Ghana National Ambulance Service
Compared to Different Regions of the World

**** This Paper Has Not Been Published****

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February 2010

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Introduction

Ambulance service is an important element of any delivery of emergency services. The ability to provide on the spot first response to a medical emergency is a crucial element in the prevention of life loss from emergencies.

The Ghanaian National Ambulance Service (GNAS) originated after a soccer stadium incident in the capital city of Accra on May 9, 2001. The incident resulted in 123 fatalities and highlighted the lack of emergency medical services and care. The tragedy initiated a movement to improve emergency services.[i]

Background

Ghana is a democratic country in West Africa with 10 very distinct regions. It has a population of 24 million widely spread across the 239,540 square km of the country. The 10 main regions of Ghana are the Greater Accra, Ashanti, Northern, Eastern, Western, Central, Brong Ahafo, Upper West, Upper East and Volta. Each region is unique, with diverse landscapes and varying degrees of accessibility. The different landscapes and the varying levels of road access and development pose many challenges in providing emergency care throughout the entire country.

In 2009, Ghana's medical emergency system consisted of 49 government ambulances and a fleet of various private hospital ambulances. The coverage of the government ambulance services has been limited to regional capitals and a few districts, with 24 ambulances stations and 243 emergency medical technicians.[ii] In regards to the government ambulances, 41 of them are equipped with basic life support equipment - oxygen cylinders, stretchers, spine boards - and the remaining 8 are equipped with advanced life support equipment (e.g. defibrillators). There are no organized regional or city ambulance services in Ghana. The central government coordinates all the public ambulances and every region has its own coordinator. The coordinators all report to the Chairman of the Ghana EMS committee and director of the Ghana National Ambulance Service (GNAS) Dr. Ahmed Zakariah. The functionality of GNAS is largely inhibited by its insufficient annual budget of $ 7 million (U.S). The GNAS does not receive any external funding and large agricultural and mining corporations in Ghana are not currently contributing financially to the development of public EMS services. [iii]

The private hospital ambulances include many vehicles that do not meet the criterion of an ambulance. According to the United States Federal Specification the operational definition of an ambulance is a vehicle for emergency medical care which provides:

> *a driver's compartment; a patient compartment to accommodate an emergency medical technician (EMT)/paramedic and two litter patients (one patient located on the primary cot and a secondary patient on a folding litter located on the squad bench) so positioned that the primary patient can be given intensive life-support during transit; equipment and supplies for emergency care at the scene as well as during transport; two-way radio communication; and, when necessary, equipment for light rescue/extrication procedures.* [iv]

An ambulance should be designed and constructed to afford safety, comfort, and avoid aggravation of the patient's injury or illness.

As of 2009 there has been no organization or regulation for private sector ambulances. Consequently, private ambulances have many uses other than patient care. Also, there is no standard training required for ambulance drivers in the private sector and many private sector ambulance drivers only receive in-house training. There is currently legislature in progress to have a governing body over all the ambulances, but until the National Ambulance Service (NAS) Bill is passed private ambulances can not be considered to function as EMS ambulances, as they do not meet the criterion of an ambulance. Despite the quality of services provided by private ambulances, it is perceived by most health professionals that 90% of people arriving at emergency care facilities are brought in by private ambulances or taxi.[v]

Population and Ambulances

The following table (Table 1) displays population statistics of each Ghanaian region.

Table 1. Populations of Ghanaian Regions

Name	Abbr.	Capital	A (km²)	C 1984-03-18	Cf 2000-03-26	E 2009-07-01
Ashanti	ASH	Kumasi	24,389	2,090,100	3,612,950	...
Brong Ahafo	BAH	Sunyani	39,557	1,206,608	1,815,408	...
Central	CEN	Cape Coast	9,826	1,142,335	1,593,823	...
Eastern	EAS	Koforidua	19,323	1,680,890	2,106,696	...
Greater Accra	ACC	Accra	3,245	1,431,099	2,095,726	...
Northern	NOR	Tamale	70,384	1,164,583	1,820,806	...
Upper East	UEA	Bolgatanga	8,842	772,744	920,089	...
Upper West	UWE	Wa	18,476	438,008	576,583	...
Volta	VOL	Ho	20,570	1,211,907	1,635,421	...
Western	WES	Takoradi	23,921	1,157,807	1,924,577	...
Ghana	**GHA**	**Accra**	**238,533**	**12,296,081**	**18,912,079**	**23,416,500**

[vi, vii]

The greater Accra region is the most densely populated region and also has the greatest number of available ambulances.

The following table (Table 2) compares emergency care parameters of different regions of the world. The following cross-section of regions were chosen to show how emergency care is provided to areas of different population densities and land mass, in countries with more advanced ambulance systems. These comparisons are useful when examining the diversity of challenges across regions in Ghana.

Table 2. Emergency Care Parameters of Different World Regions

Region	**British Columbia (CAN)[viii]**	**Toronto (CAN)[ix]**	**Gauteng (SA) (2005)[x]**	**United States of America (US)[xi]**	**Accra[xii]**	**Ghana[xiii]**
Population (millions)	4.3	3.5	8.5	307	3	24
Square distance (sq km)	929,730	650	17,000	9,166,601	3,417	239,540
People/ square km	5	5,384	500	33	878	100
Ambulances	480	150	260	42,000	9	49
Ambulances / 10,000 square km	5	* 2,308	153	46	* 26	2
People/Ambulance	8,958	23,333	32,692	7310	333,333	489,796

*The number of ambulances in Toronto and Accra pro-rated to 10,000 sq km

When compared with the people/ ambulance ratio of other countries it is clear that Accra and Ghana on the whole have a deficiency in ambulances.

The Province of British Columbia (B.C.) located in Western Canada has the largest ambulance service in Canada.[xiv] The British Columbia Ambulance Service (BCAS) is a provincially run service that is responsible for the emergency services of B.C.'s 4.3 million inhabitants.[xv] Although health care is a provincial responsibility in Canada, the BCAS receives the majority of it's funding from the Federal government. The geographical ranges of British Columbia are quite diverse and therefore pose similar challenges in delivering emergency care as that of Ghana.

The city of Toronto located in Ontario, Canada has the largest local authority Canadian ambulance service.[xvi] The Toronto Emergency Service (TOEM) is responsible for the Greater Toronto metropolitan area which has a population density of 5384 people/ square km. Therefore, the TOEM provides great insight on urban emergency care practices.

The Gauteng Province in South Africa has the largest proportion of South Africa's population with cities such as Johannesburg and Pretoria in its jurisdiction.[xvii] The emergency medical service in the province of Gauteng is one of the best-equipped and efficient emergency services in the African continent.

The United States of America is the home of one of the world's largest fleets of ambulances. Although the ambulances are run by many different organizational bodies they all serve a central purpose of providing efficient transport and care during emergencies

There are 49 government ambulances in Ghana. The current responsibility of the government ambulance service is to provide minimal care and transport patients.[xviii] Even though there are many ambulances associated with private hospitals these ambulances can not be considered part of Ghana's EMS because there is no governing body regulating them. However, there is legislation in progress to have a governing body over all the ambulances in progress. Once this Bill passes, Ghana can start utilizing the private ambulance resources. The incorporation of these resources will not be an easy transition. Rules determining training, service fees and payments will need to be put in place. Currently, private sector ambulances have specific hospital numbers for their ambulance services and they operate using a cash and carry fee system. The goal is to be eventually able to unite the public and private sectors. Currently, there are not many private ambulances that can provide adequate emergency care, as determined by the operational definition of an ambulance. Private ambulances are mostly used for patient transport between primary care centres or as a hearse.[xix]

The differences in the people/ ambulance ratio (Table 2) are mostly attributed to differences in population density. The trend shows a lower requirement of ambulances when the population density is high. One main reason for this trend is that a small amount of ambulances in urban areas can serve a larger number of people. However in low population density regions there are large expanses of land that contain a marginal population, in yet these areas still need emergency service coverage and thus have a lower people/ ambulance ratio.

The average purchase cost of a Ghanaian ambulance is US $ 168,000.[xx] The following table (Table 3) shows the costs associated with increasing the people/ambulance ratio of Ghana to the standards of other regions.

Table 3. Costs Associated With Increasing People / Ambulance Ratio of Ghana

Comparison	B.C. (CAN)	Toronto (CAN)	Gauteng (SA) (2005)	US
Equivalent ambulances needed for Ghana	2630	980	685	3234
Estimated cost of new ambulances (millions)	$ 441.9	$ 164.6	$115.1	$543.4
50 % costs (millions)	$221.0	$82.3	$57.5	$271.7

Therefore a capital expenditure of $57-$272 million (US) is required to bring the ambulances needed in Ghana to at least 50% of the global working standard. The following table (Table 4) shows the costs associated with increasing the people/ambulance ratio of Accra to the standards of other regions.

Table 4. Costs Associated With Increasing People / Active Paramedic Ratio of Accra

Comparison	B.C. (CAN)	Toronto (CAN)	Gauteng (SA) (2005)	US
Equivalent ambulances needed for Greater Accra	326	120	83	401
Estimated cost of new ambulances (millions)	$ 54.7	$ 20.1	$ 13.9	$ 67.4
50 % costs (millions)	$ 27.3	$ 10.0	$ 6.9	$ 33.7

Therefore a capital expenditure of $7-$34 million (US) is required to bring the ambulances needed to at least 50% of the global working standard in the most population dense region of the country, Accra.

Paramedics

The following table (Table 5) outlines the paramedic characteristics of the regions which have been compared above.

Table 5. Paramedic Characteristics of Different World Regions

Region	B.C. (CAN)	Toronto (CAN)	Gauteng (SA) (2005)	US	Accra	Ghana
Total Paramedics	3983	1171	1975	207,610	56	250

Active paramedics/ 1,000 square km	2	** 923	61	18	11	0.8
People/paramedics	1,190	3,977	6,155	1,479	53,571	96,000
People/ active paramedics	2,240	5,833	8,173	1,827	83,333	122,449

**The number of paramedics in Toronto pro-rated to 1000 sq km

The number of active paramedics directly correlates to the number of active ambulances. The number of active paramedics was calculated by the following:

# of active ambulances * (2 active paramedics / shift) * (2 Shifts / Ambulance)

Therefore it is assumed that at any given time there will be 2 paramedics / ambulance and that there will only be two shifts per day. Currently, Ghana is operating with 2 or 3 paramedics / ambulance and 3 shifts per day.[xxi] In order to reduce the number of paramedics needed, a switch to 2 paramedics / ambulance and 2 shifts per day is recommended. In addition, the global standard shows that this number of paramedics per ambulance and shifts is sustainable. The differences in the people/paramedics ratio in the compared regions are mostly attributed to differences in population density.

The average annual salary of a Ghanaian paramedic is US$ 4,138.[xxii] Based on the number of new Ambulances needed to bring Ghana up to the standard of each different region the following table (Table 6) shows the costs associated with acquiring new paramedics.

Table 6. Costs Associated With Increasing People / Active Paramedic Ratio of Ghana

Comparison	**B.C. (CAN)**	**Toronto (CAN)**	**Gauteng (SA) (2005)**	**US**
Paramedics needed	10466	3864	2686	12884
Estimated cost of new paramedics (millions)	$ 43.3	$ 16.0	$ 11.1	$ 53.3
50 % costs (millions)	$ 21.7	$ 8.0	$ 5.6	$ 26.7

Therefore $5.6-$26.7 million (US) is required to bring the paramedics needed to at least 50% of the global working standard. The following table (Table 7) shows the costs associated with increasing the people/paramedic ratio of Accra to the standards of other regions.

Table 7. Costs Associated With Increasing People / Active Paramedic Ratio of Accra

Comparison	B.C. (CAN)	Toronto (CAN)	Gauteng (SA) (2005)	US
Paramedics needed	1286	460	313	1588
Estimated cost of new paramedics	$5,319,543	$5,319,543	$1,295,437	$6,569,877
50 % costs	$2,659,772	$2,659,772	$647,719	$3,284,938

Therefore the government must be willing to spend $647,719-$3,284,938 (US) in order to bring the paramedics needed to at least 50% of the global working standard in Accra.

Training

The training of government ambulance workers in Ghana is to the level of an Emergency Medical Technician (EMT). This designation is given after a 12 month course offered by the ministry of health. This is the minimum training level required for government paramedics and it enables them to be able to provide basic life support. The paramedics that attend the 8 advanced life support ambulances have a higher degree of training in order to operate the advanced life support equipment.[xxiii] If the Ghana ambulance service was to increase the amount of paramedics based on the standards of different world regions then additional resources must be allotted for training of the new paramedics.

The average cost of training for a Ghanaian paramedic is US $5,000.[xxiv] The following table (Table 8) shows the costs associated with providing appropriate training to new Ghanaian paramedics using the people/ active paramedic ratio standards of other regions.

Table 8. Costs Associated With Training New Paramedics in Ghana

Comparison	B.C. (CAN)	Toronto (CAN)	Gauteng (SA) (2005)	US
Trained paramedics needed	10466	3864	2686	12884
Estimated cost of Training (millions)	$ 52.3	$ 19.3	$ 13.4	$ 64.4
80 % costs (millions)	$ 26.1	$ 9.6	$ 6.7	$ 32.2

Therefore $6.7- $32.2 million (US) is required to train new Ghanaian paramedics in order to increase the people/ active paramedic ratio to at least 50% of the global working standard. The following table (Table 9) shows the costs associated with providing

appropriate training to new Accra paramedics using the people/ active paramedic ratio standards of other regions.

Table 9. Costs Associated With Training New Paramedics in Accra

Comparison	B.C. (CAN)	Toronto (CAN)	Gauteng (SA) (2005)	US
Trained paramedics needed	1286	460	313	1588
Estimated cost of Training	$ 6.4	$ 2.3	$ 1.6	$ 7.9
50 % costs	$ 3.2	$ 1.2	$ 0.8	$ 4.0

Therefore $0.8-$4.0 million (US) is needed to train new Accra paramedics to at least 50% of the global working standard people / active paramedic ratio.

In addition to training new paramedics, emergency room doctors and nurses also require training in Emergency Medicine (EM). Although equipment for emergency care is limited, a greater issue is that there are very few personnel trained to use equipment in Emergency system triages. Currently, the University of Michigan is providing grassroots EM development in an Ashanti region hospital called KATH.[xxv] There are 7 residents in KATH receiving training in EM. 90 percent of the EM training will occur in Ghana and the other 10 percent will occur abroad. Most of the EM training is on the triage side. The funding for this training is being completely covered by the University of Michigan. If this venture is successful the University of Michigan is considering providing the same training in other Ghanaian hospitals.[xxvi]

Stations

During periods when the ambulance is not actively being used it is located at an ambulance station. Ambulance stations serve as areas for paramedics to rest and also for vehicle maintenance. In order to reduce ambulance response times it is recommended that ambulance stations be located in high population density areas. As of 2009, Ghana has 24 ambulance stations that house its 49 ambulances.[xxvii] On average a Ghanaian ambulance station is able to house 2 ambulances. There are 6 stations located in greater Accra, 5 in the Ashanti region, 4 in the eastern region, 2 in the Volta region, 2 in the Central region and 1 in the Northern region. The discrepancy in the depot location numbers is a result of the origin of the ambulance system. The ambulance system started out as a pilot project. The project started in the Ashanti and greater Accra regions first, thus they have more locations. All of the Ghanaian depot locations have been placed in high-density population locations.[xxviii] The following table (Table 10) shows the ratio of Ambulances / Stations in different regions.

Table 10. Ambulance / Ambulance Station Ratio of Different World Regions

Region	B.C. (CAN)	Toronto (CAN)	Accra	Ghana
Ambulances/Station	2.6	4.2	1.5	2.0

The current ratio of Ambulances / station in Ghana is adequate for the number of ambulances. However, if more ambulances are acquired then the number of stations must also increase.

The average cost of installing a new Ghanaian ambulance station is US $ 480,000.[xxix] Based on the number of new Ambulances needed to bring Ghana up to the standard of each compared region the following table (Table 11) shows the amount of new stations needed determined by Ghana's current ambulance to station ratio.

Table 11. Costs Associated With Increasing Ambulance Stations in Ghana

Comparison	B.C. (CAN)	Toronto (CAN)	Gauteng (SA) (2005)	US
Stations needed	1264	456	312	1560
Estimated cost of new stations (millions)	$ 606.8	$ 218.8	$ 149.5	$ 748.8
50 % costs (millions)	$ 303.4	$ 109.4	$ 74.7	$ 374.4

Therefore a capital expenditure of $74.7- $374.4 million (US) is required to bring the ambulance stations needed to at least 50% of the global working standard in Ghana.

Dispatch Centres

Dispatch centres are an integral part of the EMS. They are responsible for the appropriate and efficient coordination of emergency medical systems. Inappropriate dispatch methods lead to long response times and disorder. Dispatchers are responsible for first line response and for hospital to hospital coordination.

In the delivery of the ambulance service, the sequence of events from the time of an emergency calls to ambulances' arrival at the hospital is the following: 1) emergency phone call to dispatch centre 2) dispatch centre determines severity of call 3) dispatch centre radios ambulances 4) closest ambulance accepts call and heads towards emergency location 5) ambulance radios back to dispatch centre upon pick-up of person(s) 6) dispatch radio line placed in hospitals alerts dispatch of hospital availability 7) ambulance gets to hospital and communicates back to dispatch centre.[xxx]

The step-wise dispatch sequence is efficient; however, due to an inadequate communication infrastructure the role of a dispatcher is quite difficult. Response times

should only depend on the severity of the call and the distance from the depot location, but inefficiencies in the dispatch centre delay response times.[xxxi]

One major issue with the Ghanaian dispatch protocol is that the dispatcher relies on continuous monitoring of emergency hospital radios by hospital staff.[xxxii] Although hospital personnel are keen to improve emergency medical services, it is not practical to expect them to continuously monitor the dispatcher centre's radio unless it is their primary job. Therefore, the government needs to employ personnel to be located at hospitals to monitor the dispatch centre's radios. This is typically achieved in other countries by having the ambulance stations located in major hospitals. This allows paramedics to serve a dual function of patient care and emergency room monitoring. As a result of inadequate communication between ambulance stations and hospitals, patients are routinely transported to a hospital that has no room or beds for them. This adds to overcrowding and congestions, which reduce the level of care provided to all patients, and hinders the ability of medical professionals to perform their jobs. In Accra, patients in government ambulances are usually shipped to Ridge, Korle-Bu and 37th Military hospitals, thus, these hospitals should have ambulance stations or EMS personnel located onsite.[xxxiii]

Another issue is the number of trained dispatchers and therefore the availability of dispatchers. There are only two dispatch centres in Ghana and they each have two employees monitoring 4 phones.[xxxiv] Table 12 shows the People/ dispatcher ratio of regions compared above.

Table 12. People/ Dispatcher Ratio of Different World Regions

Region	B.C. (CAN)	Toronto (CAN)	US	Accra	Ghana
People/ dispatcher	33077	31250	4244	1,500,000	6,000,000

The reason for the particularly low people /dispatcher ratio in the U.S. is because most U.S. dispatchers are not only responsible for the dispatching of ambulance services but also responsible for the dispatching of fire and police services. The additional responsibilities require a greater number for assignment to the fire and police services as well as the ambulance service.

The annual salary of a Ghanaian dispatcher is US $ 4,138.[xxxv] The following table (Table 13) shows the costs associated with increasing the people/dispatcher ratio of Ghana to the standards of other regions.

Table 13. Costs Associated With Increasing People / Active Paramedic Ratio of Accra

Comparison	B.C. (CAN)	Toronto (CAN)	US
Dispatchers needed	722	764	5651
Estimated cost of new dispatchers	$2,985,904	$3,161,432	$23,382,692
50 % costs	$1,492,952	$1,580,716	$11,691,346

Therefore the government must be willing to spend $1.5- $11.7 million (US) in order to bring the dispatchers needed to at least 50% of the global working standard in Ghana. In addition to the costs of employees, additional resources will be needed for phones and an acquisition of a larger dispatch centre.

Also going forward, standardized ways of inter-emergency department communication (e.g. police, fire and ambulance) need to be established. Currently, the only medium of communication is through telephones.[xxxvi] Eventually, all the emergency service vehicles should be coordinated using a Computer Automated Dispatch System (CADS).

Service Number

The National Ambulance service number is "193". This number currently works from land lines but will not work for cell phones if there is no coverage. The Ghana EMS committee needs to coordinate with local cell phone providers to ensure that the service number can still be reached even when there is insufficient network coverage. In most developed countries emergency calls travel on special telephone networks and use special switches to provide some degree of non-interference with other phone traffic, and a degree of protection from power failures and other system problems. When a caller dials an emergency service number, the call is recognized by the telephone company central office switch and routed to the emergency service network.

Public Awareness

The level of public awareness of the national ambulance service is quite low. Most people are unaware of the National ambulance service number "193". In addition, the public perceive ambulances as hearses and therefore do not get out of the way even when the ambulance siren and lights are on.[xxxvii] Therefore, resources must be used in order to raise awareness and change the public view of ambulances. The costs of various mediums to raise public awareness are shown in the following table.

Table 14. Cost of Public Awareness Mediums

Medium	**Television**	**Radio**
Cost per Advertisement	$ 344.83	$ 137.93 for 1 min. Ad

[xxxviii]

Note: Some of this cost may be reduced by radio and TV companies providing such awareness campaign as part of their corporate social responsibility.

Budget

The annual budget of the GNAS is $ 7 million. Based on the above tables the amount of funds needed to bring the EMS of Ghana to 50% of the world standard is $146- $717 million (US). Thus, in order to enhance the GNAS to global standards funds other than

the GNAS budget will be required. Currently the GNAS is not covered under the national health care system and therefore receives no supplementary funding.[xxxix] Going forward, it is recommended that the GNAS will fall under the national health care system and receive the monetary benefits.

The following figure (Figure 1) shows the proportion of improvement costs.

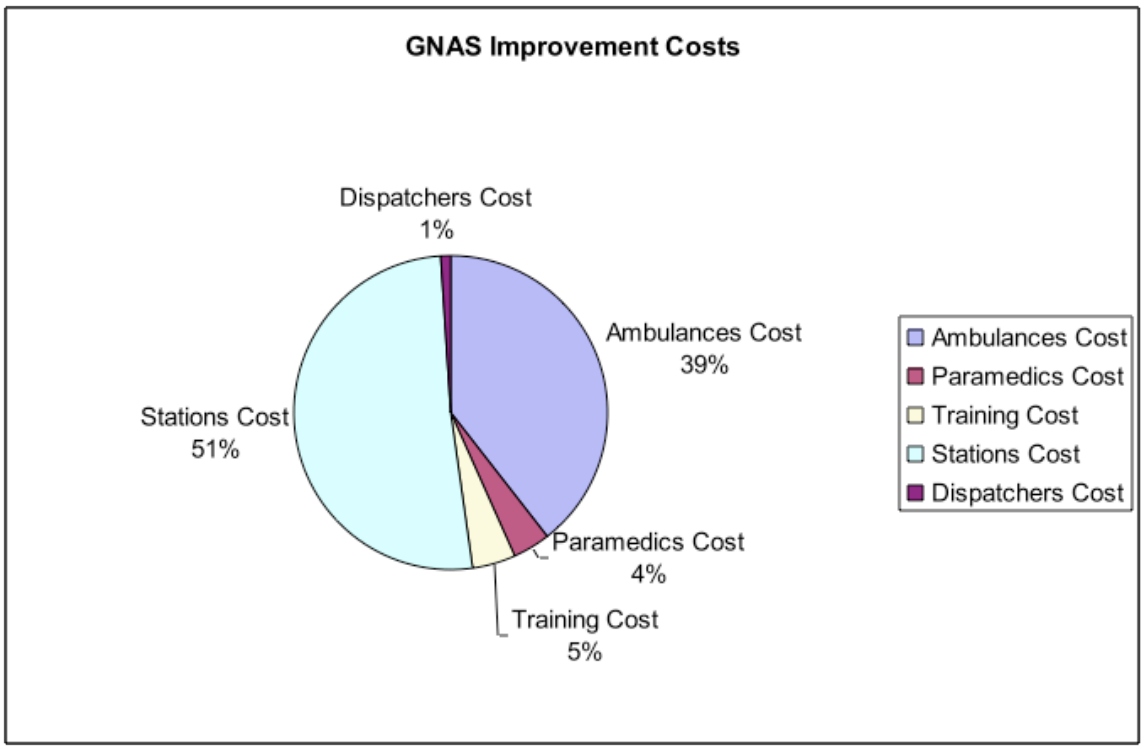

Figure 1. Proportion of GNAS Improvement Costs.

The most costly improvement is the building of new ambulance stations. In order to reduce the improvement costs the cost of new stations must be re-accessed. A basic ambulance station should include an office, washroom and small rest area in addition to the ambulance parking stalls. More research needs to be done to determine appropriate pricing of basic ambulance stations. The costs of ambulance stations could be further reduced if the government utilizes public hospitals as ambulances stations. This offers the paramedics a rest area and also allows them to be able to monitor emergency triages to determine availability. The cost associated with procuring new ambulances may also be reduced when legislation is passed to have a governing body over all ambulances. This reduction will occur if the GNAS is able to utilize a significant amount of private ambulances that meet the criteria of an ambulance.

Cost of service

Currently there is no service charge for emergency care in Ghana. However, there are many advantages in enforcing a small fee for the services provided. Implementing a fee

for ambulance service will generate much needed revenue to help with costs. In addition, a fee for the usage of emergency services will deter abuse of the system. This abuse may occur by people using the free service for uses other than emergencies. The primary use of the emergency system should be to provide care and transport in medical emergencies. The service can also serve secondary functions such as patient transport from hospital to hospital. In order to maintain an efficient service, steps should be taken to deter abuse of the system. It is recommended that further research into the challenges of addressing services abuse be pursued.

The following table (Table 15) shows the people / ambulance events of different world regions. The ambulance events of Ghana and Accra could not be tabulated due to the many private ambulances and taxis that are used in medical emergency response.

Table 15. People/ Ambulance Events of Different World Regions

Region	B.C. (CAN)	Toronto (CAN)	Gauteng (SA) (2005)
People / ambulance events	12	16	20

The following table (Table 16) highlights the amount of revenue that could be earned using the ratio of people / ambulance events of different world regions. Therefore the government could increase the GNAS budget by applying a small fee for the service.

Table 16. Revenues from Different Ambulance Service Charge

Comparison	B.C. (CAN)	Toronto (CAN)	Gauteng (SA) (2005)
Ambulance Events	2,078,165	1,534,416	1,200,000
Estimated revenue of Ambulance service (GHC 5 service charge)	$10,390,828	$7,672,080	$6,000,000
Estimated revenue of Ambulance service (GHC 10 service charge)	$20,781,656	$15,344,160	$12,000,000
Estimated revenue of Ambulance service (GHC 15 service charge)	$31,172,484	$23,016,240	$18,000,000

Data Collection (dispatch centres)

Going forward, the effective management of the ambulance service would be helped by using gathered data and reliable prediction variables. Therefore, a more comprehensive data collection method should be put in place in the dispatch centres to accurately quantify and qualify the characteristics of each emergency call.

Overall the following documents should be kept to qualify data:

- Patient care report form
- Fleet management report
- Asset Management system (AMS) invoice/report
- Vehicle logbook (transport officer)
- Financial reports (financial department)
- Government Garage reports
- First Auto reports

Acknowledgments

Specials thanks to Dr. Zakariah, Dr. Narh and all the various medical personnel for their contributions to this report. Also, I would like to thank the University of Michigan emergency medicine team for their efforts and support of this project.

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