

Tenwek Hospital

Paediatric Neurosurgery Fellowship November 2023 to December 2024



Tenwek Hospital is a mission hospital in western Kenya. It is situated in a region historically known as Rift Valley Province, the largest and most economically important provincial region in Kenya, and home to the Kenya Rift Valley, which is part of the Great Rift Valley system, an

intercontinental tectonic plate junction spanning between Syria to Mozambique, known-for mountainous planes, volcanic activity, and torrential rainfall. This has led to Kenya's Rift Valley Province being a major exporter of agricultural and horticulture produce which has placed Kenya as the top economy in the East Africa Community, and thanks to the Tana River System, and the tectonic junction within the Kenya Rift Valley, over 90% of the countries energy supply originates from renewable sources i.e., Hydroelectric power, and Geothermal energy, with the excess providing energy to neighbouring Uganda and Tanzania.

The rift valley geography not only shapes the Kenyan economy, but also plays a significant role in Health Epidemiology. As an equatorial country, the region is endemic for TB and Malaria, although evidence points to the incidence of Malaria being lower in high altitude parts (i.e., Tenwek, which is at an altitude of 6500 feet), compared to the Kenyan Coastline, (which is at Sea-level). Given that the economy is largely based on farm produce i.e., Tea, Coffee, flowers, most of the country's population is rural based, and makes a living from agriculture and informal labour, which are economic activities that are very low in the economic value chain. As a result, poverty is endemic, access to healthcare is relatively unaffordable, and national health insurance coverage remains low at 6%.

Of interest, the high altitude means that rainfall is a daily phenomenon and therefore there is a high incidence of trauma related to road traffic accidents. The rift valley region appears to have a high incidence of congenital disease and upper GI cancer. The cause of this is unknown, however there are theories that point to folic acid deficiency via diet, genetics, and possibly due to degradation from the higher levels of UV light exposure associated with higher altitude regions, but the evidence remains limited on this question.

The Neurosurgical Disease burden mainly falls into the categories of congenital disease, trauma, and sequelae of TB within the central nervous system. There is late presentation of cancer, however the disease severity and financial implication to the family, makes the expected poor clinical outcome financially unviable, and insufficient justification for surgical intervention. During my stay at Tenwek Hospital, I was involved in the treatment of spinal dysraphism such as myelomeningocele, and occipital encephalocele, multiple procedures for hydrocephalus and CSF diversion, such as VP shunt insertion, endoscopic ventriculostomy, endoscopic septostomy, percutaneous interventions, I was

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also involved in surgeries in patients (including infants) who were HIV positive, and in cranial and spinal trauma surgery.



On several occasions during my trip to Tenwek hospital I encountered moral injury, which is defined as a feeling of guilt, related to conflict against deeply held internal values. Several situations come to mind:

1. Caring for an infant that was HIV positive.
2. Caring for multiple children whose inpatient treatment was delayed or frozen due to financial constraints.
3. Providing anonymous donations to help cover the cost of medical fees.
4. Decisions not to surgically intervene in children with malignant brain tumours, due to wider constraints, rather than clinical contraindications.

Tenwek hospital has a thriving volunteer community that supports the domestic medical team, and they also provide pastoral support to short term volunteers such as myself. We would eat together every day and discuss such situations, in a round table manner, which is where I was able to learn more about the concept of moral injury and understand that, in Tenwek, it originates from the values that we bring as visiting foreign doctors, values developed in resource rich highly structured health setting, and unwittingly employ during our assignment in lower income health settings. Of interest, this moral injury exists where any two cultures clash, such as inter-generational relations in surgical training.

I learned from our daily round table discussions, about such issues, about the reality of healthcare provision in rural sub-saharan Africa, and I learned how to detach through the experiences and stories of veteran aid workers.

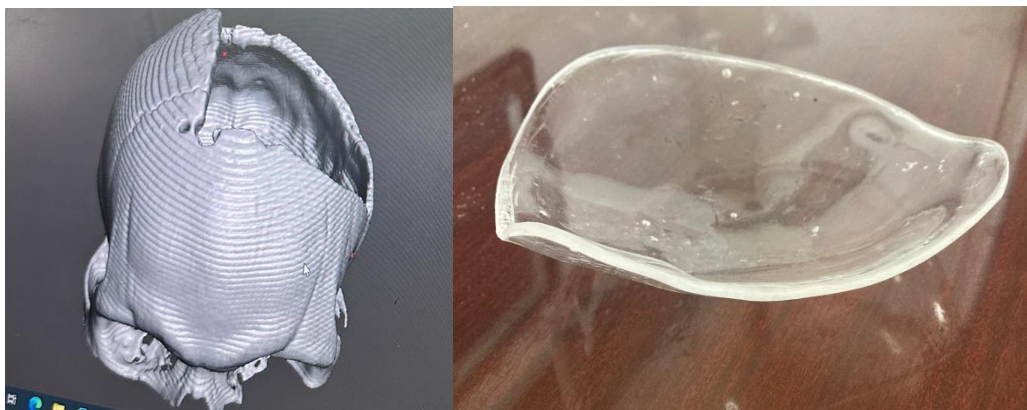
The solutions that were recommended included:

1. Allowing oneself to feel upset about these situations.
2. Sharing experiences – including positive experiences.
3. Acknowledging our failing.
4. Taking breaks.
5. Fixing what you can.

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These roundtable discussions were very helpful, and in the grand scheme of things, helped me to taper my expectations early on, enjoy the experience, and help when I could. This meant in very specific occasions, making an anonymous financial contribution. This also meant going on Safari and not taking myself too seriously.

Importantly, I completed a technology innovation project while I was at Tenwek Hospital. I designed a system for manufacturing low-cost acrylic cranioplasties, using a modern 3D printer, and handed over the hardware & software to the neurosurgical team, who have printed two personalised acrylic plates so far. In this region the average salary is \$44 dollars a month, per person, and most families do not have health insurance coverage. Cranioplasty operations cost between \$120-210; however, the currently used titanium mesh implants cost patients \$533, i.e., significantly more than the cost of the operation. With the system I developed, which requires materials that are available in-country (negating the need for imports/tax), we were able to produce cosmetically superior, personalised acrylic cranioplasties for \$12 per implant, that is a 97% implant cost reduction, and reduces the overall operation bill by more than two-thirds. The expected implant costs are expected to decrease from \$15990 per year to \$360 per year.



I'm grateful for my experience at Tenwek Hospital, it has been a huge learning experience, a gift that keeps giving, and I will be visiting again and again.

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