THEME TWO: HOSPITALS

PREPAREDNESS FOR MASS CASUALTIES OF ROAD TRAFFIC CRASHES IN UGANDA: ASSESSING THE SURGE CAPACITY OF HIGHWAY GENERAL HOSPITALS

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Abstract

In Uganda, increase in human and vehicular populations against a non-expanding road infrastructure, breakdown in enforcement of traffic regulations and poor vehicle quality contribute to the high rate of casualties from road traffic crashes on highways, with over 2000 deaths per year. Highway hospitals should be the vanguard of preparedness to manage mass surgical casualties, to minimize road crash mortality.

***Objectives**: To determine the capacity of Uganda's highway hospitals to manage mass surgical casualties.*
***Methods:** A descriptive, cross-sectional study of emergency surgical services of ten key highway general hospitals.*
***Results:** The hospitals had adequate capacity to manage uncomplicated solitary cases of injury. However, they had severe shortage of essential surgical equipment (9.6% of expected). Staffing was poor (64.3% of the recommended) and the staff lacked the life-saving surgical skills needed in a frontline hospital. There was perennial shortage of essential supplies e.g. blood, surgical gloves, intravenous fluids, oxygen and medicines. There was inadequate space for emergency surgery and only few staff members reside within easy reach for quick mobilization. Overall surge capacity was rated at below 50% of what is required.*
***Conclusion**: Ugandan highway hospitals lack the technical and infrastructural capacity to handle mass casualties resulting from road traffic crashes. Surge capacity is below 50% of that required to manage mass casualties.*
***Recommendations:** The key recommendations of this paper are: re-organisation of the outpatient departments to cater for mass emergency surgical cases, deployment of qualified surgeons in highway hospitals, training of hospital staff in life-saving surgical skills, targeted supervision of highway hospitals, training of managers in disaster preparedness, and improved funding for highway hospitals.*

Introduction

The World Health Organization (WHO) estimates that by 2020, trauma will be a leading cause of death in both developed and developing countries. In sub-Saharan Africa, injury accounts for nearly 10% of all the disability-adjusted life years (DALYs) lost annually due to illness (WHO, 2004). Road traffic accidents (RTA) form a big proportion of trauma recorded in registries. Low and middle-income countries account for 85% of the deaths and 90% of the annual global loss in DALYs due to road traffic accidents (Murray, 1996; O'Neill et al, 2002). The mortality rate due to road traffic injury is highest in Africa, at 28.3 per 100,000 people. In addition, Africa has 50 deaths/10,000

vehicles compared to 1.7 in high-income countries (Pedem M et al, 2004; Lagarde, 2007). Uganda records an average of 20,000 RTAs per year, in which over 2,000 people die. By 2004, Uganda registered 160 deaths per 10,000 vehicles (Pedem et al., 2004). In 2005, the WHO ranked Uganda as No. 2 in road traffic accidents in Africa (WHO, 2005). The trends of injuries, RTAs and mortality from RTAs are rising as the populations of both humans and vehicles in the country increase. Between 1990 and 2007, the annual increase in the incidence of injuries was at 9.6% per annum. Factors responsible for this increase include the high increase in the populations of humans and vehicles on the roads; the non-increase in road supply (in width and number) to absorb the extra vehicles and road users; and the poor state of the existing roads – in terms of design, surface and lack of road furniture. Others include the poor knowledge of road use regulations by the road users; poor mechanical condition of the vehicles due to permissive import regulations which allow old vehicles into the country; and poor mechanical condition of the vehicles due to the poor quality of maintenance and lack of spares. They also include the official commercialization of the issuing of driving permits, without due regard to driving skills; the breakdown in law enforcement for regularly verifying the drivers' skills, vehicle conditions, enforcing speed limits and speed governors; and corruption in the revenue and policing agencies. Market-induced competition, especially in the human transport sector, rapid unregulated urbanization and a rapidly growing economy which now operates on a 24-hour basis, and which has made it easier for many more people to obtain a motorized vehicle – especially the now ubiquitous *"boda-boda"* (motorcycle taxi) also take part of the blame. Finally, behavioural factors such as drunken-driving, over-speeding and reckless driving also contribute to the rise in accidents, injuries and mortality from RTAs.

The existing mechanisms for surveillance of road crash injuries in Uganda are not national, continuous or reliable. Although an effort started in 1996 to create an Injury Control Centre (ICC-U), its activities are still too insufficient to address the problem comprehensively due to poor funding. Due to this, most available data are obtained from police records, which do not usually capture information about those who have no police queries. In addition, police records do not indicate the subsequent outcome of the injuries, such as death in the hospital or residual disability. Health facility records, on the other hand only capture those who report to them for management. Many more injuries are either self-managed or managed in the private medical sector which has no legal obligation to report their data to the national health management information system (HMIS). Most of the crashes, injuries and deaths occur in urban areas and along the major roads leading into or out of the capital city, Kampala, which bear continuous heavy traffic to or from other neighbouring landlocked countries like South Sudan, DR Congo, Rwanda and Burundi. There are six main highways leading from Kampala, i.e. Kampala-Jinja to the east, Kampala-Entebbe to the south, Kampala-Masaka to the south-west, Kampala-Fort Portal to the west, Kampala-Hoima to the north-west and Kampala-Gulu to the north. In 2005, SHELL (Uganda), published 85 "accident black spots" along these highways. Most of the spots were along the Kampala-Masaka highway, mainly due to poor road design. A major government project is currently underway to improve this road.

Many accidents take place during the festive seasons and involve public commuter buses over-speeding to compete for passengers, or drunken drivers or pedestrians. While the facilities for testing the blood alcohol concentration (BAC) of drivers are also limited, Uganda has one of the highest tolerable BAC in the world, at 0.15 mg/ml (Peden, 2004). Mass RTA casualties are usually ferried to the nearest general hospitals which may not be prepared to handle a sudden and large volume of casualties creating a sudden surge in demand for specialized intense care. Road crashes are the major sources of mass casualties received at the hospitals. Uganda does not have a public ambulance system, and so the casualties are usually ferried by any means immediately available, such as police open pick-up trucks and vehicles of other passersby. Police personnel and the public are not trained in first-aid and evacuation of casualties, and could aggravate the injuries sustained in an accident. A common method they use to remove casualties from the wreckage of the vehicles is cutting it open with axes. It is a slow process and worsens many injuries. Deaths have been reported. Other injuries are worsened by the increasing negative practice whereby the population near the accident scene rummage through the pockets and bags of the injured, or in the other parts of the car in search of personal valuables of the dead and injured. In so doing, they cause injuries to the trapped passengers or worsen their injuries. Therefore, health services near these highways must always be adequately prepared and equipped to handle mass casualties and severely injured patients at any one time. However, the surge capacity of these hospitals has not been studied or documented. Surge capacity has been defined as *"a measurable representation of a health care system's ability to manage a sudden or rapidly progressive influx of patients within the currently available resources at a given point in time" (ACEP, 2004)* or

"the maximum delivery of services a system can provide if all its available and potential resources are mobilized" (Barishansky and Langan, n.d.). Ability to meet suddenly increased demand for care without compromising quality of care and the safety of patients, providers and carers is essential for life-saving, and is the holy grail of any health system. However, in Uganda, there are little efforts to understand the barriers to achievement of suitable surge capacity in the health system. Increasing the surge capacity of all hospitals is of prime concern to the public, given the high mortality rate associated with RTAs and recent spates of terrorist attacks.

While the best way to reduce the morbidity and mortality due to RTAs is to prevent the accidents, the need for a functional and good quality ambulance and emergency service system comes a very close second. Highway general hospitals are the top priority institutions to be supported because they are at the frontline of the service for mass casualties and accident victims. However, the staffing and funding of general hospitals in Uganda does not make consideration of their location vis-à-vis highways. There are recent calls to remedy this. This study only focused on general hospitals, although there are some regional referral hospitals along highways, but which were assumed to be better facilitated.

A typical Ugandan general hospital is expected to serve a population of about 500,000 people. It has 100-200 beds and handles about 25,000 outpatients per year. Its service scope includes preventive, promotive, and curative outpatient services, maternity, inpatient health services, emergency surgery, blood transfusion, laboratory and general services. It should also have diagnostic imaging services such as x-ray and ultrasound services. It should have two operating theatres (for emergency and elective cases), facilities for sterilization and a mortuary service, among others. It should have a functional ambulance on standby, running piped water and be connected to the national electricity supply or have an alternative equivalent source of energy as well as an emergency source of lighting e.g. a generator or solar lighting (Naddumba, 2008).

The objectives of this study were: to determine the annual burden of road traffic injuries at the selected hospitals; to find out the immediate outcome of treatment of traffic injuries at the hospitals; to establish the preparedness to handle mass RTA casualties; to determine the staffing levels, knowledge and skills of emergency department staff to manage mass RTA casualties; and to determine the adequacy of the infrastructure, equipment and supplies.

Methods

We studied 10 highway general hospitals (8 government hospitals, 2 faith-based private-not-for-profit, PNFP) shown in Table 2, located within a distance of 250km from Kampala.

*Table 1**: Ugandan Highway Hospitals studied***

	Highway	**Hospital**	**Ownership**
1	Kampala-Gulu-Arua	Kiryandongo	Gov't.
2.	Kampala-Masaka-Kabale	Kitovu	PNFP
3.	" " "	Lyantonde	Govt.
4.	" " "	Nkozi	PNFP
5.	Kampala-Hoima	Kiboga	Govt.
6.	Kampala-Fort-Portal	Mityana	Govt.
7.	" "	Mubende	Govt.
8.	Kampala-Tororo	Kawolo	Govt.
9.	" "	Iganga	Govt.
10.	" "	Bugiri	Govt.

Two highway general hospitals along the Kampala-Entebbe road were left out of the study because most accident cases on that road are referred directly to the nearby National Referral Hospital at Mulago.

The main outcome measure for this study was the capacity of the highway hospitals to manage mass casualties (the "surge capacity"). We considered that this capacity depends on three categories of factors, most of which depend on adequate funding i.e. organization, infrastructure and supplies, and staffing. Under organization, we considered that proper planning for emergency services, and having the plan shared among all the relevant staff was essential. There is also need for effective communication flows within the hospital and between hospitals, especially if emergency referrals have to be made. Under infrastructure and supplies, we considered that blood, electricity, running water, functional investigative services e.g. x-ray and ultrasound, a functional operating theater, adequate appropriate medical equipment, medicines and medical supplies, and an ambulance should be available. Under staffing, we considered that general hospitals should have a qualified and committed staff which is present on duty for 24/7 coverage. We considered a highway hospital to have adequate surge capacity if it had the staff and facilities on the ground that could be mobilized immediately to effectively manage at least 15 road accident casualties simultaneously. We decided upon this number on the basis of the number of two 14-seater commuter taxis colliding, and one half of all the occupants being injured seriously enough to require

emergency attention, since such taxis are the ones most commonly involved in RTAs in Uganda.

We considered this capacity on ten components which, for simplicity, we allocated equal weight. The aspects were:

a) possession of at least one functional and equipped ambulance
b) ability to form at least one standby team of two nurses to travel in the ambulance to the accident scene or to accompany the referred patient(s)
c) ability to form at least two additional concurrent surgical trauma teams each made up of at least one general physician, one theatre nurse and one anesthetist to enable two surgical operations to proceed simultaneously in the two theatres normally available in the general hospitals
d) ability to form one additional team of senior staff capable of rapid and accurate triage, on-spot resuscitation and emergency surgical intervention in the minor theatre normally available in the accident and emergency department. Such a team would comprise of at least one senior general physician and two senior nurses
e) bed space on the surgical ward to accommodate at least fifteen severely injured post-operative patients
f) possession of at least five sets of diagnostic and resuscitative equipment in the accident and emergency department to handle at least five patients simultaneously. As a minimum, we considered the possession of five sphygmomanometers and five suction machines
g) possession, at the time of our visit, of a sufficient stock of sterile surgical gloves to handle fifteen cases, and adequate intravenous fluids, drugs, drip-stands, gauze, etc.
h) possession of a blood bank with the capacity to keep at least 15 units of blood
i) functional x-ray and ultrasound equipment with the necessary supplies in sufficient stock to handle at least 15 patients
j) having at least three operating theatres (two main and one minor) to handle three operations simultaneously

Data collection for this cross-sectional study took place during June and July 2009. We collected quantitative and qualitative data from ten purposively selected highway general hospitals in Uganda, purposively selected on the basis of being located not more than 5km or 10 minute drive from a main highway. We reviewed emergency department records and held in-depth interviews with key respondents using open-ended interview guides. We selected the respondents for the study purposively. The key respondents were the medical superintendents (MS) or their designated representatives e.g. another medical officer on duty, the Senior Nursing Officer. Interviews lasted, on average, 30 minutes. All the respondents provided written informed consent for the interview and for tape-recording of the interview. The interviews were transcribed, reviewed for errors and subjected to thematic analysis. For the sake of confidentiality, effort has been made to present the results anonymously, in order to mask the individual hospitals. However, the respondents may be able to identify their hospital and their responses. The key limitations of this study include poor quality records on some of the aspects we needed, making it impossible to study and compare all the variables in all the hospitals. In addition, information about the level of knowledge and skills of staff was self-reported and could be subject to bias.

Results

We interviewed eight of the ten expected Medical Superintendents, one medical officer and one Senior Nursing Officer. Nine key informants were male, and one was female.

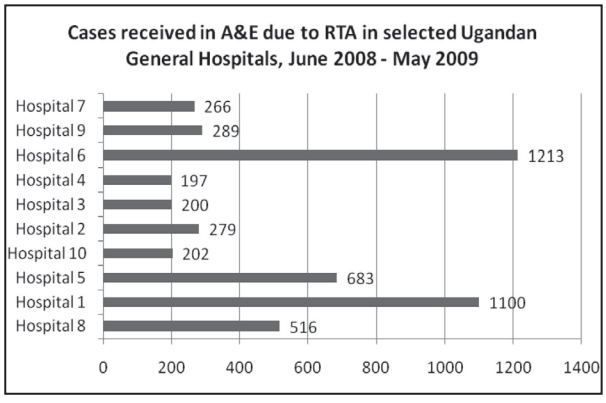
Space for injured patients

Five hospitals (Hospitals 3, 4, 6, 7 and 9) had very small reception areas for emergency cases. All hospitals had no demarcation for medical or surgical emergencies. The surgical wards in all the hospitals had sufficient capacity to accommodate more than 20 patients, which was higher than our set standard of 15.

Annual burden of road traffic injuries at the hospitals

We estimated this by use of the absolute numbers of injured people presenting to the hospitals as a proxy of the strain imposed on the system. Figure 1 shows the actual number of RTA patients who presented at the various OPDs in the study period, from June 2008 to May 2009.

Figure 1: Magnitude of RTA injuries presenting to Ugandan highway general hospitals, June 2008 – May 2009



The distribution of the RTA cases was highly skewed, with Hospitals 1 and 6 having, by far, the highest annual RTA burden. Indeed key informants from these hospitals reported getting between 1-5 RTA cases per day, equivalent to the accrual per week in other hospitals. To determine, the relative burden of RTA cases in the hospitals', we worked out the proportion of RTA cases per 1000 outpatients and the proportion of those hospitalised.

Table 2: Proportion of Outpatients due to RTA in selected Ugandan highway General Hospitals, June 2008 – May 2009

Hospital	RTA Cases per 1000 outpatients	Percentage of presenting RTA cases actually hospitalised
5	11.6	49.8
6	11.3	70.2
1	9.4	64.2
2	8.9	55.6
8	8.4	74.2
7	7.4	60.2
3	6.2	97.5
9	6.1	11.7
10	5.1	54.4
4	3.1	11.7

Whereas Hospitals 5 and 6 received the highest proportion of OPD cases due to RTA, Hospital 4 had the least. However, Hospital 3 hospitalised almost all its RTA cases, while Hospitals 4 and 9 hospitalised the least.

Immediate Treatment Outcomes of road traffic injury cases

We analysed the immediate outcomes of the patients. We categorized them into four groups depending on the condition by the time of leaving the hospital. The categories were: Discharged Recovered, Ran away, Referred, or Died. Run-away cases were of people who were not satisfied with the quality of care and discharged themselves to seek for care elsewhere, or went to look for alternative forms of treatment e.g. traditional bone-setting or those who escaped from hospital bills or those who escaped from police cases due to traffic offences committed at the time of the accidents.

Data do not add to 100% in all cases, reflecting data inaccuracies. However, those available show that all patients admitted in hospital 4 were discharged recovered. Data from hospital 8 are very questionable.

According to the key informants, all the general hospitals can manage simple peripheral body injuries successfully. However, they refer all cases of head injuries to the referral hospitals, due to lack of expertise in managing them. Lack of medicines is a frequent reason for poor management and outcomes.

> "We watch patients die even when we could have done something just because there are no things to use; the time lost in having to refer them as the only option just adds to their death, and it pains us" *[Respondent, Hospital 5]*

Organisation to manage mass RTA casualties

We inquired about measures to improve the management of injured patients. We specifically looked for availability of a library with recent books on the management of the common injuries received in RTAs; presence of internet connection; holding of in-house continuing professional development (CPD) about the management of severely injured patients; and sending staff for specific training in the management of severe injuries outside the hospital. Table 4 shows the results on the ground.

Six of the 10 hospitals had a library. However, only two libraries had some basic books about surgery. Five hospitals had internet connection, but in some, the computers were in administrative offices and inaccessible to surgical staff. Staff from three hospitals had received training on injury management by the ICC-U about 4 years earlier and some had left. Most of the hospitals held internal staff training, but it was not always focused on care for critically injured patients.

Table 3: Outcomes of RTA Patients in Selected Ugandan highway General Hospitals, June 2008 - May 2009

Hospital	Hospitalised	Outcome (%)			
		Recovered and was discharged	Ran away	Referred	Died
1	706	97.6	0.0	0.0	2.4
2	155	95.5	0.0	0.0	4.5
3	195	96.4	0.0	21.0	3.6
4	23	100.0	0.0	0.0	0.0
5	340	75.9	5.3	11.8	1.5
6	851	83.5	4.2	4.5	4.6
7	160	86.3	0.0	13.8	3.8
8	383	6.0	1.0	1.0	3.1
9	413	48.4	42.6	7.0	2.2
10	112	62.5	0.0	28.6	8.9

Quality of care for injured patients

To determine the quality of care, we made inquiries about key aspects that help in establishing

Table 4: Internal organisation to manage RTA cases in selected Ugandan highway General Hospitals, June 2009

Hospital	Presence of Library	Presence and accessibility of internet connection	Conduct of CPD relevant to RTAs	External training on injury care
1	Yes, but available books insufficient for injury care	Yes, accessible to staff	Yes, but very infrequent	No
2	Yes, but available books insufficient for injury care	None	None in the last 6 months	No
3	Yes, but available books insufficient for injury care	Yes, but not accessible to staff	Yes, regular, including surgical care	No
4	None	None	Yes, but never on injuries	No
5	None	None	No	Staff received some basic training a few years ago
6	None	None	Yes, once a week, even on surgical care	No
7	Yes, available with the necessary surgical books	Yes, but not accessible to staff	Yes, once a week, even on surgical care	No
8	Yes, but available books insufficient for injury care	None	Yes, every 2 weeks, including surgical care	Yes 4 years ago
9	Yes, but available books insufficient for injury care	Yes, but not accessible to staff	Yes, once a week, even on surgical care	Yes but more needed due to transfers
10	None	Yes, accessible to staff	Yes, once a week, even on surgical care	No

a culture of quality, rather than observe actual care. We inquired about the conduct of surgical audits, the presence and composition of trauma teams. We found that only Hospital 3 conducted surgical audits while only Hospital 5 had formed standby trauma teams.

Staffing levels

The hospitals had staffing difficulties. Table 5 shows that the biggest shortages were with nurses. However, all hospitals could, form the minimum of three teams required to handle 15 cases simultaneously. There was a serious shortage of senior doctors (MO Special Grade and surgeons).

Staff mobilization during emergencies

None of the hospitals had a disaster-preparedness plan. In all the hospitals, the entire staff body, including those off duty, would be mobilized to assist whenever a large number of accident victims were received. The response of staff in such situations was reported to be good, especially in hospitals which have on-site staff accommodation. However, Hospitals 4 and 9 had difficulties to mobilize staff. In Hospital 4 only (20%) are accommodated on-site. In Hospital 9, only 27.3% of the 132 staff lives within the hospital premises. Therefore, their mobilization in case of emergency was difficult if they had retired for the evening.

All respondents said that since there was always a shortage of staff even for the normal running of the hospitals, whenever many injured patients were brought in, other hospital activities would nearly come to a stand-still. In Hospital 3, respondents said that even 5 severely injured patients arriving simultaneously were sufficient to paralyse the activities of the entire hospital due to staff diversion.

Staff skills

All the ten respondents acknowledged that the skills to manage emergency surgical cases were inadequate in all cadres of staff and that specific additional training outside their hospital was needed. Most respondents did not feel confident about the ability of their doctors to perform the basic life-saving operations like insertion of chest tubes for pneumothorax or haemothorax, doing laparotomy, splenectomy and management of open fractures. Only staff in Hospital 3 were confident about these procedures because they have qualified surgeons. Most respondents expressed desire to have further exposure to orthopaedic surgery, which skills they considered to be needed frequently. The main cause of lack of skills was reported to be due to lack of facilities to practice what they already knew, thus leading to loss of the skills.

Table 5: Availability of staff key to emergency surgery in selected Ugandan highway general hospitals, 2009

Staff category	Recommended number for a general hospital	Hospital									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Surgeons	**0**	0	0	1	0	0	0	1	0	0	0
M/O Special Grade	**1**	1	0	1	0	1	0	0	0	0	0
Medical Officers	**5**	6	4	5	4	4	4	3	4	3	3
Dental Surgeons	**1**	1	1	0	0	1	0	1	1	1	0
Anaesthetic Officer	**2**	2	0	2	0	1	1	1	0	1	2
Anaesthetic Assistant	**1**	0	0	1	1	0	1	0	1	1	0
Radiologist	**0**	0	0	1	0	0	0	0	0	0	0
Radiographer	**2**	2	1	0	0	1	1	0	1	1	0
Dark Room attendant	**1**	1	0	1	0	0	1	1	1	1	0
Sonographer	**1**	0	1	0	0	0	0	0	0	0	1
Laboratory Technician	**2**	1	1	2	2	3	2	1	3	2	1
Laboratory Assistant	**1**	6	1	13	2	0	1	2	1	1	3
Orthopedic Officers	**2**	3	2	0	0	2	2	0	1	2	1
Physiotherapist	**1**	0	0	0	0	1	0	0	1	1	0
Theatre Assistant	**2**	0	0	3	1	1	0	2	2	1	0
Senior Nursing Officer	**5**	4	1	1	1	4	2	1	3	1	3
Registered Nurse	**17**	9	6	4	9	15	10	2	9	6	9
Enrolled Nurse	**46**	21	15	29	34	27	13	16	27	24	15

Infrastructure and equipment

Regarding patient reception and triage, none of the ten hospitals had a casualty department or a section of its out-patients department specifically earmarked for the management of surgical emergencies. All categories of patients were mixed and handled by the same staff. For diagnostic facilities, all hospitals but one had functional x-ray facilities. Hospitals 4 and 6 lacked ultrasound machines. Lack of consumable supplies for x-ray services was common in all the eight government hospitals. Five hospitals (Hospitals 1, 3, 6, 7 and 9) had stable running water supply. In one hospital, the piped water system had been out of service for 2 years by the time of the study. The running water supply in the other hospitals was unstable and they compensated for this with multiple reservoirs for harvesting rain water.

All the 10 hospitals are connected to national electricity supply grid and they all had standby generators, although fuel was a frequent problem. Power supply was described by all respondents as being fairly stable. All the hospitals had one or two functional ambulances, except Hospitals 4 and 6 which had none. The ambulances could transport two emergency cases with attending staff comfortably. None of the ambulance drivers had received any first aid training. Apart from Hospitals 3 and 10, the hospitals lacked fixed facilities for communication with their next referral level, and whenever the need to refer patients arose, they would use mobile phones or just send the patients without alert.

In terms of space for surgical operations, only Hospital 3 had three operating theatres and could handle three major operations at a go. The others could only manage one major operation at a time, with a possibility of one minor operation. Extra operations could only be done on patient trolleys or beds. Only two of the ten hospitals had sufficient oxygen in stock and oxygen concentrators. Hospitals 5 and 6 lacked oxygen completely at the time of the study and did not even have reserve cylinders or oxygen concentrators. Hospitals 1, 8 and 9 relied on oxygen cylinders but the oxygen supply was irregular due to procurement bureaucracy.

Most of the hospitals also lacked adequate theatre equipment and supplies. Only Hospitals 3 and 8 had patient monitors in their operating theatres. Only three of the ten hospitals had suction machines in their emergency reception areas. Only two of the ten hospitals maintained adequate supplies of sundries and materials necessary for routine running of their hospitals despite budgetary constraints. Hospital 2 had spent 2 months without any sterile surgical gloves. Hospital 5 was rationing intravenous fluids.

Only one hospital had the capacity to provide 15 units of blood simultaneously, because it has the facilities to collect and test blood from donors on-site. The other 9 hospitals rely on regional blood banks and receive an average of 5-20 units per week. However, due to high demand from other medical and surgical conditions, most of this is consumed within two days.

Transport to the blood banks and failure of blood banks to provide sufficient blood are persistent problems. All the hospitals had the capacity to do the most essential laboratory tests like hemoglobin estimation or blood grouping and cross-matching. Most of them lacked the basic essential equipment used in a surgical or medical emergency, as recommended by Uganda's National Advisory Committee on Medical Equipment (NACME) (Uganda MOH, 2003) as shown in Table 6.

Table 6: Availability of essential surgical equipment in selected Uganda higway general hospitals, May 2009.

Item	Expected quantity (NACME standard)	Number of hospitals out of 10 that fulfill the NACME standard
Mobile operating lamps	3	0/10
Sterilisers (autoclaves)	1	5/10
Suction machine (manual)	1	1/10
Suction machine (electric)	1	3/10
Instrument drums	4	0/10
Examination coaches	6	2/10
Instrument trolleys	3	0/10
Drug trolleys	2	0/10
Stretchers/patient trolleys	5	0/10
Ambubags	2	1/10
Laryngoscope	1	0/10
Magill forceps	1	1/10
Oxygen concentrator.	1	2/10
Stethoscope	4	1/10
Wheel chairs	3	0/10
Bed pans	2	0/10
Splints for fractures	30	0/10
Beds for patients	10	0/10
Mattresses	10	0/10
Glucometer	1	1/10
Underwater seal bottles	1	0/10
Pulse oximeter	2	0/10
Face mask	2	0/10
Bp machine	4	0/10
Arterial tourniquets	5	0/10
Dressing sets	10	1/10
Suturing sets	6	0/10
Gumboot pairs	10	1/10
Mc intoshes (Aprons)	10	1/10
Drip stands	10	0/10
Diagnostic set	1	4/10

For more than half of the equipment list provided, none of the hospitals fulfilled the required quantities of equipment. Ironically, hospitals with the largest injury load (Hospitals 1 and 6), were among the worst equipped to handle injuries. We did not do a physical stock check on medicines and medical supplies in the emergency units but from the interviews with key respondents, there was perennial shortage too.

Discussion

The results show that the hospitals do not have the physical infrastructure and arrangement to handle mass casualties. This seems to have been either an oversight or a conscious decision right from their design stage. It is possible that RTA injury management was not a priority at the time. This neglect has persisted to today and has not been rectified. The health policy makers need to plan new arrangements to meet the current health problems. The economy and lifestyles in Uganda have changed, with more people acquiring or traveling by vehicular transport. The speed of the modern vehicles is faster than those in the past, the condition of the roads has deteriorated and traffic law enforcement has declined. All these factors increase the occurrence of road crashes and casualties in the emergency departments of highway hospitals. The limited health care budget available is mainly concentrated on curative services for communicable diseases. Surgical services and conditions have minimal attention.

The research aimed at establishing the quality of care and the outcome of management of RTA injuries. Despite the poor records, it is apparent that most patients recover sufficiently to be discharged from the hospitals alive. This is a commendable outcome, given the poor conditions prevailing in the hospitals. However, it is within the means of the health policy makers in Uganda to improve the quality of care in these hospitals. Inadequate space for emergencies in the hospitals is a matter that can be addressed with relatively few resources. Insufficient equipment and supplies can also be addressed, with good planning, training and supervision. Calls have been made in several forums to increase the funding for highway hospitals but this has not resulted into tangible results. Our take on the matter is that if the funding for these hospitals is to be increased, it should be specifically targeted to the improvement of their

emergency surgical services capacity. Specifically, it should target to create casualty departments, operative theatre capacity and blood bank services. Ideally, each one of these hospitals should have on-site capacity to collect and test blood from donors.

Hospital 9 had a very high runaway rate of 46.6%. It was under-staffed, having only 2 doctors, including the MS. It is probable, therefore, that since patients usually vote with their feet, the quality of care is poor, leading the patients to look for alternative and complementary care. Under-staffing was very evident in all cadres of staff, but especially in the most relevant cadres (Medical Officer Special Grade), anaesthetists and nurses. These are critical shortages which make it difficult to undertake safe emergency surgery. It is not surprising that all the hospitals refer their head injury cases to higher levels due to lack of local capacity to manage them. More of the referred patients would be saved if local capacity to manage them existed at the highway hospitals, since referral time can make a crucial difference in surgical emergencies.

Internal quality improvement mechanisms seemed to be absent or poorly implemented. Only one hospital had surgical audits. This probably stems from poor supervision or lack of it from higher levels like the regional hospitals or the Ministry of Health. If supervision were to be done properly, the local managers would understand the importance of surgical audits and implement them. However, appropriate incentives need to be put in place for local managers to implement such policies. Such incentives could include short training courses for the managers, accompanied with implementation targets and appropriate sanctions for non-implementation. Some proposals to improve surgical services have included the posting of surgeons to the level of general hospitals but this may not be feasible for now since even regional referral hospitals do not have sufficient technical capacity for emergency services (Moro, 2005). Provision of internet connection to staff may also be one way of enabling them to access the necessary technical information about the surgery they may need to do to save lives. This may supplement the currently small hospital libraries.

The study also reveals that hospitals which provide on-site staff accommodation are more capable of mustering a quick response to mass casualties than those whose staff stays far away. There is therefore need for an increase in on-site staff accommodation. In addition, with mass casualties, the hospitals tend to use everybody available, as a coping strategy for staff shortage. This approach is also recommended by the WHO disaster management plan (WHO, 2007). However, not all staff are trained in handling emergency cases and some may cause more harm than good. Therefore, there is need for comprehensive training and regular drills for all qualified staff in resuscitation, patient transportation and other first-aid skills.

Improvement of staff numbers, especially nurses, is essential, to ensure continuity of services even in that face of mass casualties. Such staff, however, should be facilitated with medicines, equipment and other supplies like gloves and oxygen. All these call for increased funding for the hospitals, and better management of the resources. There is, currently, a number of local institutions in Uganda which offer affordable formal qualification programmes in the management of health services and short on-site courses for hospital managers. Short course could even be organized at hospital level to benefit more staff, one at a time until all the hospitals are covered. They would give skills to the staff and improve the management of hospital resources.

Conclusion and recommendations

Ugandan highway general hospitals do not have sufficient physical and technical capacity to handle mass surgical casualties resulting from road crashes. They lack adequate "surge capacity". However, they are able to manage solitary uncomplicated cases reasonably well. Their weaknesses stem from poor infrastructural design, poor financing, poor staffing, lack of surgical skills, lack of facilities and weak management skills. Most of their staff does not reside on-site and this limits the ability to mobilize them at short notice. The managers need to develop emergency preparedness plans for their hospitals, and let these plans be shared and known by all the staff. They need to be trained in the management of hospital resources. Staff needs to be trained and regularly drilled in handling mass casualties. District and central government officials need to supervise the highway hospitals more closely, and give appropriate incentives for performance and sanctions for non-performance.

The Department of Clinical Services of the Ugandan Ministry of Health, which is responsible for hospitals, needs to consider highway general hospitals as special cases deserving not only an increase in funding, but also staffing with qualified and experienced surgeons in order to reduce mortality from road crashes. In addition, the Uganda Blood Transfusion Service of the ministry needs to consider equipping these hospitals with local blood banks with the ability to collect and process blood on-site. While the government is still looking for funds to construct new casualty units for

the highway hospitals, the Infrastructure Division of the Ugandan Ministry of Health needs to reorganize the current outpatient departments in such a way that there is space specifically available for the management of emergency surgical cases, especially mass casualties. In particular, focus should be on emergency theatre space. The Ministry of Health also needs to reconsider the government position on staff accommodation and mobilize resources for the construction of on-site staff houses. At the level of prevention, the Section of Disability Prevention and Rehabilitation in the Ugandan Ministry of Health needs to liaise with the law enforcement agencies to strengthen their vigilance in removing faulty vehicles from the roads, controlling driving practices, and ensuring that only genuine drivers drive cars. The Ministry of Works, Transport and Housing needs to ensure that the road conditions and road furniture are in conducive for motoring. Ultimately, the Ministry of Finance and Economic needs to uncouple revenue collection from the issuance of driving licences. All these activities clearly require multi-sectoral collaboration and the Minister of Health could be the champion for the interventions.

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