Strengthening Prehospital Trauma Care in the Absence of Formal Emergency Medical Services

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The article by Jayaraman, Mbweijano, Lipnick et al. represents an important contribution to the literature because it addresses one of the most significant and difficult issues in care of the injured [1]. This is the issue of how to improve prehospital trauma care services in areas of low- and middle-income countries that are beyond the reach of any formal emergency medical services (EMS). This issue is of great significance for several reasons: Most of the injured who die do so in the field, before there is any chance of hospital care. In low- and middle-income countries the proportion of prehospital deaths is much higher than in high-income countries. For example, one study showed that of all trauma patients who die, 81% die in the field in a low-income setting (Ghana) compared with 72% in a middle-income setting (Mexico), and 59% in a high-income setting (USA). This difference in prehospital deaths is a major contributor to the overall higher case fatality rates for severely injured persons in low- and middle-income countries. Furthermore, it has been roughly estimated that some 50–75% of the world's people live in areas with no access to formal EMS [2, 3].

In brief, this paper is of great relevance to the field of trauma care, as it addresses the situation in which many—possibly most—fatal injuries occur: in the field, in a low- or middle-income country, in an area with no formal EMS.

This scenario has scarcely been addressed by the field of trauma care research, thus far.

Given these factors, the question then arises of how to improve access to prehospital trauma care in the setting of low- and middle-income countries, especially in areas where no formal EMS currently exists. The World Health Organisation (WHO) publication *Prehospital Trauma Care Systems* gives guidance on two complementary approaches, designated tier 1 and tier 2 care. Tier 1 implies care by first responders, often not as part of a formal system, whereas tier 2 implies formal EMS, such as with an ambulance service [4]. There is evidence from several locations worldwide that each approach may be useful, depending on the circumstances.

One study from Brazil has documented the effects of a new ambulance service (i.e., tier 2) started where none had previously existed: The mortality rate among victims of motor vehicle crashes decreased from 7.1% (before) to 5.9% (after) [5]. However, starting new formal EMS should be approached with caution, given the potential high cost. An economic analysis from Kuala Lumpur, Malaysia, suggested that upgrading that city's existing basic EMS to a high-income model would cost \$2.5 million per year, with only an additional 7 lives per year saved [6]. Whether one agrees with the specifics of this economic analysis or not, certainly the caution these authors urge is warranted.

Hence, there is a need not only to consider the creation of new formal EMS, but also alternatives that will increase local access to basic first aid measures (i.e., tier 1 care). In some cases these might be considered as adjuncts to formal EMS, allowing ambulance services to extend their reach through networks of first responders. In other cases, these might be standalone efforts, especially in circumstances where formal EMS would be impractical or too costly. Often, these efforts to increase access to basic first aid

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measures build on existing, albeit informal, patterns of prehospital care and transport. That is, in almost every location, some system exists whereby some form of care is rendered to severely ill or injured persons and whereby some of the ill and injured are transported to clinics or hospitals. This system varies around the world. For example, in Ghana, the majority of severely injured persons who do make it to a hospital are taken there in commercial vehicles, including taxis and buses. In some cases this involves relatives paying a commercial driver for services. Sometimes commercial drivers act as Good Samaritans, conveying injured persons from the scenes of crashes that they come across in their driving work. In some places, these commercial drivers also provide elements of first aid, rarely with any formal training. Thus, in Ghana, a program to provide first-aid training to commercial drivers was documented to increase the provision of appropriate first-aid maneuvers (such as airway protection, external hemorrhage control, splinting, and triage) in the field [7].

Similarly, in mine-infested areas of northern Iraq and Cambodia, a model program created a two-tiered system in villages where several thousand lay first responders were trained in two-day basic first-aid course. They provided immediate in-field care for the injured and could call in more highly trained paramedics when needed. The paramedics had participated in a 450-h training course and constituted the second tier of the system. The program provided training and supplies to the village first responders and paramedics, but no ambulances. The injured continued to be transported to hospitals as they had before, primarily by a mixture of private and public transportation. With the implementation of this program, there was a documented decrease in mortality among injured patients treated by the system, from 40% at the beginning to 9% after the system was in place. Moreover, this system has proved durable and flexible, having continued at least 8 years since its inception, and now treating primarily victims of road traffic crashes, rather than the mine blast victims who, at the beginning, had represented the preponderance of the severely injured in the program areas. Thus, this program showed the benefit of using a two-tiered approach, and it also showed that this can be done without creating an ambulance service [8, 9].

The article by Jayaraman et al. expands on the above prior work. It documents a successful tier 1 first responder training program in a new location (Uganda) and with a varied and different set of first responders than previously reported in the literature. This includes the police and local

council leaders (grassroots community leaders), in addition to taxi drivers. The authors provide detailed information on their training techniques, evaluation methods, and program costs. This information should be very helpful to those who are considering implementing a similar approach in their own locations. The authors are to be commended for their work and are to be encouraged to follow the outcomes of their program as it continues and expands. It would be especially useful if they were to provide long-term data on the outcomes (including mortality rates) of severely injured patients, providing a comparison between those who received care from people trained under the new program and those who were not. Of course, this kind of analysis will be difficult, because in most environments with no formal EMS, there is limited, if any, documentation of care provided and outcomes for severely injured people in the field, especially if they never make it to a hospital. Nevertheless, providing in-depth data on outcomes of tier 1 first-provider medical care would be a significant contribution to the field of trauma care and would help to better inform decisions that need to be made on how to most effectively and affordably improve prehospital trauma care globally.

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