Health Worker. There is music and dancing following the ceremony.

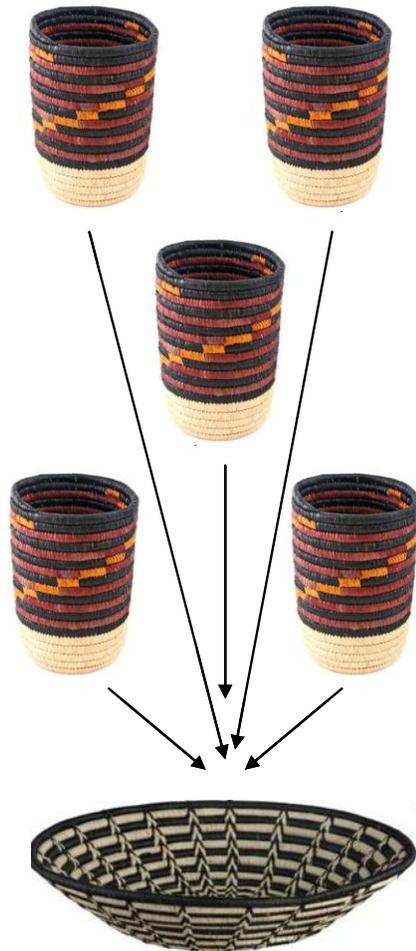
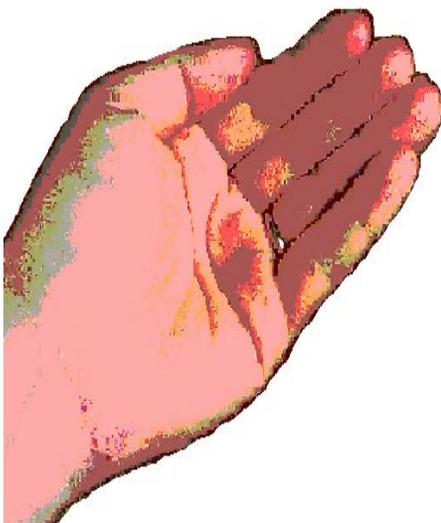
*Appendix D: Oral Rehydration Solution Instructions*

**How to Make Oral Rehydration Solution**

**1 pinch of salt**



**1 fistful of sugar**



**1 liter of water**

**= 5 cups**



Appendix E: Sample Certificate of Completion

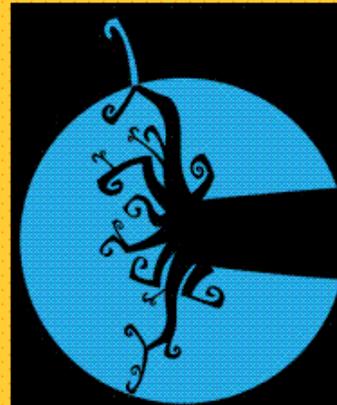


**CERTIFICATE OF COMPLETION**  
**VILLAGE EMERGENCY HEALTH WORKERS PROGRAM**

This certificate is awarded to

**NAME OF RECIPIENT**

In recognition of earning the title of  
Village Emergency Health Worker.



**GLOBAL**  
**EMERGENCY CARE**  
**COLLABORATIVE**

\_\_\_\_\_  
*Signature*

\_\_\_\_\_  
*Date*

\_\_\_\_\_  
*Signature*

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*Date*

## VIII. References

1. Our Vision. *Global Emergency Care Collaborative*. Accessed 16 March 2012 at <http://globalemergencycare.org/blog/our-vision>.
2. Blake A. *Feasibility assessment of a proposed pilot program: Uganda prehospital emergency resources (PER) Project (Draft One)*. Unpublished manuscript, Global Emergency Care Collaborative 2011.
3. Sikka N, Margolis G. Understanding diversity among prehospital care delivery systems around the world. *Emergency Medicine Clinics of North America* 2005; 23:99-114.
4. Hammerstedt, H. *A Resource Utilization Question: Programming for Fulfilling the Emergency Care Continuum in the Developing World; A Ugandan District Case Study*. Unpublished thesis manuscript, Harvard School of Public Health 2008. Accessible online at <http://globalemergencycare.org/blog/our-vision>.
5. Geduld H, Wallis L. Taxi driver training in Madagascar: the first step in developing a functioning prehospital emergency care system. *Emergency Medicine Journal* 2011; 28:794-796.
6. Husum H, Gilbert M, et al. Rural prehospital trauma systems improve trauma outcome in low-income countries: a prospective study from North Iraq and Cambodia. *The Journal of Trauma* 2003; 54(6):1188-1196.
7. Tinuade O, Iyabo RA, Durotoya O. Health-care-seeking behaviour for childhood illnesses in a resource-poor setting. *Journal of Paediatrics and Child Health* 2010; 46:238-242.
8. Kyomuhendo GB. Low use of rural maternity services in Uganda: impact of women's status, traditional beliefs, and limited resources. *Reproductive Health Matters* 2003; 11(21):16-26.
9. Razzak JA, Kellermann AL. Emergency medical care in developing countries: is it worthwhile? *Bulletin of the World Health Organization* 2002; 80(11):900-905.
10. Hofman K, Primack A, et al. Addressing the growing burden of trauma and injury in low- and middle-income countries. *American Journal of Public Health* 2005; 95(1):13-17.
11. Murray CJL, Lopez AD. *The Global Burden of Disease: A Comprehensive Assessment of Mortality and Disability from Diseases, Injuries, and Risk Factors in 1990 and Projected to 2020*. Cambridge, Mass: Harvard University Press; 1996.
12. Jayaraman S, Mabweijano JR, et al. Current Patterns of Prehospital Trauma Care in Kampala, Uganda and the Feasibility of a Lay-First-Responder Training Program. *World Journal of Surgery* 2009; 33:2512-2521.
13. Mock CN, Jurkovich GJ, et al. Trauma mortality patterns in three nations at different economic levels: implications for global trauma system development. *The Journal of Trauma* 1998; 44:804-814.
14. Mock CN, Tiska M, et al. Improvements in prehospital trauma care in an African country with no formal emergency medical services. *The Journal of Trauma* 2002; 53:90-97.
15. Sasser S, Varghese M, Kellermann A, Lormand JD. *Prehospital trauma care systems*. Geneva, World Health Organization, 2005.
16. Dobson M, Wilkinson D. *Primary life support: a proposal to increase survival and reduce disability following trauma in developing countries*. Oxford, 1996.
17. Husum H, Gilbert M, Wisborg T. Training pre-hospital trauma care in low-income countries: the 'Village University' experience. *Medical Teacher* 2003; 25(2):142-148.
18. Wisborg T, Murad MK, et al. Prehospital trauma system in a low-income country: system maturation and adaptation during 8 years. *The Journal of Trauma* 2008; 64:1342-1348.

19. Tiska MA, Adu-Ampofo M, et al. A model of prehospital trauma training for lay persons devised in Africa. *Emergency Medicine Journal* 2004; 21:237-239.
20. Jayaraman S, Mabweijano JR, et al. First Things First: Effectiveness and scalability of a basic prehospital trauma care program for lay first-responders in Kampala, Uganda. *PLoS ONE* 2009; 4(9):e6955.
21. Kobusingye OC, Guwatudde D, et al. City-wide trauma experience in Kampala, Uganda: a call for intervention. *Injury Prevention* 2002; 8:133-136.
22. African First Aid Materials: Guidelines. *Belgian Red Cross-Flanders* 2011. Supplemental document linked to Van de Velde, et al (below).
23. Van de Velde S, De Buck E, et al. Evidence-based African first aid guidelines and training materials. *PLoS Medicine* 2011; 8(7):e1001059.
24. Sharkey A, Chopra M, et al. Influences on healthcare-seeking during final illnesses of infants in under-resourced South African settings. *Journal of Health, Population, and Nutrition* 2011; 29(4):379-387.
25. Sasaki S, Fujino Y, et al. Access to a health facility and care-seeking for danger signs in children: before and after a community-based intervention in Lusaka, Zambia. *Tropical Medicine and International Health* 2010; 15(3):312-320.
26. Midhet F, Becker S. Impact of community-based interventions on maternal and neonatal health indicators: Results from a community randomized trial in rural Balochistan, Pakistan. *Reproductive Health* 2010; 7:30-39.
27. Mann V, Fazzio I, et al. The EPICS Trial: Enabling parents to increase child survival through the introduction of community-based health interventions in rural Guinea-Bissau. *BMC Public Health* 2009; 9:279-290.
28. 2002 Uganda Population and Housing Census, Annex 3, Table C1. *Uganda Bureau of Statistics*. Accessed 27 March 2012 at [http://www.ubos.org/onlinefiles/uploads/ubos/census\\_tabulations/centableC1.pdf](http://www.ubos.org/onlinefiles/uploads/ubos/census_tabulations/centableC1.pdf).
29. Kavuma RM. "Uganda's healthcare system explained." *The Guardian* 1 April 2009. Accessed 27 March 2012 at <http://www.guardian.co.uk/katine/2009/apr/01/uganda-healthcare-system-explained>.
30. Nuwaha F. People's perception of malaria in Mbarara, Uganda. *Tropical Medicine and International Health* 2002; 7(5):462-470.
31. Hildenwall BMC International Health and Human Rights 2008
32. Hildenwall Acta Tropica 2007
33. Kallander K, Nsungwa-Sabiiti J, Peterson S. Symptom overlap for malaria and pneumonia: policy implications for home management strategies. *Acta Tropica* 2004; 90:211-214.
34. Werner D. *Where There Is No Doctor: A Village Health Care Handbook*. Palo Alto: The Hesperian Foundation; 1994.
35. Varghese M, Mohan P. *When Someone Is Hurt: A First Aid Guide for Lay Persons and Community Workers*. New Dehli: The Other Media Communication Private Ltd; 1998.