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EMERGENCY MEDICINE



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IN MEMORIAM

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We are so familiar with health emergencies; when someone suffers from cardiac arrest, diabetic coma, acute abdomen, a calamity in pregnancy or trauma, we call 112 or 911 (whatever applies in our area) and an ambulance with skilled staff is on its way to the scene and should arrive within a specified time to provide first aid. Resuscitation may have already been started by bystanders who have been trained in cardiac massage in publicly available courses. Skilled staff awaits the patient at the emergency department and major life-saving interventions can be done immediately with further care in an intensive care unit if needed.

Not so in most low- and middle-income settings. Bystander response or any form of emergency service such as ambulance transport or hospital-based facilities is absent in many places. However, this is slowly changing. In 2018, the WHO launched the Global Emergency and Trauma Care Initiative to provide a structured framework to address this issue. In Africa, there is now an African Federation for Emergency Care (AFEM) that has produced the Oxford Handbook of Acute and Emergency Care with protocols for all common conditions.

In Malawi, the adult trauma and emergency centre at Queen Elizabeth Central Hospital in Blantyre has transformed emergency care dramatically based on triage and a well-defined patient approach. In the same hospital, a paediatric intensive care unit was successfully established, boosting health care for children in general and offering specialized care for those who need it.

Patients with burns form a special category, and the emergency management faces many challenges in which cultural beliefs, poor infrastructure, poor training and lack of specialized care play a role with a direct negative effect on outcome.

For the medical staff, working in such an environment is challenging; one must quickly become used to taking on a lot of responsibility. A (junior) expat doctor may have to perform emergency operations particularly on trauma patients that he would never have been allowed to do in countries like the Netherlands, with little if any supervision.

Emergency Medicine (EM) has developed into an increasingly recognized speciality with improved access to specific training for all staff and the availability of protocol-based management. Designated emergency units and intensive care units have been established. EM has been integrated into the medical curricula, and medical and nursing staff do rotations in the Emergency Department. The impact of EM cannot be overemphasized: besides saving lives, it reduces the burden of inappropriate admissions to the wards and reduces overcrowding and overburdening of nursing and medical staff, which in turn benefits all admitted patients. And last but not least, increased awareness, better staff training, and improved infrastructure in overall health facilities result in better care and a more rational referral pattern.

It is gratifying to see yet another important component of the medical spectrum coming of age.

ED ZIJLSTRA
JOSEPHINE VAN DE MAAT

NO ONE SHOULD DIE
FOR THE LACK OF
ACCESS TO EMERGENCY
CARE, AN ESSENTIAL
PART OF UNIVERSAL
HEALTH COVERAGE

WHO DIRECTOR-GENERAL
DR TEDROS ADHANOM
GHEBREYESUS ⁽¹⁾

Disclaimer

All views expressed in this journal are of the authors only and are not necessarily shared by the editors of MT. Letters and articles may be edited for purposes of clarity and space.

1. World Health Organization (WHO). Global Emergency and Trauma Care Initiative [internet]. Geneva: WHO; 2018. Available from: <https://www.who.int/emergencycare/global-initiative/en/>

The importance of Emergency Medicine in Africa

Many acutely ill or injured adults and children in Africa seek care every day. Frontline providers manage patients with acute problems like injuries, infections, stroke, asthma and complications of pregnancy. These acute presentations unfortunately contribute to a high mortality and morbidity. Health-care provision on the continent has historically focussed most on the classic burden of disease such as elective chronic care e.g. HIV/AIDS programs, nutritional care, elective surgery etc. It seems a growing burden of emergency presentations is not being provided for sufficiently. In response, in 2018 the WHO launched the Global Emergency and Trauma Care Initiative to provide a structured framework to address this issue.^[1]

THE PROBLEM

Health and well-being in Africa is characterized by a unique and evolving triple burden of disease as well as a lack of access to healthcare. This combination contributes to the fact that it is the continent with the lowest life expectancy by far.^[2]

THE TRIPLE BURDEN^[3]

Communicable diseases, poverty and malnutrition characterize the first burden of disease, classically representing the majority of years of life lost in Africa.^[4] These conditions can lead to acute life-threatening presentations such as sepsis and dehydration, which have a very good prognosis if treated adequately and in time. The second burden is non-communicable diseases (NCDs) and mental health. NCDs in Africa almost doubled the percentage of total deaths attributed to them in the period from 2008 to

2013.^[5] These chronic lifestyle diseases such as cardiovascular disease, lung disease and diabetes typically present as life-threatening acute exacerbations such as diabetic ketoacidosis, asthma/COPD exacerbation, stroke and heart attacks. The third burden is perhaps the most characteristic of the continent: accidents, violence and war. Specifically, trauma as a consequence of road traffic accidents (RTAs) and interpersonal violence causes almost double the amount of disability adjusted life years (DALYs) in Africa compared with the rest of the world.^[6] Other major causes are burns and drowning.^[7] Africa is the only WHO region where the percentage change in age-standardized road injury DALY rate increased over the period 1990–2013.^[7]

LACK OF ACCESS TO EMERGENCY CARE

There are many obstacles to healthcare access in an emergency, especially in the rural areas of the continent. It starts with a lack of bystander response, and there is usually no coordinated provider dispatch carried out by a call centre. Subsequently, there is a lack of emergency medical service (EMS) ambulances to bring patients to a hospital or clinic. Attendance may be further delayed by lack of triage and/or emergency department facilities. Ultimately, there is often a lack of admission facilities such as high or intensive care units (ICU) or early operative care.

All the links in this chain rely heavily on each other and need to be in place in order to be successful. Research conducted at a large Emergency Department in Botswana identified a clear gap. This unpublished prospective observational study observing the outcome of witnessed cardiac arrest revealed that 27% of patients (n=71) regained return of spontaneous circulation.

This is up to international standards especially considering there were no cases of shockable rhythm observed. Disappointingly, none of the patients survived to discharge. The main contributing factor was the lack of post cardiac arrest care, as only about half of the patients were admitted to ICU.^[8]

FRAMEWORK PROPOSED BY WHO

Any regional or national approach should be customized and take into consideration the specific burden of disease, gaps in the health care system and resources available. For instance, emergency care in Southern Africa is slowly taking off while in Central Africa there is virtually no emergency care provision. These different areas need different solutions. The 'WHO emergency care system framework' is a tool to identify gaps in care delivery and to create context-relevant priority action plans for system improvement. The framework is based on three distinct levels as illustrated in Figure 1. The levels include the scene, transport and the facility. All three have the same key components to function: human resources, protocols and equipment. Some context relevant examples of these components are described below.

HUMAN RESOURCES

As scarcity of appropriately skilled providers is an issue, a realistic approach to the attainable level of training as well as task shifting is required. A good example is the introduction of specialist nurses such as Emergency Care Providers (ECPs) in rural Uganda. Since 2009, they have attended to 80,000 patients, which resulted in favourable mortality rates. This suggests that task shifting can be successfully applied to acute care in order to address the shortage of emergency care.^[9] In South Africa, there is an overwhelming demand for



doctors with skills in emergency care in numbers that the national residency program cannot provide. A Diploma in Primary Emergency Care (DipPEC) was introduced, a one-year core curriculum program, which is now graduating 150-180 candidates per year, providing an immediate solution in a responsible and affordable way.^[10] South Africa, Botswana, Rwanda, Tanzania, Ethiopia, Egypt, Sudan, Malawi and Ghana have developed their own emergency medicine residency programs. Local EM specialists are now ready to fill key coordinating roles in EMS and disaster management, guideline development and research as well as teaching.^[11]

CONTEXT BASED PROTOCOLS

Clinical protocols are evidence-based but rely heavily on studies performed in the Western setting. There are strong examples that demonstrate that it is not possible to extrapolate appropriate management to African settings. These include the increased mortality after fluid boluses in children with severe infections found in East Africa as well as the observed increased mortality after an early resuscitation protocol in adults with sepsis in Zambia.^[12,13] Both studies contradict current Western guidelines. The African Federation for Emergency Medicine (AFEM) is closing this gap by providing a platform for local

researchers to share research in their peer-reviewed journal and by publishing the 'AFEM Clinical Handbook of Acute and Emergency Care'. Additionally, free online open-access medical education (FoaMED) blogs like #badEM (brave Afri-can discussions in Emergency Medicine, www.badem.co.za) contribute by discussing current issues.

EQUIPMENT AND IT

Resources are required at all levels to function at a minimum level. A call centre with a national alarm number, equipped EMS ambulances, and EDs with equipped shock rooms supported by 24/7 radiology, laboratory and blood bank. Bedside diagnostics in the ED such as ultrasound and portable blood gas machines are quick wins; they make the provider independent, are quickly accessible and generally cheap.

CONCLUSION

There is still a lot to gain by introducing or improving the emergency care chain in Africa. Looking at Africa's specific and dynamic burden of disease and its access issues, emergency care is likely to be in high demand. Application of the WHO emergency care system seems to be a useful framework in an African setting, especially when scrutinizing specific issues such as weak links in the access chain, realis-

tic training of human resources, and selecting evidence-based pro-protocols applicable to the African setting.



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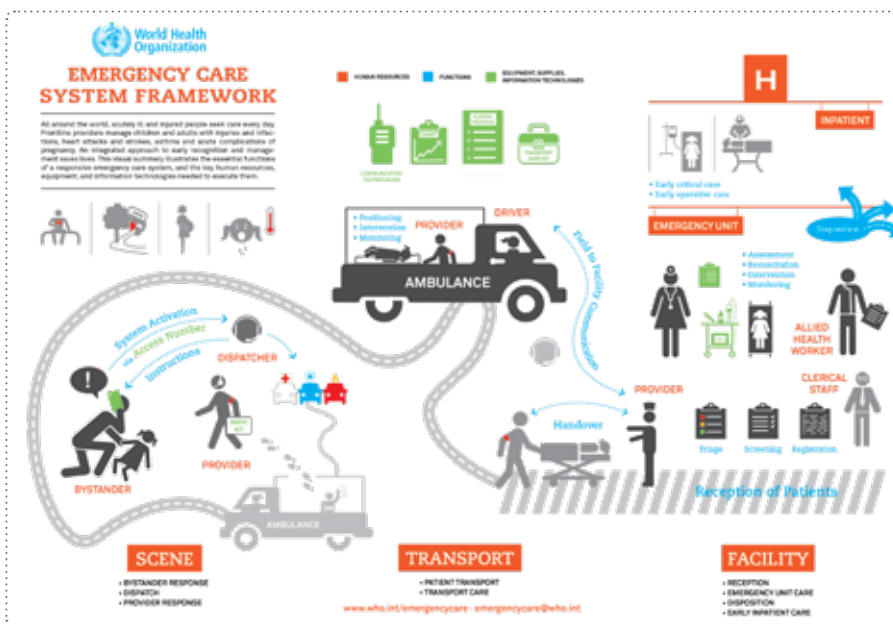


Figure 1. WHO Emergency Care System Framework
 Source: www.who.int/emergencycare/emergencycare_infographic/en



Emergency Medicine training in Africa

Heike Geduld is one of the first emergency physicians trained in Africa, and she is currently a leader in emergency medicine (EM) in the region. In this interview, Heike shares her story, experiences and vision on this new and fast-growing specialty in medicine.

FROM FIRST RESIDENT TO HEAD OF DEPARTMENT

Heike Geduld, born and raised in Cape Town, was among the very first group of residency trainees in emergency medicine on the African continent. Though the medical system in South Africa in those days (in 2004) was fairly advanced, EM as a speciality tended to lag behind. For Heike it was quite a challenge being in that first group. 'We had no idea what we would get into, but I felt that EM was really important, particularly in the African context with a high burden of HIV, TB and trauma. That was the area in which we could make the biggest difference, we thought. And in addition, for me personally, I really liked the idea that emergency medicine allows you to fix things quickly.'

From there, her career took off, as Heike – after many years of presiding the African Federation for Emergency Medicine (AFEM) and the College of Emergency Medicine of South Africa – embarks on a new position as Head of Division of EM at Stellenbosch University.

SHARED VISION

Over the past 15 years, the speciality of EM has matured vastly although it is still fairly new. In her job with AFEM, Heike was responsible for training and systems development in emergency medicine. She also devoted much of her time to advocating for having an emergency physician in a medical facility and for training nurses in emergency medicine. 'Emergency care appears quite costly to health managers, especially building supporting systems (from the community to the hospital), which makes advocacy quite challenging. We managed however to bring key partners from across Africa

together around specific needs in EM and shared materials. Our strength was fostering this network and validating the work of partners in their respective countries.' For Heike this was one of the main successes of AFEM: the creation of a network and bringing committed people together around a shared vision of emergency care for all across Africa.

THE RELEVANCE OF DATA

Education has been very important in reaching this goal, Heike recalls. This is considered 'low-hanging fruit, as it is measurable and it allows you to prove that you made a difference. There are thousands of educational projects in Africa, so one of our primary focus areas has been to bring people together, facilitate their collaboration, and harvest the educational projects.'

This harvesting was done by themselves, as they always ensured that the authors and collaborators were Africans and not only visitors from high-income countries. The personality of people working in EM helped to get things done, as according to Heike 'We are people who are often quite willing to push ourselves, take chances and give things a go.'

This attitude was important and proved useful in publishing on EM in Africa, because as Heike underlines 'One of the things we were very aware of from the start is that you can't build and advocate for a system unless you have data. That is what ministries want, and this needed to be produced by people on the ground. So when you train people to take on this role as EM nurse or pre-hospital provider or emergency physician, you have to teach them how to do the research and to present it in a way that actually allows them to provide advocacy. For EM to develop, everyone who is a new trainee is a future leader.'

AND THE HARVESTING CONTINUES...

In a relatively short time span, AFEM has published two handbooks on acute and emergency care – geared to LMIC settings,^[1] their Journal (AFJEM, Afri-

can Journal of Emergency Medicine) has received Pubmed registration, and the AfCEM conferences held every two years attract hundreds of participants. As an educator, Heike holds great pride in having been an implementation partner of the WHO in their Basic Emergency Care (BEC) course. The course is for providers having to deal with emergency care in limited resource settings. There have been pilots in Uganda, Tanzania, and Asia, and the course is open-source available.^[2] Heike was one of the editors, and it was one of 'those personal dreams to be involved in something way bigger than the things that I can do day to day.'

DEALING WITH EM IN THE COMMUNITY

In places where emergency medical service (EMS) is not formalised, it is important to educate the lay person and enable people to respond to emergencies in a sensible way. To support this, AFEM developed the Community First Aid Responders (CFAR) project in which the community is trained in firstly recognizing emergencies, and secondly knowing what to do when they occur. Building a good EMS is building a good community response system. The CFAR curriculum includes basic components on safety and personal protection, on how to stop bleeding, and basic splinting with things that are lying around. The context is important, as Heike explains. 'When we started educating taxi drivers in Madagascar, the taxi drivers asked if we could also teach them how to deliver babies. Because there is no prehospital system, they are the ones driving patients to hospitals, and they were sometimes delivering babies themselves!





That never crossed our mind!’ Besides the context, culture and acceptance of emergency care matter, but also much depends on the system and resources. An example is how to deal with cardiopulmonary resuscitation (CPR) in a low-resource setting, or if there is debate on the issue, for example on whether to perform CPR on an elderly person. In some cultures, ‘People will actually say it is important that you do CPR on elderly patients as they are the soul of the community.’ Examples like this show the relativity of ‘common views’ when considered in a specific context.

THE FUTURE OF EMERGENCY MEDICINE IN AFRICA

Emergency medicine training took off over the past decade, with ten countries across Africa now providing this training (South Africa, Botswana, Tanzania, Ethiopia, Egypt, Sudan, Ghana, Rwanda, Uganda and Mozambique). This is a good development, though Heike hopes

to see more education programmes across Africa – particularly franco-phone countries. In addition, ‘There is a need to focus on formalising training of nurses and other care providers in EM, alongside improvements in prehospital care, and of course we need consolidation of the existing systems.’

A WORD OF ADVICE

One of the tips Heike would give Dutch MDs coming to work in emergency medicine in Africa is to be culturally sensitive and aware of the context. ‘I do think that there are fantastic experiences you can have as an emergency care provider in an LMIC. We have very complicated cases, but there is also this experience of being part of something that is both challenging and incredibly uplifting. EM in Africa is very uplifting, because there is the chance to do something in a space where very few people are involved. So the things you do can make a big difference. There

are quite a lot of places that actually need people to come and teach.’

With these words, and an invitation to participate in the upcoming conference on EM in Cape Town in November (www.emssa2019.co.za), we concluded an interesting conversation about emergency medicine in Africa. Those who cannot wait until November and are interested in any of the programmes Heike is involved in, can contact her directly (heike.geduld@afem.info).



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Establishing a paediatric intensive care unit in a low income setting

Childhood mortality in low- and middle-income countries (LMICs) has dramatically decreased over the last two decades.^[1,2] In the 1990s, nearly one in five children living in sub-Saharan Africa died before their fifth birthday. The under-five mortality for sub-Saharan Africa has since more than halved and is currently estimated at 7.6%.^[1,2]

Childhood mortality in LMIC settings however remains an unacceptable eight times higher than in high-income country (HIC) settings and needs further reduction in the coming decades.^[2] The question is of course how to achieve this. So far the largest reduction may have been due to preventive medicine, an area that may still have room for improvement.^[3] However, we now may have entered an era where further reduction of mortality should (also)

come from improved curative services.

Reducing in-hospital mortality means improving care of critically sick children, or in other words developing critical care medicine in low-income settings. The WHO acknowledged the importance of critical care in paediatrics by developing the Emergency Triage and Treatment (ETAT) guidelines in the previous decade.^[4] These guidelines, developed for healthcare workers in LMICs, help to timely detect critically sick children, prioritise their care, and improve the quality of resuscitation and save lives.^[5]

Although this may be seen as the introduction of critical care to LMIC, still much has to be improved in the care we deliver to children following the acute event. Focussing attention, resources, and efforts on the sickest children is ide-

ally done in high-care wards or paediatric intensive care units (PICU), a concept which is relatively new to sub-Saharan Africa. Even in western settings, separate paediatric intensive care units were only established in the 70s and 80s. In sub-Saharan Africa, these units are not common but are slowly appearing.^[6]

In Blantyre, Malawi, we opened the first paediatric intensive care unit in July 2017. In this article we describe some of the issues we faced and progress that has been made that may be of use to others with similar interests.

SETTING

Malawi is one of the poorest African countries and has a current health expenditure of 30 US dollars per capita per year.^[7] Blantyre, the second largest town in Malawi, is home to the country’s only medical university, the College



Entrance of the Mercy James Centre building.



Interior of the PICU or paediatric intensive care unit.

of Medicine, which was founded in the early 1990s. The Queen Elizabeth Central Hospital is a third-line government hospital affiliated to the college. Its paediatric department is one of the largest departments and hosts on average 200-350 in-patients, with wards specialising in general paediatrics, neonatal care, malnutrition, oncology, orthopaedics, neurosurgery, burns and general paediatric surgery.^[8] The paediatric surgical unit was rebuilt and re-opened in 2017 as the 'Mercy James Centre for Paediatric Surgery and Intensive Care'. As part of the improved care, three new operating theatres, a four-bed high-care and six-bed paediatric intensive care was included in the building plans for this new paediatric surgical hospital.

CHALLENGES

Setting up a new high-tech facility in an LMIC faces several challenges. Some of these challenges may not be different from setting up a new health facility or even a business in a low-resource setting. However, the consequences of suboptimal functioning are potentially lethal as critically sick children are involved. Unmistakably the most important challenge has been obtaining funding, embedding it in the existing infrastructure, and obtaining sustainable involvement of the government. To achieve this, several important collaborations have contributed essential equipment and other resources to the development of our PICU (Figure 1). The paper focusses though on more practical challenges we faced during the first year.

STAFF

Staffing the unit with sufficient and adequately trained nurses, doctors, and

support staff is unmistakably one of the most important aspects in developing a PICU. In collaboration with the government, 20 nurses were hired to staff the six-bed PICU, a relatively low number compared to western PICUs in HICs, but a very high number compared to normal hospital wards in LMICs. Some of the nurses had paediatric experience whilst others were newly registered nurses. All nurses were trained in the weeks prior to opening the PICU with support from an American PICU nurse trainer, input from Cape Town University, and the involvement of the paediatric, surgical and aesthetic departments and the college of nursing. The two lead nurses of the unit had spent a six-month period in the PICU of Oslo and a Norwegian PICU nurse was present to deliver bedside training.

Since the opening, nurse training has continued on site, and after a year most nurses have developed from beginner to a good basic level of PICU nursing. In the next year, the level should be further improved to also be able to make an impact on the vulnerable neonates which require a very high level of attention to detail and care.

During the first year, new nurses joined our team, which emphasised the need of having our own PICU nurse trainers to deliver the curriculum developed for our new staff. Two nurse teachers were selected to receive further training in Oslo and have been linked up with American and Dutch nurse trainers. By involving the College of Nursing in Malawi, we aim to boost the development of a critical care curriculum for nurses in Malawi.

The unit is currently run by two international paediatric intensivists that perform the clinical work and build up the unit. With the help of visiting intensivists from the collaborative projects and a Malawian paediatric anaesthetist, the clinical work of the unit is covered. During out of office hours most of the work is performed by Anaesthetics Clinical Officers, who have been trained over the past 18 months in PICU-related topics. These physicians can rely on a growing number of local protocols developed over the past months which are accessible through a website.^[9] In the long run, the unit should be staffed by a paediatric intensivist from Malawi; the first one is currently being trained in Cape Town, South Africa. A six-month fellowship in paediatric intensive care and anaesthesia was developed to encourage interest among young doctors.

The care for critically sick patients relies on many more persons than doctors and nurses alone, including ward assistants, cleaners, technicians, store managers, lab technicians, pharmacists, physiotherapists and data clerks. The performance of all these persons is essential but demands (very) different skills in the critical care setting and requires extra training. Most training, once again, was provided in the ward by our own staff or by external specialists who were sent by one of the collaborative partners, as many of these areas involve expertise that cannot be provided by nurses and doctors.

CONSUMABLES, DRUGS AND LOGISTICS

The permanent availability of essential consumables and drugs is essential to outcomes of PICU patients. A list of



essential equipment and drugs was compiled together with our management team, and we are setting up reliable supply lines and a solid store management system. This process in itself is quite complex in our settings for several reasons. We require new items and drugs



Figure 1. A summary of some partners involved in developing the Mercy James Centre Paediatric Intensive Care Unit (MJC PICU)

that have not been routinely available in health services in Malawi. Some items cannot be bought locally and delivery can take weeks to months. We partly depend upon donations, which may not always provide the right items. We are trying to improve this essential aspect by simultaneously involving hospital pharmacies at a local and national level, preferably sourcing items through local commercial suppliers rather than depending upon international donations, by developing a computerised stock system, and by appointing a stores and procurement manager.

EQUIPMENT AND FACILITIES

Intensive care medicine involves a large quantity of essential equipment including ventilators, monitors, syringe drivers, special intensive care beds, mobile imaging machines and basic lab machines. These items were donated as refurbished equipment or purchased as new equipment with the help of donors. To be able to run these sensitive machines non-stop, several essential facilities were incorporated in the design of the hospital including a generator and Unlimited Power Supply (UPS), a plant to concentrate oxygen, air and create vacuum and a buffered water supply. These systems are all equipped with alarm units to detect malfunctioning

and require permanently available staff to perform urgent repairs. Training and appointment of a qualified and motivated technician has been essential to keep the donated items running, and we aim to move towards preventive maintenance and an indexed system of equipment.

HYGIENE

Intensive care also means clustering patients who are severely sick, often due to infections, with patients most vulnerable to infections. Infection prevention and treatment is therefore even more important than in other parts of the hospital. Even in high-income settings it is not uncommon that (multi-resistant) bacteria rapidly spread in ICUs and cause temporary closing of units. In our hospital, multi-resistant gram-negative bacteria were and are present and have not ignored our PICU.^[10] The role of an active and multidisciplinary infection prevention committee, medical bacteriology support, appropriate antibiotic drugs / guidelines, and a proper supply line to prevent re-using equipment are essential but also a challenge.

PATIENTS AND ETHICS

Possibly the biggest clinical challenge is deciding whom to admit (or reject) to PICU. Even in settings with high resources this is a recurrent dilemma, but in settings with high numbers of severely sick children and limited beds this ethical dilemma is even more pressing. An important element of critical care is to focus resources on those in whom we can positively change the course of disease. Deferring a patient from PICU will likely mean the patient will not survive, whilst admission of a patient who will not survive indirectly means that (several) other children with a potentially good outcome may not get a PICU bed.

The decision is further complicated since a) PICU-care is new to all physicians involved and thus there is little experience and data aiding these decisions, b) presentations are often delayed, and c) information on the course and cause of disease is more difficult to obtain. The latter two both delay prompt and adequate treatment and reduce chances of full recovery. Ideally, intensive care is given to a healthy child

suffering from an acute illness which is detected in time, and after a short and intensive treatment, the child fully recovers. The ICU is then a bridge towards a healthy future. We have written a guideline that can help in making these difficult decisions as we gather outcome data from patients we admit to PICU.^[9]

The timing of admission is essential as detection of clinical deterioration and timely intervention and PICU admission can prevent morbidity and mortality. Creating a PICU has demonstrated the need for a unit that can more closely monitor patients who may need more intensive care or do not need to be in PICU anymore but still need monitoring. The paediatric department is currently developing such a high-care unit, which is essential to improve the full chain of care for our patients.

CURRENT DATA

In the first year since opening, we admitted 296 patients to PICU who spent 1185 bed days in our unit. The number



Figure 2. Admissions during the first year of the PICU

of admissions per month is displayed in Figure 2. Most admissions consisted of children with surgical conditions (80%). The majority of our patients (151/296 = 51.0%) was less than one year of age and 29.3% (n=87) less than one month. Newborns are generally overrepresented in PICUs, as this age group is commonly affected by either congenital (surgical) conditions or infectious diseases. The percentage of patients who were ventilated during admission increased from 40% in the first month to approximately 80% at the end of the year. The overall mortality was 25% (n=75), which was higher in neonates but was not different amongst surgical or medical patients (data not shown).

FUTURE DIRECTIONS AND CONCLUSION

The development of a paediatric inten-

sive care in Malawi has been a major achievement that was realised by the commitment and collaboration of many individuals, institutes and governmental and non-governmental bodies. Embedding the PICU into the current system and obtaining government and hospital support and resources has been essential. However, much more time and effort will be needed to fully embed the PICU in paediatric healthcare services. Challenges to be faced involve developing reliable supply lines and stocks, maintaining and replacing essential equipment, development of a critical care curriculum for nurses and doctors, and finally improvement of high-care facilities in our medical wards.

Critical care has brought a new dimension to paediatric healthcare in Malawi and has made a promising impact on the outcomes of several children. The opening of a PICU will boost these developments and will undoubtedly further improve paediatric healthcare and survival in Malawi and other sub-Saharan African countries.



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Burden and pattern of injuries in an Ethiopian referral hospital

Results from data collection in the Hawassa University Referral Hospital Ethiopia

Injuries account for 10% of deaths worldwide. This is higher than the total number of deaths from malaria, tuberculosis and HIV combined. Road traffic accidents are responsible for 23% of these, followed by intentional harm from suicide (15%) and homicide (11%). Low- and middle-income countries (LMICs) suffer the brunt of these, with injury death rates ranging from 45-55 fatal injuries per 100,000 population in Western Europe and North America up to 99 to 126 in LMICs.^[1] These numbers are rising in sub-Saharan Africa due

to rapid growth of motorized transport and expansion of industrial production without adequate safety precautions.^[2] Only little attention is given to this problem and thus there is insufficient monitoring of the pattern and burden of injuries. In 2012, 11% of the total disability adjusted life years (DALYs) lost in Ethiopia were due to trauma.^[3] Our aim is to describe the causes and type of injuries in Hawassa University Referral Hospital in 2013 (2006 Ethiopian calendar) and to make recommendations for possible interventions.

EXPERIENCES FROM AN ETHIOPIAN HOSPITAL

We performed a retrospective cohort study in Hawassa University Referral Hospital in Ethiopia. All trauma patients who presented in either the surgical or the paediatric emergency department (ED) in 2013 were included. We collected their file numbers from the logbooks in the emergency and paediatric department. Using a structured checklist, socio-demographic and injury-related facts were recorded. In case of multiple injuries but no poly trauma, we selected the most severe injury.



THE HOSPITAL

Hawassa University Referral Hospital is a large tertiary hospital (79 surgical beds, 8 intensive care beds) for the southern region of Ethiopia that serves a population of 19.1 million people. At the time of research, there were eight general surgeons, one of them also specialized in urology and one in plastic and reconstructive surgery. None were formally trained as trauma or orthopaedic surgeon. The hospital serves as a training facility for medical students and provides postgraduate training for surgical residents and emergency physicians. Residents or emergency physicians are usually the first responder in the ED. No structured triage system is in place and trauma cases are not structurally assessed via Advanced Trauma Life Support (ATLS) principles. X-ray and ultrasound possibilities are available. No CT scan was available at the time. Those who could afford it were sent to a private hospital with CT facilities. We should mention here that, contrary to the situation in most high-income countries, there is a possibility of keeping patients in the ED for several days, and these patients did not count as admissions.

RESULTS

In 2013, in total 1318 patients presented with trauma in either the emergency or paediatric department of our hospital. We excluded 14 patients from our study due to missing files. Finally, 1304 patients were included, of which 30% were referred by a lower-level facility. Two-thirds were male, median age was 28 years (ranging from 0 to 90 years). Unintentional harm accounted for 70% of the injuries: mainly road traffic accidents (36%), occupational accidents (19%) and domestic accidents (15%). Fighting, sexual abuse and other intentional harm accounted for 28% of the cases, while suicide attempts were seen in less than 1%. The remaining cases were mostly from animal attacks (e.g. hyena-, dog- and snakebites). See also Figure 1.

In terms of injury types, the most frequent were wounds and burns (N=395, 36%), although most of these cases were only mild (85%). Second most frequent were head injuries (N=381, 29%). Of

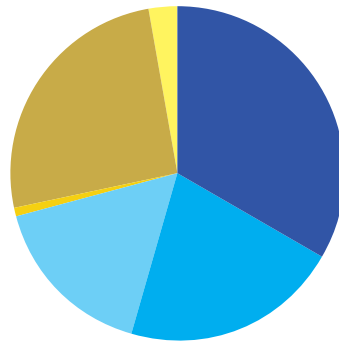


Figure 1. Causes of trauma of patients presenting at Hawassa University Referral Hospital in 2013.

- Traffic accident
- Occupational accident
- Domestic accident
- Suicide attempt
- Fighting, sexual abuse and other violence
- Other

these, severe head injuries were seen in 21% of the cases, 22% had moderate head injuries and 57% only mild head injuries. Only 2% of the patients were poly trauma patients. Location of injury is provided in Figure 2.

Head trauma was a major reason for presentation at the ED. Half of these (187) needed admission. From this group, 29 needed burr holes. A total of 45 head injury patients died during admission. This was the leading cause with 66% out of the total in-hospital deaths after trauma.

Because of a lack of orthopaedic surgeons, 57 patients (4.4%) were referred to another hospital. Almost half of those patients (24/57) were sent for orthopaedic treatment of lower or upper extremity fractures or dislocations, 14 were referred because of head injuries, 6 because of complicated poly trauma, and 12 for the treatment of other injuries.

DISCUSSION

We described the causes and types of injuries in a large tertiary hospital in Ethiopia during one year. Unfortunately, little epidemiological data is available on injuries in Ethiopia.^[4,5] We believe

that more data would be crucial for health policy makers to guide their decisions on in-hospital care as well as on preventive measurements. Compared to recently published data collected elsewhere in Ethiopia, we found similar rates of road traffic accident victims: 34% in our study, 35% in Bulto et al. versus 14% in Amdeslasie et al.^[4,5] We found slightly less victims from intentional harm (28%) than Bulto et al (43%) and Amdeslasie et al (31%). Mainly young men are affected. Most common

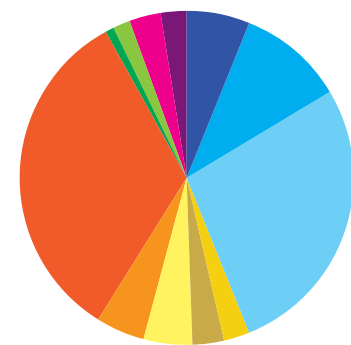


Figure 2. Distribution of type of injury of patients presenting at Hawassa University Referral Hospital in 2013.

- Upper extremity fracture/dislocation
- Lower extremity fracture/dislocation
- Head injury
- Maxillo-facial injury
- Neck/Spine injury
- Thoracic injury
- Abdominal injury
- Wounds/Burns
- Amputation
- Eye injury
- Polytrauma patient
- Other

are soft tissue and head injuries, with the latter type accounting for both most admissions and in-hospital deaths. We found an in-hospital mortality of 5.4%, mainly after head injury. This is comparable to the 4.2% in a recent study about trauma in a tertiary hospital in Malawi.^[6] Head injury accounted for most of our admissions, similar to the studies by Bulto et al and Amdeslasie et al.^[4,5]

We hypothesize that we underestimated the true trauma related morbidity and mortality. Firstly, not all patients reach the hospital alive. There are no comprehensive statistics about victims who died on the accident scene or while being transported to the hospital. Another category that do not make it to our tertiary referral hospital are those that are seen in a local clinic but cannot afford the travel costs. Thirdly, we only looked at admissions. Patients seen and treated in the ED, even if for an overnight observation there, were not included. Another limitation is the retrospective nature of this study. The coding system used in this study was not standardized in the hospital admission forms. This means that the files had to be reviewed and interpreted by the researchers, sometimes with incomplete data. The earlier mentioned lack of trauma skilled personal was confirmed by the lack of structured trauma screening found in this retrospective study.

Our data cannot directly be extrapolated to other low-resource settings but gives a mere indication of the trauma burden in a referral hospital in an Ethiopian rural area.

MULTILEVEL INTERVENTIONS ARE NEEDED TO DIMINISH THE HIGH BURDEN OF TRAUMA VICTIMS IN SOUTHERN ETHIOPIA, INCLUDING A FOCUS ON PREVENTIVE CARE

RECOMMENDATIONS

As we consider the burden of injuries to be high, we propose that multilevel interventions are needed to diminish the high burden of trauma victims in southern Ethiopia, including a focus on preventive care.

In the first place, the hospital staff is not trained in trauma care and resources are limited. Although there is no formal training available in Ethiopia, we recommend inclusion of the principles of ATLS during medical and postgraduate

training.^[7] Also, the scarce availability of diagnostics that are essential in trauma care such as ultrasound and CT should be improved and made readily available. Furthermore, the limited treatment options, especially for traumatic bone injuries, play a major role in the outcome of trauma care. Often conservative treatment via plaster of Paris (POP) or skin or bone traction for fractures are the sole options available. The option of plating or intramedullary fixation is absent and there is only limited availability for external fixation, even in a tertiary referral centre. Inadequately treated fractures in young patients may lead to disability, more DALYs and hence less productivity for Ethiopia as a whole. Some (mission) hospitals provide orthopaedic care via expatriate trauma/orthopaedic surgeons. However, there is a lack of trained Ethiopian trauma surgeons, especially in remote areas.

Secondly, prevention of trauma remains key. This prevention should primarily focus on traffic safety by addressing poor road structure, poor adherence to traffic rules, and the use of poorly maintained motorized vehicles and lack of use of safety equipment like helmets. Also, substance abuse (qat, alcohol) should be strictly controlled especially in traffic. Burns by cooking fires at home or kerosene lights pose a significant risk in relation to the high burden of burns we have encountered (36%). Occupational incidents could be prevented by better regulation of personal protective equipment at work.

CONCLUSION

In 2013, 1304 trauma patients were admitted after being seen in the emergency and paediatric department of Hawassa University Referral Hospital, most often due to road traffic accidents. Traumatic brain injury was the predominant reason for admission and for in-hospital death. Improvements could be made in the training of medical staff with the principles of ATLS or the presentation of multiple casualties. Policy makers should focus on enhancing the in-hospital trauma care and the referral system but above all should invest in preventive measures.



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The adult emergency and trauma centre (AETC) at Queen Elizabeth Central Hospital, Blantyre, Malawi

This summary was compiled after a discussion between Mulinda Nyirenda, expert in the subject, and Ed Zijlstra on behalf of the Editorial Board of MT.

BRIEF CV

Mulinda Nyirenda completed her medical education at the College of Medicine, Blantyre, Malawi and graduated in 2001 (MBBS). She then trained in Internal Medicine in Malawi (University of Malawi, MMed, 2010) and South Africa (Witwatersrand, 2012, MMed; FCP (SA) in 2010). She is now finalising a Masters of Philosophy in Emergency Medicine at University of Cape Town. In 2010 she joined the OPD/Emergency/casualty section that later became the AETC at QECH. She is a section editor of the African Federation of Emergency Medicine (AFEM) handbook.

INTRODUCTION

Before 2011, it was not uncommon to find a patient in the adult medical wards of Queen Elizabeth Central Hospital (QECH) during the daily morning ward round who was admitted during the night because of headache and fever. Quick assessment would show that the patient was probably suffering from acute bacterial meningitis, a medical emergency condition. However, no adequate clinical assessment, including diagnostic procedures such as lumbar puncture, had been done, and appropriate (or empirical) treatment with antibiotics and IV fluids had not been started. Precious time was therefore lost which often contributed to a poor outcome in this serious disease. This was not a standalone example, but a common occurrence that painfully showed the lack of a well-functioning emergency department with a 24-hour service and skilled staff.

INFRASTRUCTURE AND STAFF

The Adult Emergency and Trauma Centre (AETC) at QECH began its operations in October 2011 with support of

the Wellcome Trust, the Anadkat Family and other private donors. QECH is a tertiary referral hospital and serves the adult population of Blantyre district with a catchment area of 1.2 million people. The AETC provides emergency care for adult patients with medical, surgical, trauma or obstetric/ gynaecological conditions; a paediatric Emergency Department had existed at QECH from 2001.

The staff consists of generally trained medical and nursing staff supported by ancillary staff. The medical team is composed of clinical officers, medical interns and medical officers. All require in-house training in emergency and trauma care skills at the beginning of their rotation. There are three senior consultants who are all special-

ized in Emergence Medicine and offer oversight and expertise. Nurses are trained in triage and basic life support skills and basic trauma care skills that allow them to initiate life-saving emergency care and treatment as patient awaits clinical evaluation.

The departments of Internal Medicine, Surgery and Obstetrics/Gynaecology each have interns and registrars responsible for medical, surgical and gynaecological admissions and for offering consultation for other specialties.

ORGANIZATION OF PATIENT CARE

The AETC operates on four pillars: 1. proper initial assessment using a triage system to reduce delays for patients who need treatment urgently; 2. early

EMERGENCY TO BE SEEN IMMEDIATELY	PRIORITY TO BE SEEN WITHIN 1 HOUR
<p>SIGNS</p> <p>AIRWAY</p> <ul style="list-style-type: none"> Airway compromise <p>BREATHING</p> <ul style="list-style-type: none"> Severe respiratory distress Respiratory rate > 30 or < 8 Pulse oximetry < 90% Wheezing or stridor Central cyanosis <p>CIRCULATION</p> <ul style="list-style-type: none"> Systolic blood pressure < 80 or > 220 Diastolic blood pressure > 130 Pulse > 130 or < 40 Heavy bleeding Weak or thready pulse Severe dehydration Temperature > 40 °C or < 34 °C <p>DISABILITY</p> <ul style="list-style-type: none"> Active convulsions GCS ≤ 10 RBG < 2 mmol/l <p>SYMPTOMS</p> <ul style="list-style-type: none"> Facial swelling Major burn Major trauma Pregnancy with seizure history Severe shortness of breath Snakebites Violent behavior 	<p>SIGNS</p> <p>BREATHING</p> <ul style="list-style-type: none"> Difficulty breathing Respiratory rate > 20 or < 12 Pulse oximetry < 93% <p>CIRCULATION</p> <ul style="list-style-type: none"> Systolic blood pressure < 90 or > 180 Diastolic blood pressure > 110 Pulse > 110 or < 50 Very pale appearance Moderate dehydration Temperature > 38 °C or < 35.5 °C <p>DISABILITY</p> <ul style="list-style-type: none"> GCS < 14 RBG < 4 mmol/l <p>SYMPTOMS</p> <ul style="list-style-type: none"> Active bleeding Chest pain Focal neurologic deficit Fracture / dislocation Head injury with loss of consciousness History of convulsions Moderate burn Poisoning Pregnancy with abdominal pain Recent faint or severe weakness Severe pain Sexual assault Visual changes
ALL OTHER PATIENTS MAY BE TRIAGED AS GREEN	

Figure 1: The Triage parameters utilised in the AETC three-tiered triage



clinical assessment and treatment, with proper consultation and evaluation of treatment response; 3. availability of senior consultants (medical expertise) to provide early diagnosis recognition and implementation of appropriate care packages for patients; and 4. early diagnostic pathways leading to initiation of treatment before admission to the wards and reducing unnecessary hospital admissions and follow-up visits for patients.

The triage system was developed locally from the South African Triage System, the Manchester Triage system, and the World Health Organisation (WHO) QUICK check tools.^[1,2,3] Its implementation was guided by the local experience of the WHO paediatric Emergency Triage Assessment and Treatment (ETAT) implementation, which has been adopted by health workers in Malawi.^[4] The triage parameters include a presenting complaint and core vital signs (respiratory rate, oxygen saturation, pulse rate, blood pressure, Glasgow Coma scale (GCS) and temperature). It is a three-tiered continuous triage system coded with traffic light signs: red (emergency) indicating 'to be seen immediately', yellow (urgent/priority) 'to be seen within 1 hour' and green (queue) 'to be seen within 4 hours of arrival'. (Figure 1)

Senior medical expertise has improved resuscitation care for the unstable patient resulting in prompt recognition of respiratory and circulatory failure, shock, and altered mental state presentation that require stabilization. Airway management, oxygen supplementation, circulatory support and relevant intensive care monitoring are initiated and provided in the 4-bed designated resuscitation room. Patients from this area are often admitted later to the high dependency and intensive care units of the hospital.

The short-stay ward reduces unnecessary hospital admissions for patients

TABLE 1: CHANGES OBSERVED IN TIME REQUIRED TO ACHIEVE SPECIFIC INDICATORS FOR CARE OF ACUTE MENINGITIS PATIENTS BEFORE AND AFTER THE OPENING OF THE ADULT EMERGENCY DEPARTMENT

INDICATOR	BEFORE AETC OPENING 2009 Mean (SD)* in hr:min	After AETC opened 2012 Mean (SD)* in hr:min	Difference noted Mean in hr:min
Registration to Triage**	02:50 (1:00-4:55)	00:05 (00:04-00:13)	01:10
Registration to First Clinical review	03:07 (00:45-4:57)	00:38 (00:15 - 01:19)	02:31
Registration to Lumbar Puncture	03:30 (01:00-04:51)	01:25 (00:47 -02:31)	02:05
Registration to antibiotics administration	02:42 (01:42-06:00)	01:52 (01:03-03:00)	0:50

* (SD) = standard deviation. ** Triage in 2009 had no clearly defined criteria but was based on nurses' acuity assessment.

who present for example with asthma exacerbations, non-severe malaria with gastrointestinal disturbances, gastroenteritis requiring IV rehydration as well as patients requiring observation after minor surgical procedures in the emergency department.

OUTREACH

In addition to care at QECH and in collaboration with the district health officer (DHO), the AETC reaches out to the health centres (HC) in Blantyre district by helping to strengthen the care given at HCs and by designing access pathways and identifying nearest gateway clinics. The Family Medicine speciality has also taken on the role of improving delivery of care in Blantyre District Health Centres. Supervision by specialists and the DHO have been strengthened. Overtime and decentralisation of care, particularly of chronic conditions, have also helped in improving primary

care packages offered at health centres.

ACHIEVEMENTS AND CHALLENGES

The impact of transforming the adult patient care pathway is illustrated using the acute care pathways indicators in providing care for the acute meningitis patient displayed in Table 1.

The admission rate of the adult patients decreased from 32% to 9% of all acute presentations in the hospital (Figure 2). A shift in the pattern of admitted patient load was observed; for example, there was a significant reduction in the number of patients admitted to internal medicine wards from 68% to 28%, whereas 21% of adult admissions were diverted to the emergency medicine short stay ward for observation and stabilisation. The outreach activities in Blantyre District that aimed at primary care strengthening yielded a reduction of 19% in visits to

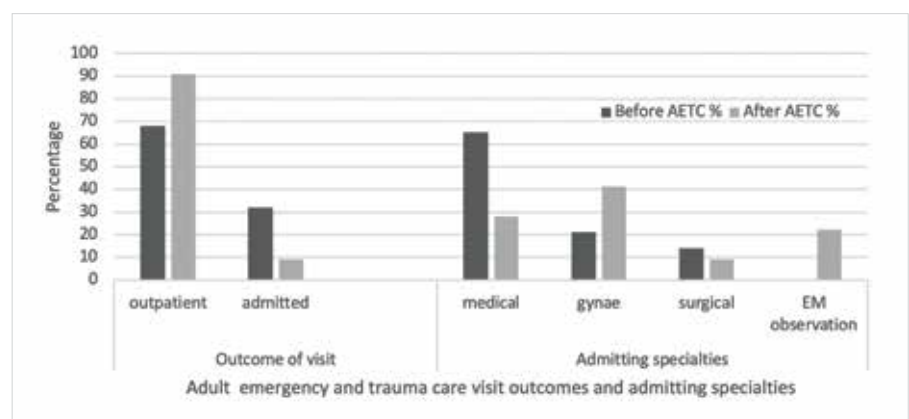


Figure 2: Impact of change in adult emergency and trauma care pathways.



the adult emergency and trauma center between 2011 (n= 596,536) and 2012 (n = 482,571), reducing overcrowding and optimizing the care for critically ill patients. Critical care in various specialties has improved with the establishment of the AETC, resulting in better selection of patients admitted to high dependency units. The 4-bed intensive care unit of the hospital has also diversified its patient profile, which especially benefits non-surgical patients.

The AETC is an educational hub and a unique model of adult acute/ emergency care in Malawi. Medical and nursing students in undergraduate and post-graduate programs are exposed to the AETC as part of their curriculum. Since November 2017, medical interns have been doing a formal rotation in emergency medicine which is unique in the country.

Current challenges include high turnover rates in staff that affect standards of care. Overcrowding in the AETC occurs due to delays in processing of medical and surgical admissions. In addition, the AETC is still utilized for primary care and follow-up outpatient care. Limited funding from the Ministry of Health with minimal external partnerships compromises the emergency care package at various levels.

CONCLUSION

The AETC has transformed medical care in Blantyre district and in QECH, both conceptually and practically, in terms of understanding the concept as well as the delivery of emergency care. This has also resulted in the restructuring of primary health care in the district leading to improved care at the health centre level.



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Burn injuries in Africa with a focus on management in the acute phase

Burn injuries are a common cause of trauma in Africa. The injuries are often severe and contribute to major morbidity and mortality. Children are most vulnerable to sustaining burns. The World Health Organization (WHO) estimates that between 15,000 and 30,000 children under the age of 5 years die of fire-related injuries in Sub-Saharan Africa annually.^[1]

Burn care is complex even in well-equipped centres in high-income countries (HIC). Lack of prevention programmes, poverty, co-morbidity, ignorance, and cultural beliefs all influence the incidence of burn injuries as well as the outcome. In many African countries, an individual with an epileptic fit who falls into a fire is thought to be bewitched and will not be pulled from the flames until the shaking stops resulting in devastating burns.^[2] (Figure 1)



Figure 1: Full thickness burn with necrosis of the toes (black tissue) and signs of infection (yellow tissue) in a patient who had an epileptic fit. The patient presented with a delay of 1 week.

Burn care is usually poorly organized and suffers from shortage of supplies, poorly educated staff, and lack of commitment from the health authorities.^[1] In general, health facilities are under-equipped for adequate management. Although in recent years more burn centres in Africa have been established, for example in Ethiopia, Kenya, Ghana and Malawi, these are at a central level and people from the rural areas often do not have access because of cost and lack of transport. Instead they visit a traditional healer first, causing further delay and increased risk of adverse outcome such as infection. Therefore, patients with burn injuries often present late in local hospitals and do not receive proper first-line treatment.^[1,2,3]

THE ACUTE MANAGEMENT OF BURNS

Burn injuries require special care by well-trained health workers. The Early Management Severe Burns (EMSB) course is now widely accepted as the standard of required training for nursing and medical staff.^[4]

This one-day course has been established in Australia to help with triage and transfer of a victim with severe burns to a burn centre. It is based on the ABCDE (Airway, Breathing, Circulation, Disability) primary assessment. After this, 'Exposure' follows where temperature, assessment of the total burned surface area (TBSA), depth and site of the burn are reviewed. Other topics include effective resuscitation, early transfer to a specialist burn centre, intensive care for inhalation injury, skill stations and interactive discussion groups. In the Netherlands and in South Africa for example, this course is very successful and led to a dramatically improved outcome.^[4] In most African countries this course has not yet been introduced.

FIRST AID AND ASSESSMENT

First aid of burn injuries follows the same procedure worldwide: stopping the burning process, removal of clothing and cooling the burn.^[5,6]

Thereafter assessment of the injury is performed: where is the burn, how big is the burn, how deep is the burn? These questions help a

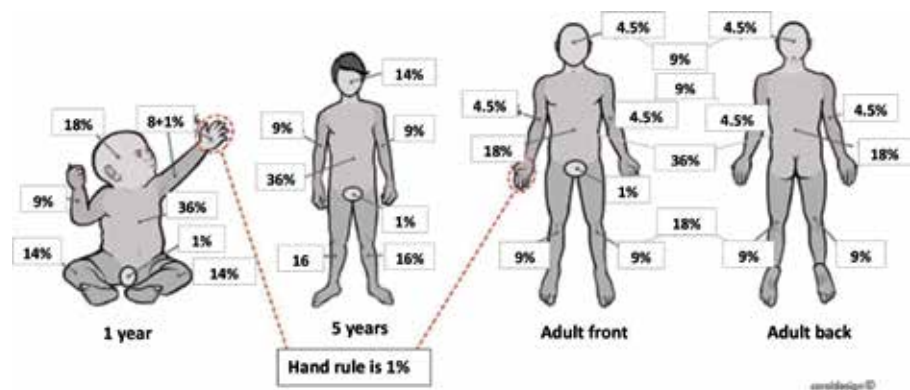


Figure 2. The Rule of Nines. © Dutch Burns Foundation; Coraldesign

practitioner to follow the right procedure in treating burn patients.

COOLING

The Dutch Burns Foundation started an awareness campaign many years ago: 'First water and the rest comes later'. This slogan has become well known in the Netherlands. Guidelines all indicate that cooling the burn with lukewarm water for a period of not more than 10 minutes is the first management (longer cooling may induce hypothermia) that should be started immediately.^[5,6,7] In Africa this is not common knowledge. Instead of water, other substances are used such as flour, soil, mud, toothpaste, crushed snails, egg yolk, butter, palm oil, cow dung, tea leaves and forms of traditional medicine. There is an increased risk of tetanus with the use of cow dung or soil.^[8] In practice, because of ignorance and delay in presentation, cooling is often not done, with an increased risk of a deeper burn and secondary infection leading to higher morbidity and mortality.^[7]

WHERE IS THE BURN?

Deep burns covering the joints may result in contractures and early surgical management may prevent disability. Facial burns are often associated with inhalation injury and may need artificial ventilation; eyelids are fragile and an ectropion may develop. Perineal and genital burns may require a urinary catheter and proper nursing care to prevent infection.^[7]

HOW BIG IS THE BURN?

It is important to estimate the percentage of the Total Burned Surface Area (TBSA) with regard to the risk for hypovolemic shock due to increased fluid loss. The Rule of Nine is most commonly known but difficult to use, especially in children because of body changes with increasing age and growth of the child (Figure 2). Therefore the 1% hand rule has been introduced. The closed hand with the palmar surface of the patient represents 1% TBSA and gives a reliable estimation of the TBSA. In Africa, a TBSA of more than 30% is life threatening because of hypovolemic shock, sepsis and anaemia, and in extensive burns with TBSA > 50%, the outcome is invariably fatal and comfort care in the patient's own environment is advised.^[7,9] In contrast, patients in HICs with TBSA > 50% are managed with ICU admission and this condition is not necessarily life threatening.

HOW DEEP IS THE BURN?

The depth of the burn determines if a surgical or conservative approach should be initiated. Furthermore, a circumferential deep burn may lead to loss of a limb and urgent escharotomy is indicated to relieve the pressure.^[5] (Table 1, Figure 3 a,b,c)

EARLY MANAGEMENT – KEY POINTS

FLUID RESUSCITATION

If the TBSA in an adult is >20% (or >15% in children), intravenous (IV) treatment with normal saline or



TABLE 1. BURN DEPTH CHARACTERISTICS

	Epidermal (e.g. sun-burn, flash burn)	Superficial dermal burns (Partial thickness)	Deep dermal burns (Deep partial thickness)	Full thickness
Pathology	Involves epidermis only	Epidermis and upper dermis	Epidermis and part of dermis	Epidermis, dermis
Appearance	Dry and red	Pale pink, wet. Wound base blanches with pressure	Blotchy red or pale deeper dermis where blisters have ruptured	White waxy charred
Sensation	May be painful	Increased, very painful	decreased	-
Circulation	Normal	Rapid capillary refill	Sluggish capillary refill	-
Colour	Red, warm	Pink	White/pink pale/lotchy red	White/ charred/ black
Blisters	-	+	Early, large blister which rupture rapidly	-
Healing time	Within 7 days	7-14 days	Over 21 days	Does not heal spontaneously
Scarring	No scar	Colour match defect, low risk of scarring	High risk of hypertrophic scarring	Wound contraction. Heals by secondary intention



Figure 3a: Partial thickness burn.



Figure 3b: Deep partial thickness burn.

Ringer's lactate should be started. If this is not available, Oral Rehydration Salt (ORS) may be given instead. Similarly, ICU monitoring of severe burns is not available in most settings. Nurses on the unit should insert a catheter and monitor the urine output. If patients arrive with a delay of a few hours, IV treatment should be started. If there is a delay of more than one day, the patient is first reviewed and treated accordingly.^[5,6,7]

PAIN MANAGEMENT

Pain management is often a problem in LMICs. Burn injuries can be extremely painful and adequate pain management is needed. Opioids are not widely available and medication is often restricted to paracetamol, 3-4- times daily.^[5]

PREVENTION OF HYPOTHERMIA

To prevent hypothermia, especially in children, nursing in a warm room, without fan or air-conditioning is indicated until the wound is covered. Bed cages are used to prevent sticking of the blankets or sheets to the wound. Extra blankets should be distributed especially if the wounds are exposed.^[5]



Figure 3c: Full thickness burn.

WOUND CLEANING

If there is a delay in referral, cleaning the wounds, with (boiled) water, or normal saline or a fluid with anti-septic is advisable. Experience shows that nurses in LMIC clean the wounds very thoroughly; however, this can be very painful. After cleaning, the burn should be dressed. Leaving the burn open, 'exposure treatment', is not widely performed although it prevents a lot of pain; the exposure is continued until the crust of the burn cracks, usually 4-5 days, which should then be removed.^[1,7]

IDENTIFY CO-MORBIDITY

In LMICs, co-morbidity such as malnutrition and HIV infection are typical risk factors for slow wound healing and increased risk of infection or sepsis and should be managed appropriately from the start.^[7,10]

AFTER EARLY MANAGEMENT

WOUND DRESSING

As silver-impregnated bandages are often not available, traditional remedies are used including the use of plants such as banana leaves for wound dressing. Other plant materials include papaya (Carica Papaya), honey and palm oil. Basic burn dressing can be done with petroleum jelly gauzes. The vaseline gauze does not stick to the wound, not interfering with the wound healing and maintaining a moist wound environment.^[1,7]

PAIN MANAGEMENT

Optimal pain management should be continued, particularly during change of dressings. Ketamine is often used for sedation, with careful monitoring of the airway and breathing.^[7]

NUTRITION

High energy and high protein intake are necessary from admission. Peanut butter, high-energy milk or porridge with extra oil and sugar may be used. Vitamin supplements (particularly A, C and D) are recommended.^[7,11]

SURGICAL INTERVENTION

Deep burns need early excision but due to lack of surgical capacity and blood transfusion or in case of wound infection operations are often cancelled or postponed.^[1,7]

HYPERTHERMIA

Burn patients often have raised temperature (typically 38-39 °C); this may be due to wound infection, or a concurrent infection (e.g. malaria), or due to the evolving burn wound or hypermetabolism induced by a large burn.^[7]

AFTERCARE

Aftercare is of utmost importance for scar management (e.g. pressure garments, pruritus treatment) and psychosocial support, but this is not commonly available in LMICs. Typically, patients seek follow-up only in the case of contractures or keloid development (which is common in Africans).

THE WAY FORWARD

Emphasis should be on prevention campaigns such as safe cooking and first-aid measures. Resources for education and improved care are needed.^[12] Research in the traditional medicine for burn care such as banana leaves, honey and papaya seems warranted.

Telemedicine may fill a gap in communication between the field and specialized centres, even abroad.^[13] It is then essential that the health professional consulted should be aware of the limitations of working in burn care in LMICs.



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Lessons learned from an internship at an Emergency Department in South Africa

KHAYELITSHA

The last decade, crime rates have increased in Cape Town, while in the bigger South African cities, including Johannesburg and Durban, a downward trend can be seen. In Cape Town, 69 inhabitants per 100,000 were murdered in 2017, a significant and astonishing increase when compared with 2010, when it was 42 per 100,000.^[1] Violence takes place mostly in the townships and the informal settlements east of the city centre. The biggest township in Cape Town is Khayelitsha. In 2011, this fast-growing township had approximately 400,000 inhabitants. Khayelitsha is also known for its large proportion of unemployment (38%), and the majority of the people live in shacks, with 74% of households existing on a monthly income of less than \$220.^[2] Khayelitsha is considered a dangerous township because of the activity of gangs, murders, robberies, and the use of alcohol and drugs such as 'tik' (amphetamines) and 'whoonga' (cheap heroine which is smoked).^[3] Approximately 16% of traumatic injury is caused by gang-related violence.^[4]

Khayelitsha has one district hospital that was founded in 2012. The hospital is equipped with a 24-hour level-3 emergency service. Almost 40% of the patients in the resuscitation room have trauma-related problems.^[5] Trauma occurs mostly during the nights in the weekends and especially when it is 'pay day', the day that salary is handed over and people start drinking alcohol, using drugs and stealing. The busiest shifts in the year take place during the weekend before Christmas, when the number of patients arriving can increase to 50 cases in one night, the majority of which consist of penetrating trauma of the thoracic region. This includes many stab wounds as well as gunshot wounds.^[6,7] I was personally a lot more exposed to out-of-hospital cardiac arrests in children and infants than in my own

hospital, including a very striking case of a victim with a lacerated trachea.

DUTCH EMERGENCY PHYSICIAN

I spent the final phase of my residency in South Africa. For me as a Dutch Emergency physician (EP) in training, an internship in Khayelitsha District Hospital in Cape Town was valuable for gaining skills in resuscitative procedures because of the extensive exposure to traumatic injury, in particular the treatment of penetrating traumatic injuries (i.e. thoracocentesis, intercostal drainage of a pneumothorax or hemothorax, pericardiocentesis, airway management, paediatric trauma, traumatic arrest and ultrasound in trauma). However, the practice in Khayelitsha is different from Dutch practices. I learned three major lessons at this hospital.

SHARED RESPONSIBILITY?

The first one is about responsibility. An important difference between the practice in the Netherlands and in South Africa is the degree of independence of a doctor working in the Emergency Room (ER). In the Netherlands, the decision to perform a major intervention will be discussed in larger teams with representatives and supervisors from different acute specialties such as anaesthesiology, intensive care medicine and surgery. Responsibility is shared with supervisors, who are medical specialists. The Dutch EP is accustomed to sharing responsibility, and this is often documented in protocols.

In South Africa these decisions are made by the individual doctor working in the resuscitation room, and this requires thorough knowledge, skills and competence. An EP or senior resident in emergency medicine available at the ER for direct supervision. These are involved only in complex cases, and they expect the doctor working in the resuscitation room to solve the majority of the cases by himself. They give a

foreign doctor the responsibility to treat a patient completely independently. This means that you provide the indication to start a procedure, know the contraindications, understand the preparation and deal with complications, even if a patient is in haemorrhagic or obstructive shock.

During my visit, the number of patients in serious shock was high. This was an unexpected challenge that I never thought about before starting this internship. To be responsible for the initial treatment of a life-threatening injury takes more than the capability and competency of performing a lifesaving procedure. It is quite an experience to be faced with the most severely injured patients from stab wounds, shootings and burn wounds in large numbers within short time spans. It is mentally challenging. Treating one patient while two other patients are rushed into the resuscitation room with comparable injuries requires a coping strategy. You need someone at home to share your experience after a hectic shift. And maybe you should share the experience again later.

For me it also helped to realize that the causes of the patients' problems can be sought in the greater social problem that exists in the townships of Cape Town. It is part of daily life. On a medical level, it was also challenging. I remember a patient in the resuscitation room who was visibly distressed and excessively sweating after a stab wound of the chest. The patient had a precordial sucking chest wound located on the sternum without signs of decreased breathing sounds in the left or right lung. Vital parameters remained stable without signs of haemorrhagic shock. After point-of-care ultrasound a hemothorax was excluded. An immediate decision on management of the patient was required. Is it acceptable to perform imaging of the chest with the accompanying delays, or does immediate intercostal drainage need to be performed



at the injured site or on both sites?

WHO GETS THE BLOOD?

The second lesson is about dealing with scarce resources. The number of emergency blood units is limited. Intraosseous needles are present in small numbers. Syringes can suddenly be used up. EPs have to deal with out-of-stock running medication and medical equipment. An unlimited supply cannot be taken for granted, and health care workers need to be thrifty with the amount of equipment and medication. There are six units of blood ready for use while in some situations more blood is needed for traumatic injuries. Limited resources put limits on medical treatment.

The third important lesson to learn is related to the first and second lesson: critical decision making with these limited resources in mind. The idea is that wasting a limited supply on a hopeless case with little chance for survival negatively impacts other patients with better chances. In such situations, the individual EP plays a prominent role in deciding to stop treatment, causing the patient to die. These decisions also differ from Dutch practice. In the Netherlands, treatment is never stopped due to limited equipment, and blood products and vital resources must be available. The process for stopping treatment if there is little chance of success is also more elaborate. As a Dutch doctor, it was difficult to see drastic decisions being taken in such a short period of time, especially if it involved a young patient. And it was precisely the age group around 18 years old that were brought in after stabbing.

ROOM FOR INNOVATION

But my experience in South Africa also opened up opportunities for smart ideas and innovation. Instead of using expensive blood products such as fresh frozen plasma, freeze-dried plasma is used in South Africa. This limits the use of blood units so they can be used

for subsequent cases.^[8] In Khayelitsha, the views on trauma and massive blood loss are very modern. No crystalloid fluids like normal saline are given to the patient. Instead, tranexamic acid (TXA), emergency blood, and plasma are supplied. During a traumatic arrest there will be no thoracic compressions, but the acronym 'HOTT' (i.e. hypovolemia, oxygenation, tension pneumothorax and cardiac tamponade) is used. Hypovolemia due to blood loss is treated with mass blood transfusion. Oxygenation is treated preferably with bag mask ventilation. Tension pneumothorax requires direct relief or intercostal drainage. And cardiac tamponade is treated by a resuscitative thoracotomy.^[9]

During mass blood transfusion, we used a maximum of two units of emergency blood, and more units of freeze-dried plasma could be supplied until an acceptable state of perfusion was reached. After a haemothorax, blood that was collected by an intercostal drain was returned to the patient immediately. The chest tube drainage system contained an intravenous access point. This makes autotransfusion possible. And with the help of a glove and the longest and thickest intravenous needle, you can prepare a one-way valve thoracocentesis device to relieve a tension pneumothorax. In case of a sucking chest wound that was caused by a big laceration in the thoracic wall, we applied a plastic sheet which was cut to the size of the wound. The plastic sheet used was from the package of an adhesive plaster. After that, we applied the adhesive bandage on three sides so that during inspiration no free air was sucked into the intrathoracic space.

CONCLUSION

In conclusion, it seems that the most important learning goal is not the skill itself but the bigger picture. Practicing a resuscitative skill in South Africa also involves understanding the clinical

context, daring to make a decision by yourself, and taking responsibility for this decision. The transition from the Dutch situation to the South African is a big one, but in view of the large number of critically injured patients, the contribution made by foreign doctors is very important. In the first half of the internship, I needed more support and supervision, but after treating more patients I became more independent. In cases where I felt the need to consult a senior clinician/EP, there was always the possibility to do so. After a few weeks, I was able to work on my own with help from the nursing staff, who were very suitable and well educated for the job at hand.



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A rabid pregnant woman in Tanzania: Obstetric dilemmas and considerations

CASE HISTORY

A 38-year-old pregnant woman was admitted with vomiting and general body itching in Ndala hospital, Tabora region, Western Tanzania. The fundal height corresponded to a gestational age of 30 weeks. Malaria and syphilis tests were negative, the haemoglobin count was 12.4 g/dl, and urinalysis showed only haematuria. Following admission, she was unable to eat and drink with excessive vomiting and shortness of breath. She progressively suffered from tremors and was becoming increasingly restless, febrile and afraid to drink water. When asked, a bite of an unknown animal five months before was reported, increasing suspicion of rabies. The patient was treated with diazepam and promethazine. The first dose of antenatal corticosteroid therapy was administered to promote lung maturation of the foetus in anticipation of possible preterm birth. While staff and relatives were still contemplating whether to perform a caesarean section to try and save at least the baby, the mother died, together with her unborn baby, two days after admission.

Prophylaxis (PEP) with the anti-rabies vaccine, with or without rabies immune globulin (RIG); see Table 1.^[1,2]

The woman we presented did not receive PEP although she was bitten by a dog, maybe due to lack of knowledge or money. We will focus on some dilem-

sensory nerves until it reaches the spinal cord and brain, causing acute encephalitis.^[3] Time of incubation varies from one week to six months.^[2]

PASSIVE AND ACTIVE IMMUNISATION
Post-exposure immunisation reduces the risk of rabies when the treatment

TABLE 1. SUMMARY OF MANAGEMENT OF RABIES FOR EXPOSED INDIVIDUALS.^[2]

<p>CATEGORY I</p> <p>touching or feeding animals, licks on the skin</p>	<p>No treatment</p>
<p>CATEGORY II</p> <p>nibbling of uncovered skin, minor scratches or abrasions without bleeding, licks on broken skin</p>	<p>Wash wound with running water and soap for 15 minutes.</p> <p>Administer antirabies vaccines:</p> <ul style="list-style-type: none"> > 0.2ml (ID) in divided doses of 0.1 ml on deltoid on one hand and another 0.1ml on the deltoid of the second hand on days 0, 3, 14 and 28 OR > 1 ml (IM) on deltoid muscle for days 0, 3,7,14, and 28 <p>Note: Children are given the same doses but vaccine should be administered on the lateral part of the thigh.</p>
<p>CATEGORY III</p> <p>single or multiple transdermal bites or scratches with bleeding, contamination of mucous membrane with saliva from licks; exposure to bat bites or scratches</p>	<p>Wash wound with running water and soap for 15 minutes.</p> <ul style="list-style-type: none"> • Administer Rabies Immunoglobulin (RIG) on day 0 • 40 IU/kg body weight for Equine (ERIG) • 20 IU/kg body weight for Human (HRIG) • Administer antirabies vaccines <ul style="list-style-type: none"> > 0.2ml (ID) in divided doses of 0.1 ml on deltoid on one hand and another 0.1ml on the deltoid of the second hand on days 0, 3, 14 and 28 OR > 1 ml (IM) on deltoid muscle for days 0, 3,7,14, and 28 • Note 1: Children are given the same doses but vaccine should be administered on the lateral part of the thigh. • Note 2: The World Health Organization recommends ID route of vaccination administration because it is cost effective.

BACKGROUND

Around 30,000 to 70,000 people worldwide die of rabies each year, most often acquired by bites of rabid dogs causing transmission of the virus from the dog's saliva. If left untreated, infection rates vary between 38% and 57% and depend on the severity and location of the wound and virus titre in the saliva. When symptoms start to develop, mortality reaches 100%. Human rabies deaths are preventable through local treatment of the wound, followed by prompt administration of Post Exposure

mas regarding rabies in pregnancy. Will the foetus benefit from premature delivery by caesarean section or would vaginal delivery be better? What is known about the risk of the baby also becoming infected? Moreover, how safe is PEP in pregnant women and newborns?

THE RABIES VIRUS

Rabies is caused by several different species of viruses (Genus Lyssavirus). After amplification near the site of contamination, the virus migrates centrally to the peripheral motor and

is given before clinical signs of rabies develop. Prophylaxis should be given as soon as possible after exposure. The rabies vaccine induces protective virus-neutralising antibodies within approximately 7-10 days (active immunisation). The rabies immune globulin (RIG) provides immediate virus-neutralising antibodies until protective antibodies are generated in response to the vaccine (passive immunisation), which may be necessary when contamination of the virus is near to the central nervous system, resulting in a short incubation

period.^[4] In Ndala hospital, human RIG is not available; only rabies vaccine is. Rabies PEP is safe for pregnant and breastfeeding women as well as for newborns.^[1,5,6] Studies found no increased risk of spontaneous abortions, premature births or foetal abnormalities among pregnant women after receiving PEP.^[1]

MOTHER-TO-CHILD TRANSMISSION

The exact risk of vertical transmission of rabies is unclear, but mother-to-child transmission has rarely been reported. The most important risk for the baby is the death of the mother before labour. Rabies virus is not present in the blood, and risk of contamination of the baby's mucosa by maternal infectious fluids and tissue seems limited.^[7]

There are multiple reports describing cases of healthy babies being born, irrespective of mode of birth, from pregnant women with rabies.^[1,5,6,7,8,9,10,11] In most cases, either the mother, the baby or both received PEP (vaccine and humane RIG when available).

However, in one study four pregnant women with rabies and their babies appeared to not have received PEP due to fear that PEP might harm the foetus. Three of these women delivered successfully by caesarean section, and one baby died due to non-rabies related complications.^[1] Some studies also described the status of the mothers after delivery. In every reported case, the mother had passed away.^[8,9,11] An interesting Turkish article mentioned a term woman who was bitten by a dog 34 days earlier.^[12] 40 hours after vaginal delivery the baby died suddenly. Rabies was confirmed in both the mother and baby. This is the first case reporting human rabies acquired by placental transmission.

The above indicates that the delivery of a healthy neonate from a rabid mother is possible. The route of delivery does not seem to be a determinant for the

neonatal outcome. It cannot be excluded that the foetus can be contaminated by the placenta, vaginal secretions of infected maternal tissues although many reports conclude that the neonates remain healthy after receiving PEP.

PRACTICAL DILEMMAS

If the diagnosis is correct, the mother will surely die. This raises concerns on the (long term) chances if the neonate is born without rabies, especially in case of suspected prematurity. In general, the prognosis of a neonate after maternal death is poor. An analysis in Ethiopia indicated that in case of maternal death, the infant was much more likely to die than to survive.^[13]

After symptoms of rabies appear, death by rabies will follow in a few days. Vaginal delivery might not be quick enough. Caesarean section is quicker but exposes health care workers to a higher risk of rabies infection.

Prevention of rabies is a superior strategy. The use of PEP and RIG appears to be safe in pregnant women and newborns. If a pregnant woman might have been exposed to rabies, prophylaxis needs to be administered as soon as possible. Health education campaigns need to focus on education of pregnant women and local health workers to inform them of the importance of timely prophylaxis and its safety. In our case, the prognosis of both the mother and the foetus was poor because the rabies was already symptomatic and prematurity was predicted. Retrospectively, a caesarean section would have put health staff at risk with little chance of saving the baby.



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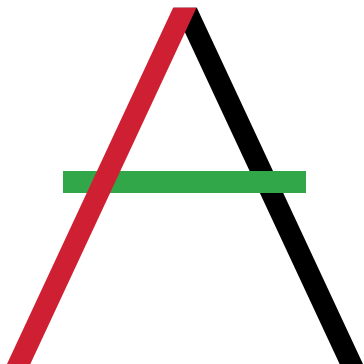
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Ankie Borgstein van Wijk 1925–2018

by JOHANNES BORGSTEIN



Ankie Borgstein van Wijk lived on to just beyond the age of 93 and dedicated at least 60 years of her life to paediatrics and her small farm just outside Blantyre in Malawi.

Born in 1925, an only child of an eminent citizen from Gouda, Netherlands, she grew up a solitary child, rarely accompanying her parents on holiday, being sent instead to various summer camps.

After high school, she went on to study medicine in Utrecht, starting during the Second World War. Towards the end of the war, the university was closed but some of the lectures continued clandestinely, and she had to sit for exams at the professors' homes.

Meanwhile she worked for the resistance, ferrying messages concealed under the saddle of her bicycle between various resistance cells. Had these been discovered, she would have been summarily executed. Her father spent several years during the war as a German hostage incarcerated in the local jail. Ten hostages were randomly selected and executed for every German soldier killed by the resistance, so her resistance work must have occasioned a great deal of soul-searching.

After the end of the war, she met fellow medical student Jan, who was to become her husband and the love of her life. She never fully recovered from

his untimely death at the age of 52, though she outlived him by 39 years. They were married in 1951, and made plans both for a large family (7 sons in the space of 9 years), and for moving out of Europe. Chile as a first choice was discarded due to administrative restrictions, and their interest turned towards Africa. In early 1960, having finished his surgical training, Jan requested an appointment with the Undersecretary for Colonial Affairs in London.

The Foreign Office must have assumed he was a representative of the Dutch government, and they were slightly taken aback when he asked them for a job as a surgeon in Africa. But with the inimitable politeness and sangfroid of the British civil servant, the Undersecretary called in a minor official who dealt with postings, and they were able to offer him a choice between a district hospital in Nigeria or a central hospital post in what was then still known as Nyasaland. He immediately took the central hospital, though he admitted later that he had only the vaguest idea where Nyasaland was.

After a brief preparation, the couple loaded their worldly possessions, their 6 children, and their Citroën station wagon (with small camping trailer) onto a cargo boat bound for Cape Town. There were eight of us in a car for 3 passengers with two small folding seats in the back.

The 12-day boat journey was followed by an epic road trip from Cape Town to Johannesburg, Salisbury (Harare), Bulawayo, Tete in Portuguese East Africa (Mozambique) where we climbed up to see the recently discovered ancient rock paintings, and on into southern Nyasaland.

From there it was a day's drive to Blantyre where my parents were to spend the rest of their lives. We arrived there late at night at the Ryall's Hotel with six

hungry children and only buttered toast and tea available from room service.

Jan was soon immersed in the busy work of surgical specialist at the Queen Elisabeth Central Hospital (QECH) in Blantyre, leaving the running of the house to Ankie. Their youngest child was born several months later at home in an ancient government house in the Sunnyside suburb of Blantyre. Jan delivered all his own children.

Several years later Malawi became independent, and fearing violence most of the British doctors left for Southern Rhodesia (not yet Zimbabwe). Jan took the unprecedented decision to remain in Malawi and try to keep the hospital going. He was to look after the surgical and obstetrics/gynaecology departments, while Ankie had to take over the medical wards (she was then not yet a specialist). A paediatric department as such did not exist yet, the ill children being admitted with their mothers to the female medical ward. They ran the 1000 bed hospital for several years between them, with the help of the nurses and medical assistants, until gradually the specialist positions were filled again.

Throughout this time, Ankie would make sure she was home when the seven of us returned walking from school. But after dinner, when we were asleep, she would often walk back to the hospital alone to see some patients or chat between cases with Jan, who, as the only surgeon in the country, frequently had to operate far into the night.

In her 'spare time' and to keep us entertained in those days before television, she would also write and direct plays for us to perform on controversial subjects such as drug smuggling and gold fever. She never threw anything away, and I recently came across some of the original scripts while cleaning out some of my old schoolbooks that



were still gathering dust in my room of the house she lived in for the rest of her life. Ankie had played the violin since she was at school, and in Malawi all the family members were 'encouraged' to learn a musical instrument. Jan took up the clarinet, while the sons played piano, guitar, flute, trumpet accordion and various other instruments. Musical evenings were usually organised once every few weeks with other musical enthusiasts.

Having dedicated several years to largely self-taught paediatrics, she felt it was time to obtain some official qualifications, and she travelled to London to sit for the Diploma in Child Health of the Royal College of Physicians in 1969, and subsequently passed the very stringent fellowship exams of the South African college of medicine in 1975.

She singlehandedly set up the paediatric department at the QECH in Blantyre, and gradually built it up as one of the top departments in the hospital. In the early years of Malawi independence, she persuaded South Africa to offer 10 cardiac operations per year for patients with congenital heart problems, all expenses paid. With only a chest x-ray and a stethoscope accurate diagnoses had to be made (echocardiogram was not even on the horizon then), but I did not hear of any patient being returned without treatment because of an error in diagnosis.

Our medical education started as soon as we were able to follow the endless patient discussions at the dinner table.

After Jan's untimely death while climbing the Mulanje mountain range, she was so utterly devastated that she was unable to talk about him for many years. She threw herself into her work and continued running the farm as she thought he would have liked. She had grown up as a city girl in Gouda and

had very little previous experience in farming.

Her daily routine was up by dawn, prepare home-grown coffee, supervise the milking of the cows... then off to the hospital in her trusty Landrover, delivering milk to friends along the way.

Morning ward-rounds were followed by a quick coffee then out-patients until lunch. A snack in her office or a visit to a friend's house was followed by further clinical work on the wards and, increasingly, teaching and supervision. Returning home at the end of the afternoon, she would have tea with whoever of her sons happened to be around at the time, and check on their schoolwork. Years later when I spent some weeks writing up my PhD dissertation, she would still check if I had spent the morning working and not lounging in a hammock in the garden.

After tea she would hold a free clinic for all the ill children of the surrounding villages; often between 20 and 30 children were seen before dark. One of her gardeners would tag along with a box of medicines, ointments and bandages provided by various donations.

Gradually, over the years, her sons all drifted off one by one to medical school in Europe, some returning to various jobs in Malawi, before moving off again for specialisation. Once a year she would embark on a whirlwind tour of the family, spending a few days with each of her sons in the various countries they were living in, before returning home to her farm.

She lived in the old house filled with books and memories. She read voraciously, often 40 to 50 books per year, keeping careful notes in her diary, always eager to discuss any recent book she had read. She looked up any unfamiliar words in an ancient dictionary,

making a note of the meaning. Otherwise her life style was determinedly stoic: no unnecessary luxuries, with most of the food from her own farm and gardens. To her delight, the farm was mostly self-sufficient, energy being drawn from a batch of solar panels on the roof and used to power both water pumps and light in the house. Cooking and hot water came from an Aga stove in the kitchen, fired by wood carefully and sustainably harvested from the farm.

She worked until the age of 87, completing 50 years of service for the Malawi health ministry in 2012. Later in her career she received numerous awards:

- a knighthood from the Netherlands in 1990
- an honorary doctorate from the Mzuzu University of Malawi in 2006
- the lifetime award of the Medical Association of Malawi in 2008
- and the order of 'Grand Achiever of the Malawi Order of National Achievement' in 2013.

She continued teaching until she retired, and although a progressive hearing loss must have made the paediatric cardiac sounds particularly difficult to identify, she rarely made errors of diagnosis.

She disliked her increasing dependency as old age gradually began to take its toll, but remained living on her own. She maintained a keen interest in all the activities around the farm and those of friends and family as well as international politics.

She died some months after her 93rd birthday, body completely worn out, mind as sharp as ever.



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