

## WHAT'S NEW IN INTENSIVE CARE



# A humanitarian's perspective of critical care in conflict zones

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“Go to the safe room” were the unforgettable words we heard when our hospital was caught in the crossfire. When medical professionals think about conflict zones, they tend to think about gunfights, bomb blasts, and mass casualty incidents (MCI). This is true for newsworthy events, such as the attack on a mosque in Afghanistan on 8/10/2021, when over 100 patients with bomb blast injuries and large body surface area burns presented to the Médecins Sans Frontières (MSF) hospital [1, 2]. An impressive team spirit allowed us to open a new temporary intensive care unit (ICU) during the MCI, despite being understaffed and underequipped. However, not all patients admitted to an ICU in conflict zones are cases of trauma (Fig. 1). People living in conflict zones live their everyday lives, despite the insecurity, with their everyday medical problems.

In 2021, MSF, an independent, medical humanitarian organization, treated 7397 patients in 11 ICUs (MSF-managed or in support of a local Ministry of Health hospital) in 7 countries in conflict (Fig. 1). Our data underreports the amount of critically ill due to the limitations of our routine data collection, which only includes established ICUs and misses critically ill patients who are hospitalized for days within the emergency department (ED) or recovery room when no ICU exists. All of our ICUs were staffed by local generalists, receiving on-the-job training by international staff, as specialists in critical care were seldom found in these countries.

Critically ill obstetrics accounted for the highest proportion of ICU admissions (Central African Republic (CAR), Nigeria, Yemen) as pregnant women are even

more vulnerable due to the collapse of health services and insecurity means a dangerous journey to access care. Antepartum hemorrhage was the most common maternal complication due to unregulated oxytocin use [3]. Eclampsia is also common in humanitarian settings, where Cesarean sections must be performed judiciously as the ability for a repeat, future Cesarean section may not be possible. There are risks associated with a prior uterine scar during a vaginal delivery and, given these risks, a decision to not immediately intubate an unresponsive, post-ictal patient with eclampsia in order to facilitate a vaginal birth may be favored, but doing so requires close monitoring within a critical care environment [4]. Uniquely, our project in northern Nigeria has many cases of peripartum cardiomyopathy with pulmonary edema and thus obstetrical non-invasive ventilation has become standard care.

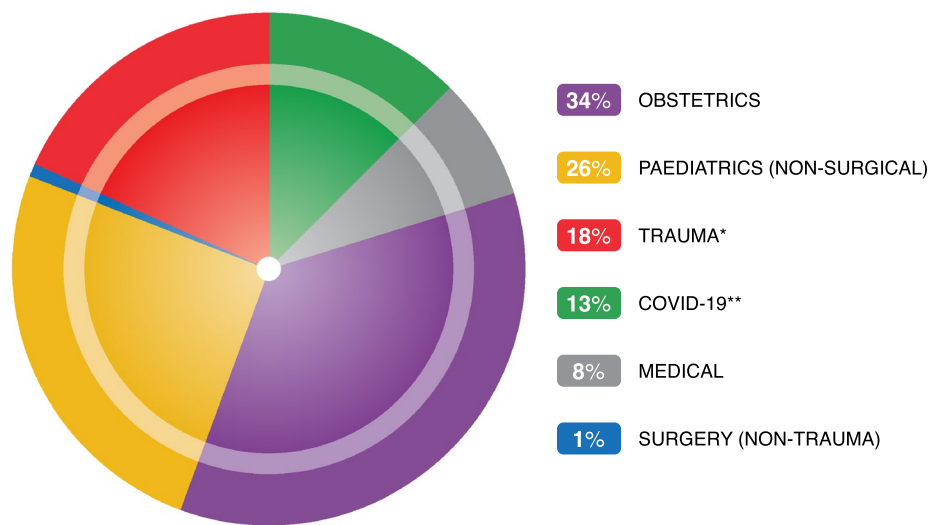
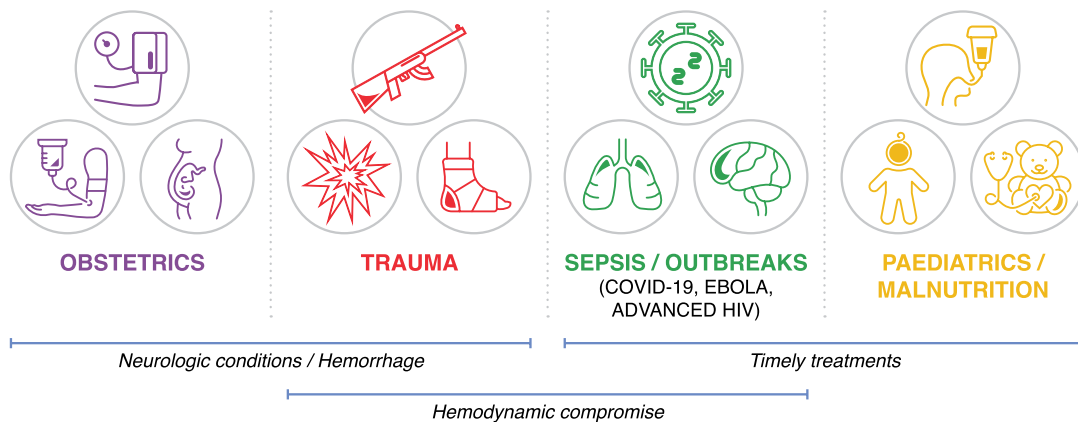
Pediatric medical cases accounted for the second largest proportion of ICU admissions (CAR, South Sudan) mainly due to severe malaria and severe acute malnutrition. Nutritional crises are often exacerbated in conflict zones [5]. Many children are admitted to a general ICU, which highlights the importance of maintaining pediatric competencies if working in humanitarian settings.

Trauma accounted for the third highest proportion of ICU admissions (Afghanistan, CAR, Haiti, Yemen) (Fig. 1). Violent trauma (gunshots, bomb/mine explosions, and stabbings) accounted for the majority (77%) of trauma-related ICU admissions; however, it was only a small proportion of ED visits. In fact, accidental trauma (road traffic accidents, falls, and burns) accounted for the majority (90%) of trauma-related ED visits. Damage control resuscitation, hemostasis, and injury-specific management are fundamental to trauma care; however, the intensivist's role in trauma care goes beyond those norms. In humanitarian settings, high-velocity projectile injuries are common, and for a surgeon, they represent

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TYPE OF HOSPITAL ICU	COUNTRY	MORTALITY
TRAUMA	AFGHANISTAN	8.6%
	CENTRAL AFRICAN REPUBLIC	7.4%
	HAITI	10.7%
	YEMEN	8.2%
TRAUMA & OBSTETRICS	YEMEN	5.7%
OBSTETRICS	NIGERIA	3.3%
MEDICAL, SURGICAL & OBSTETRICS; ADULTS-PAEDIATRICS	CENTRAL AFRICAN REPUBLIC	10.9%
PAEDIATRICS	SOUTH SUDAN	23.1%
MEDICAL-HIV	CENTRAL AFRICAN REPUBLIC	52.6%
COVID-19	IRAQ	62.5%
	YEMEN	54.1%

**Fig. 1** **a** Common critical care pathologies, **b** proportion of Intensive Care Unit admissions ( $n = 7397$ ), and **c** mortality rates from 11 hospitals in 7 countries with an active conflict in 2021. \*106 patients received invasive mechanical ventilation in two trauma hospitals' ICU ( $n = 1357$  total trauma cases from all hospitals). \*\*65 patients received invasive mechanical ventilation in one COVID-19 hospital's ICU and 335 patients received non-invasive ventilation in two COVID-19 hospitals' ICU ( $n = 951$  total COVID-19 cases from all hospitals)

concerns for hemorrhage, whereas for an intensivist, they also represent concerns for sepsis. High-velocity projectiles destroy tissue in a cavitary-fashion trajectory, unlike a low-velocity handgun, which has a narrow bullet trajectory with less tissue destruction. The cavitary lesion results in tissue necrosis, necrotizing deep space tissue infection, and ultimately sepsis/septic shock if the wound is not surgically debrided. An initial wide debridement is preferred, but it is often difficult to detect all potentially necrotic tissue at the initial surgery. Thus, these high-velocity projectile wounds require frequent surveillance as a potential source of sepsis and repeat surgical debridements must be encouraged in order to prevent/obtain source control for sepsis as invasive physiologic supports to manage multi-organ dysfunction from septic shock may not be readily available in humanitarian settings. In some projects, invasive physiologic supports were available; however, septic shock may still prevail due to the high prevalence of extreme drug-resistant (XDR) antibiotic resistance [6]. As intensivists, not only are we experts in sepsis, but also judicious antibiotic stewards regarding narrow-spectrum surgical antibiotic prophylaxis versus broad-spectrum empiric antibiotics for septic shock.

Despite resource limitations (e.g., in oxygen, blood, and lab investigations), essential emergency and critical care can be easily implemented in conflict zones [7]. We cannot forget about the life-saving value of clinical examination, bedside tools, applying ICU principles, and quality improvement initiatives that are context-adapted with local staff input for sustainability. Timely interventions before resource-intensive organ failure develops should be encouraged. In Pakistan, we focused on low-cost, high yield interventions to improve processes: teaching basic ICU principles such as a systems-based or problem-based approach to rounds with daily targets, best practice care bundles, checklists, morbidity and mortality reviews, and multi-disciplinary simulation. A retrospective review of our routine programmatic data demonstrated a decrease in mortality with our basic critical care-focused quality improvement initiatives [8].

Critically ill or injured children and adults will be present regardless of resource limitations and irrespective of insecurity, thus access to critical care in conflict zones must improve [4, 9]. In 2022, MSF focused on critical care transport by train in Ukraine in order to bring critically ill patients, regardless of pathology, from the conflict-affected regions in the east to the more safe regions in the west (typically a 22-h one-way trip). A specialized ICU train wagon with an accompanying oxygen generator wagon were created using lessons learnt from our coronavirus disease 2019 critical care response in austere environments [10].

In summary, critical care in conflict zones goes beyond trauma care with obstetrics and pediatrics representing the highest proportions of ICU admissions. Trauma critical care has unique challenges due to high-velocity projectile wounds resulting in sepsis in contexts where XDR antibiotic resistance is more common. Finally, access to critical care must improve.

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#### Data availability

Data for this manuscript is presented in Figure 1. Additional data related to Ukraine Medical Train project has been submitted as part of another manuscript.

#### Declarations

#### Conflicts of interest

The authors declare that they have no competing interests.

#### Ethical approval

Not applicable. Need for approval was waived by the Medical Director for Médecins Sans Frontières.

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