Improvised Medical Evacuation in Low-Airspace Conflict Zones – A Case Series from East Africa

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Background

In regions affected by conflict, infrastructure collapse, and airspace denial, traditional MEDEVAC systems are compromised. Air ambulances and rotor-wing support, essential for tactical casualty care, are often unavailable due to security risks, fuel shortages, or political restrictions.
This case series challenges the assumption that effective trauma evacuation requires aircraft or wheeled ambulances. In a remote and volatile area of East Africa, our team conducted 17 medical evacuations using donkey carts, motorcycles, foot transport, and agricultural vehicles, sometimes travelling for over 24 hours without radio contact.

Setting

The region is:

- Actively contested between armed groups
- 200 km from the nearest tertiary care facility
- Inaccessible by road for parts of the year
- Without reliable radio, GPS, or mobile coverage

The majority of patients were civilians injured in:

- Gunfire and blast events
- Obstetric complications worsened by FGM/C
- Acute infections and sepsis
- Snakebites and environmental trauma

Objectives

1. To evaluate outcomes of improvised medical evacuations
2. To analyse the methods, materials and techniques employed for casualty stabilisation and evacuation
3. To inform future ground-based MEDEVAC strategies

Methods

Study Type: Prospective, observational case series
Period: October 2024 – June 2025
Sample Size: 17 evacuations
Inclusion: Patients in critical condition (GCS <8 , shock index >0.9)
(>30km from facility, no air support)

Evacuation Methods:

- 7 by motorcycle stretcher rig
- 3 by donkey cart
- 4 by on-foot teams using tarpaulin litter
- 3 by agricultural flatbed vehicles

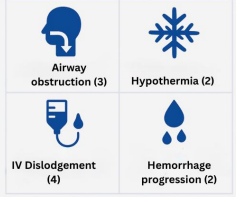
Field teams comprised:

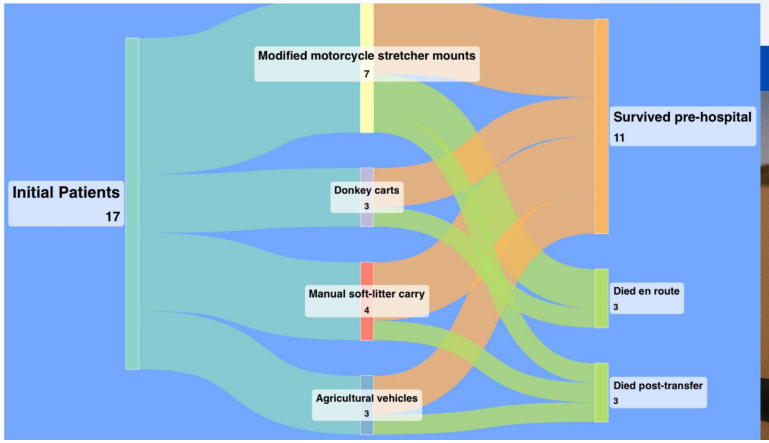
- 1–2 paramedical responders
- Local cultural/navigation guides
- Patient family members providing support

Outcomes

Metric	Value
Patients evacuated	17
Survived to referral facility	14 (82.35%)
Survived to discharge	11 (64.71%)
Median evacuation time	7.2 hrs (range 2-24 hrs)
Fastest method	Motorcycle (avg 3.8 hrs)
Most stable method	Donkey cart (no rebleeds)
Most at-risk group	Foot evac (^ airway loss)

Common complications





Key Findings

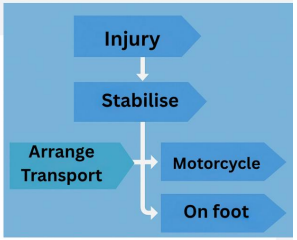
- Low-tech does not mean low-standard, where skills and trust are high
- Patient outcome was more dependent on route planning and team resilience than equipment
- Donkeys, while culturally accepted and biologically adapted, are slow, yet offered the smoothest ride
- Motorcycle rigs were fast and agile but risked injury from falls and rough terrain
- Foot evacuation, presented significant medical risk to both patient and team

Sociocultural Insight:
FGM/C survivors in labour were more likely to delay evacuation due to fear of male providers, highlighting the need for female-led MEDEVAC in some contexts.

Field Innovations

Despite extreme constraints, responders implemented high-risk, improvised solutions:

- Solar-powered headlamps and chest rigs to monitor vitals at night
- Donkey harnesses adapted with foam padding to reduce cart shock
- Foil blankets layered with cloth to reduce pressure sores on hard boards
- IV tubing secured with cloth knots, not tape
- Rope-litter designs with handles adapted from market sacks
- Use of informal networks and local matriarchs to coordinate clearance



"One patient rode for 10 hours in a modified farm trailer, conscious throughout; with no IV pole, no oxygen, and no radio."

Conclusion

Ground-based evacuation in conflict zones is often seen as a last resort, yet our experience suggests it must be integrated as a primary strategy in remote medicine planning. Irrespective of the mode of transport: foot, cart, or motorcycle, the human body can endure evacuation across substantial distances, provided stabilisation protocols are adapted to resource constraints and routes are planned with contextual intelligence.

The motorcycle stretcher, proved to be an agile and efficient method for navigating unpaved terrain, characteristic of these regions. Its speed allowed for more rapid transit over long distances, reducing transfer times in emergent situations where every minute is critical. Patients, carefully secured and stabilised on the stretcher, benefited from a relatively quicker journey to definitive care points, minimising prolonged exposure to hazardous environments and mitigating the risks associated with extended periods without advanced medical intervention. Donkey carts, while inherently slower, offered a distinct and invaluable advantage: a stable platform for continuous patient monitoring. This stability was particularly important in managing sensitive clinical conditions, such as postpartum haemorrhage, where jostling or sudden movements could exacerbate the patient's condition. The relative smoothness of the cart's movement, even over uneven ground, allowed for more consistent assessment of vital signs, administration of basic medications, and the provision of comfort to patients. The slower pace allowed for communication with the patient and accompanying family members, fostering a sense of reassurance in stressful circumstances. Even foot evacuations, despite their logistical demands and increased medical risks, including prolonged exposure to environmental stressors and fatigue for both patient and bearers, highlighted the determination of both patients and care providers to access medical attention.

These evacuations were not flawless, the loss of three patients en route attests to the extreme challenges encountered, the survival of 14 patients and the eventual discharge of 11 demonstrates the potential of low-resource solutions implemented by trained and trusted local personnel. This approach not only extends critical care access but also contributes to community resilience and confidence in healthcare services.

Limitations of this case series include the small sample size and lack of standardised outcome metrics. Future studies could explore patient outcomes over longer follow-up periods, cost-effectiveness of different transport methods, and strategies to mitigate risk during foot-based evacuations. The decision to evacuate critically ill patients through high-risk environments raises ethical concerns around informed consent, risk exposure, and the responsibilities of care providers operating under extreme constraints. Ethical approval for this study was granted by the relevant institutional review board and informed consent was obtained from all participants.

"One patient was evacuated 22 km on a donkey cart overnight—he survived."

References

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