



Fifteen Years of Free Surgical and Obstetric Care in Conflict-Affected Afghanistan: A Retrospective Analysis of EMERGENCY's Scalable Surgery Model (2007–2022)

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Abstract

Background: Global disparities in surgical access continue to limit healthcare equity, particularly in low-income and conflict-affected countries. Afghanistan exemplifies this challenge, where the health system is constrained by conflict, resource limitations, and political instability. Since 1999, the international NGO EMERGENCY has delivered free surgical and obstetric care in Afghanistan through a network of hospitals and first aid posts. This study evaluates the scale, outcomes, and sustainability of their work from 2007 to 2022.

Methods: A retrospective, descriptive analysis was conducted using aggregate administrative data from EMERGENCY's three surgical hospitals and one maternity centre. Data on admissions, procedures, maternal and neonatal outcomes, and financial expenditures were reviewed. Statistical comparisons were made before and after the U.S. military withdrawal in 2021 using chi-squared and t-tests. Ethical approval was obtained from EMERGENCY's independent review board.

Results: Between 2007 and 2022, 120,226 surgical patients were treated, with 58.4% undergoing war-related procedures. In-hospital mortality averaged 3.6%. Following 2021, admissions for civilian trauma increased significantly. Nearly 695,000 outpatient visits were recorded. Maternity services expanded sixfold, with maternal and neonatal mortality rates approaching Sustainable Development Goal targets. The average annual cost of operations was €10.95 million, funded through private and institutional support.

Conclusion: EMERGENCY's model demonstrates that sustained, high-volume surgical and obstetric care is feasible in conflict-affected settings. The transition to civilian trauma care highlights the need for adaptable surgical systems. This model provides a viable blueprint for global surgery initiatives in low-resource environments.

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Introduction

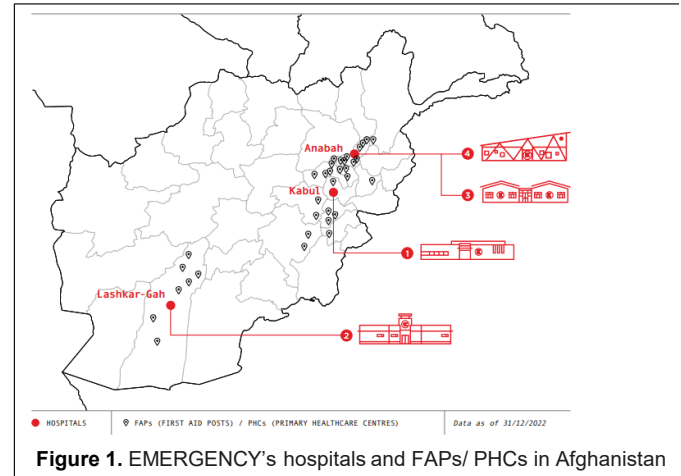
Global Surgery has emerged as a crucial field aimed at improving surgical care and advancing health equity, particularly for underserved and crisis-affected populations. It is defined as “an area of study, research, practice, and advocacy that seeks to improve health outcomes and achieve health equity for all people who require surgical care, with a special emphasis on underserved populations and populations in crisis”¹. It is now recognised as an essential component of comprehensive healthcare systems^{1,2}. The 2015 Lancet Commission on Global Surgery report, *Global Surgery 2030*, highlighted the global need for accessible, safe, and affordable surgical and anaesthesia care, especially in low- and middle-income countries (LMICs)³. Despite this, stark disparities remain, particularly in low-income countries (LICs), which perform only a fraction of global surgical procedures despite housing over a third of the world’s population^{4,5}. In such settings, out-of-pocket costs can be prohibitive, leading to untreated conditions, disability, or premature death, with broader socioeconomic consequences⁴.

Although surgical interventions are cost-effective, most LICs remain far from achieving the Lancet Commission’s target of 5,000 surgical procedures per 100,000 people by 2030³⁻⁵. Afghanistan, ranked low on the Legatum Prosperity Index⁶, has made notable gains in maternal and child health⁷, yet surgical care remains limited. Public hospitals face shortages in infrastructure, trained personnel, and operational capacity needed for safe surgery⁸. Essential components such as anaesthesia, blood banks, sterilisation, and diagnostics are often lacking, while political instability, poverty, and weak international investment further limit capacity^{8,9}.

EMERGENCY, an international NGO founded by Gino Strada in 1994¹⁰, began addressing these gaps by establishing a surgical hospital in Anabah in 1999^{11,12}. It later expanded to Kabul and Lashkar-Gah, adapting to areas of conflict and need. To support patient access in isolated regions, EMERGENCY created a network of First Aid Posts (FAPs) and Primary Healthcare Centres (PHCs) to provide initial care and coordinate referrals (Figure 1). Today, this network includes three surgical hospitals, a maternity centre, and 41 FAPs and PHCs across 11 provinces, offering trauma, obstetric, neonatal, paediatric, and general surgical care.

This report reviews EMERGENCY’s delivery of surgical and obstetric services in Afghanistan over a 15-year period (2007–2022). It assesses the scale and impact

of these efforts and considers their relevance as a sustainable, replicable model of free surgical care in crisis-affected LICs.



Methods

Aims

This study evaluates EMERGENCY NGO’s delivery of surgical and obstetric care across Afghanistan between 2007 and 2022. The aim is to assess service volume, patient outcomes, and financial expenditure during this 15-year period. Specific objectives include describing the number and nature of surgical procedures performed, examining maternal and neonatal outcomes, and analysing financial sustainability. The study also explores shifts in patient characteristics and surgical focus before and after the 2021 withdrawal of U.S. armed forces, including the transition from war-related to civilian trauma and general surgery.

Study Design

A retrospective, descriptive study design was employed. The analysis covers the years 2007 to 2022 and includes clinical, operational, human resource, and financial data from EMERGENCY’s network of healthcare facilities in Afghanistan. The focus is on surgical activity, maternal and neonatal outcomes, and funding trends across time.

Ethical Approval

This study received ethical approval from EMERGENCY’s independent institutional review board. The report is based exclusively on aggregate administrative data. Because individual-level data were not used, patient consent was not required. Data from the years 1999 to 2007 were excluded due to inconsistency and incomplete documentation.



Data Sources

Data on surgical admissions, procedures, and in-hospital mortality were sourced from hospital registries maintained at the three surgical centres. Maternal and neonatal data were extracted from delivery records at the Anabah Maternity Centre. Financial data covering the years 2018 to 2022 were obtained from EMERGENCY's audited balance sheets and annual reports. Staffing data as of December 2022 were drawn from payroll records and include clinical, administrative, and logistical personnel. Patient data from First Aid Posts and Primary Healthcare Centres were excluded from outcomes analysis due to inconsistent documentation.

Outcome Measures

The primary outcomes assessed were in-hospital mortality following surgical intervention, the maternal mortality ratio (MMR, defined as maternal deaths per 100,000 live births), and the neonatal mortality rate (NMR, defined as neonatal deaths per 1,000 live births). Secondary measures included surgical volume, case mix, and operational costs. The study also examined patient characteristics and procedural trends before and after the U.S. military withdrawal in 2021.

Operational Context

EMERGENCY operates a decentralised healthcare network across 11 provinces in Afghanistan, consisting of three surgical hospitals, one maternity centre, and 41 First Aid Posts and Primary Healthcare Centres. Services are available 24 hours a day, entirely free of charge, and non-discriminatory. International staff, rotating every four to six months, work alongside a stable, locally trained workforce. Facilities are equipped with emergency rooms, operating theatres, blood banks, sterilisation units, intensive and high-dependency care beds, digital radiology (including CT in Kabul), laboratories, pharmacies, outpatient departments, and physiotherapy. Cleaning and infection control protocols are rigorously enforced. Educational and psychosocial support areas, including classrooms and playrooms, are incorporated into all centres.

The Surgical Centre for War Victims in Kabul, operational since 2001, includes 100 surgical beds, three operating rooms, a six-bed intensive care unit, a high dependency room, and CT imaging. It employs 429 local staff members, including 26 doctors, and six international personnel.

In Lashkar-Gah, the Surgical Centre has been active

since 2004. Originally focused on war injuries, it has adapted to treat an increasing proportion of civilian trauma. It includes 93 beds, three operating rooms, a six-bed sub-intensive care unit, and a high dependency room. The staff includes 336 local workers, including 17 doctors, and three international staff.

The Anabah Surgical and Paediatric Centre, established in 1999, offers general, emergency, and paediatric surgical services. It comprises 78 beds, two operating rooms, and an eight-bed sub-intensive care unit. It is staffed by 352 local employees, including 19 doctors, and supported by four international healthcare workers.

The Anabah Maternity Centre, opened in 2003, delivers maternal and neonatal care with 56 beds for women, 43 neonatal beds, two operating rooms, a neonatal intensive care unit, and a high dependency room. It is staffed exclusively by women, including 179 local employees and 18 doctors (a mix of obstetricians and residents), supported by three international healthcare workers, including paediatricians.

To support referral and decentralised care, EMERGENCY operates 41 First Aid Posts and Primary Healthcare Centres across 11 provinces. These facilities stabilise patients and provide ambulance transfer to surgical hospitals. In some regions, they also deliver antenatal and postnatal services and participate in polio vaccination campaigns. As of December 2022, these centres employed 378 local staff, including four doctors. Due to incomplete data capture, outcomes from these centres were not included in the current analysis.

Statistical Analysis

Descriptive statistics were used to report annual frequencies, proportions, and central tendencies. Categorical variables, such as procedure types and patient case mix, were summarised using frequencies and percentages. Continuous variables, such as annual cost and number of procedures, were presented using means and standard deviations. To assess differences in patient characteristics and procedural distributions before and after 2021, chi-squared tests were applied for categorical variables. Independent-sample t-tests were used to compare means for continuous variables. A significance threshold of $p < 0.05$ was used. Maternal and neonatal mortality rates were plotted across time and compared to WHO Sustainable Development Goal targets. All analyses were conducted using Microsoft Excel and Stata version 17.



RESULTS

Surgical Activity and Patient Characteristics

Between 2007 and 2022, 120,226 patients underwent surgical procedures at EMERGENCY’s three dedicated surgical hospitals, excluding the Anabah Maternity Centre. War-related surgery accounted for the majority of cases (58.4%, table 1), while 31.6% of surgeries were performed for non-war-related emergencies and 9.9% were elective procedures. Elective operations were offered exclusively at the Anabah hospital.

Patient numbers increased steadily over time, with this trend reaching statistical significance ($p < 0.005$). Children under the age of 15 made up 28.3% of all surgical admissions, and female patients comprised 20.2%. Among war injuries, bullet wounds were the most frequent mechanism (51.8%), followed by injuries caused by shells (29.4%), knives (10.0%), and landmines (8.8%).

In-hospital mortality showed annual variation, ranging from 4.8% in 2007 to 1.9% in 2022. The overall mean mortality rate across the study period was 3.6% (95% CI [0.03, 0.04]). Across the three surgical hospitals, approximately 695,000 outpatient visits were recorded during this time (Figure 2).

Shifts in Surgical Focus After 2021

Following the withdrawal of U.S. military forces in August 2021, there was a marked decline in war-related trauma admissions. Simultaneously, the incidence of trauma related to road traffic accidents, interpersonal violence, and other non-conflict injuries increased. This change necessitated adjustments in triage protocols, surgical training, and hospital infrastructure, particularly in Kabul and Lashkar-Gah.

A comparative snapshot of hospital activity before and after this transition is provided in Table 2, which details data from the first half of 2021 and the first half of 2022 at the Lashkar-Gah hospital. These figures reflect both the changing epidemiological profile of trauma in post-conflict Afghanistan and the hospital’s operational flexibility in responding to new healthcare demands.

Obstetric Services and Maternal Outcomes

Obstetric care at the Anabah Maternity Centre expanded significantly during the study period. The annual number of deliveries increased sixfold from 2007 to 2022 (Table 3), a change that was statistically significant ($p < 0.005$). The rate of caesarean sections remained consistently low, with an average of 6.4% over the last five years of the study.

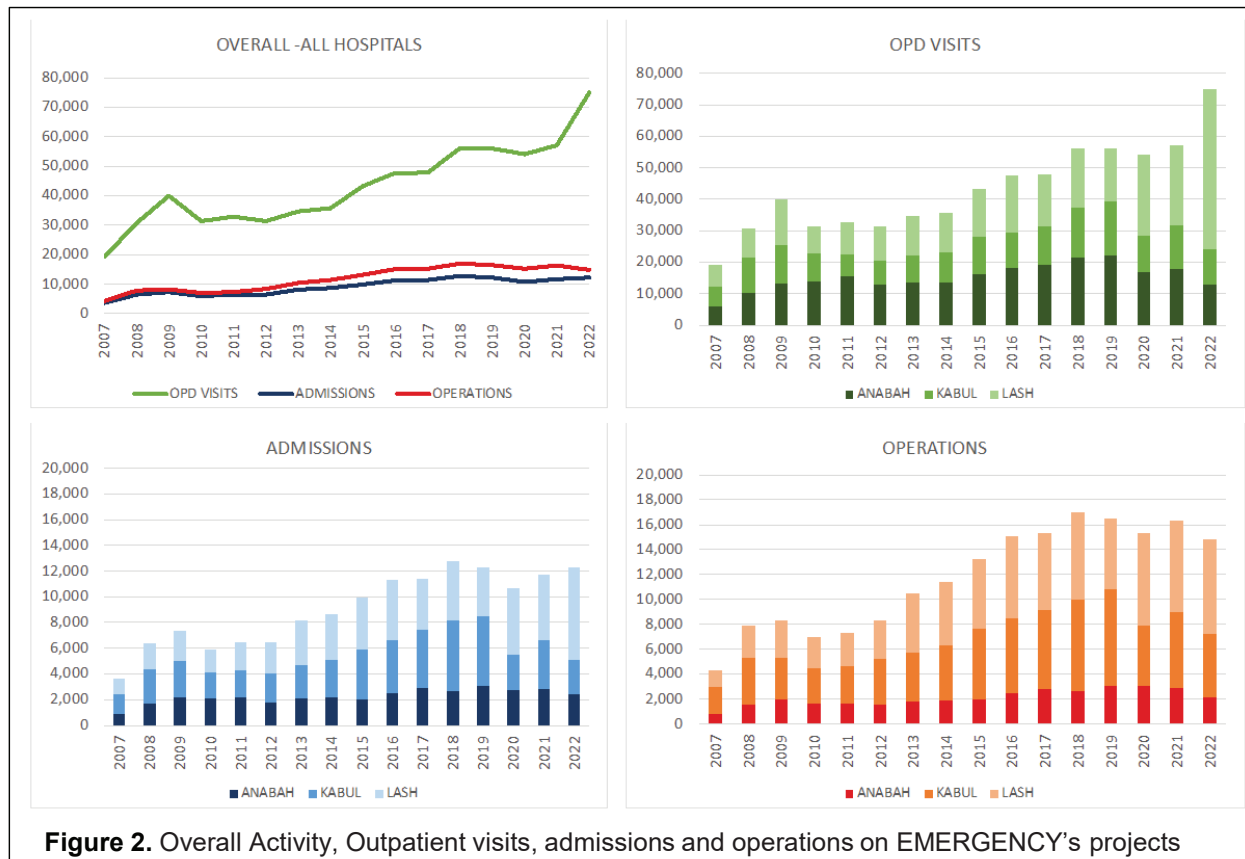


Figure 2. Overall Activity, Outpatient visits, admissions and operations on EMERGENCY’s projects



Maternal and neonatal outcomes improved progressively. The maternal mortality ratio (MMR) and neonatal mortality rate (NMR) approached, and in some years met, the Sustainable Development Goals for 2030, set at ≤ 70 per 100,000 live births for MMR and ≤ 12 per 1,000 live births for NMR. These indicators demonstrate not only the effectiveness of EMERGENCY's maternity services but also the broader impact of sustained investment in facility-based childbirth.

Financial Trends and Funding Sources

Operational expenditure increased in parallel with service volume and staff numbers. Financial data presented in Figure 3 show that the mean annual budget for the years 2018 to 2022 was €10,947,498, with a 95% confidence interval of €8,968,166 to €12,926,830. The largest portions of this budget were allocated to national staff salaries (32%), pharmaceuticals and medical equipment (25%), and costs related to international staff and travel (13%).

Funding initially came solely from EMERGENCY's private donor base but expanded over time to include support from institutional donors such as the World Health Organization (WHO), the Office for the Coordination of Humanitarian Affairs (OCHA), the European Civil Protection and Humanitarian Aid Operations (ECHO), and the Elective Recovery Fund (ERF). Between 2012

and 2021, additional contributions were received from the Afghan government. Further breakdowns of funding flows and annual expenditure are included in the electronic supplement accompanying Figure 3.

Discussion

EMERGENCY's long-term engagement in Afghanistan has demonstrated that safe, timely, and free surgical and obstetric care can be provided sustainably in conflict-affected, resource-constrained environments. Inspired by the principles of neutrality and non-discrimination, similar to those that guided Henry Dunant in founding the Red Cross after Solferino in 1859, Gino Strada established EMERGENCY after working with the International Red Cross to treat war victims¹⁰. Unlike Solferino, however, the Afghan conflict has led to an overwhelming civilian burden. Wounded soldiers often benefit from organised military hospitals, while "collateral victims" of bombings, terrorism and mass casualties¹⁴, as well as children injured by landmines, are cared for only by a depleted local health system. There are an estimated 176,000 war victims¹⁵, but no available data on the number of people injured, disabled or dead in the absence of treatment for non-war-related conditions. Against this backdrop, the treatment of civilians, without discrimination or out-of-pocket costs, became the primary aim of EMERGENCY's intervention in Afghanistan.

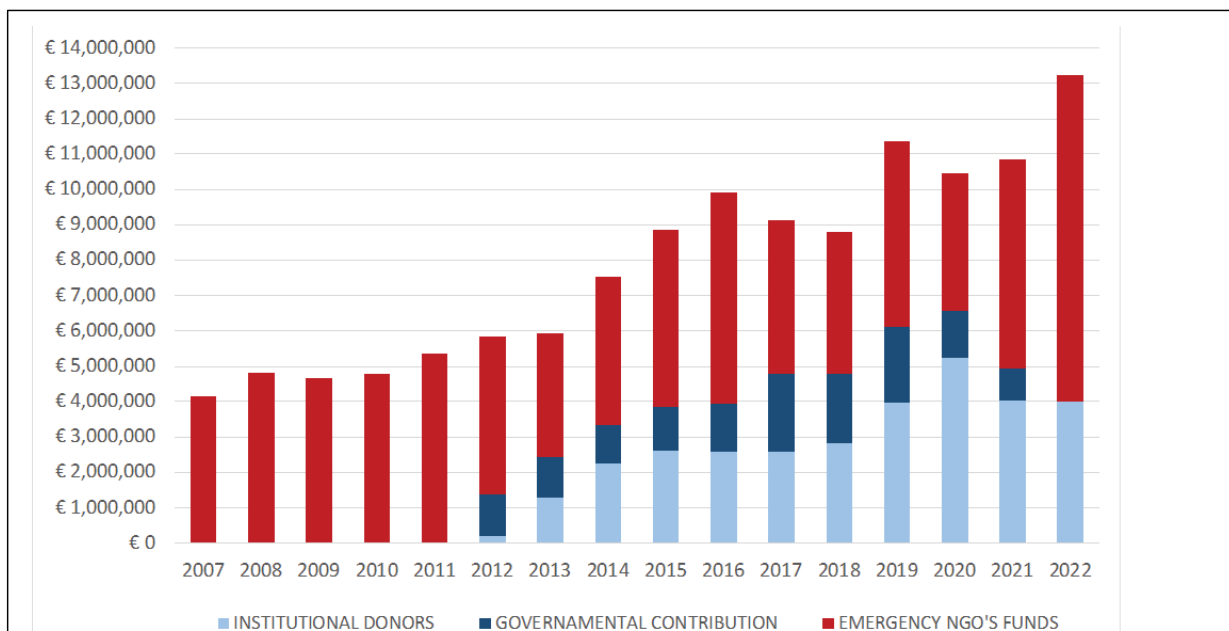


Figure 3. Costs of the Afghanistan project over the years (2007-2022).

Each bar represents the expenditure for the year, the red part of the bars represents direct disbursement by EMERGENCY NGO, using funds collected from private donors. The light blue part of the bars indicates the contributions from institutional donors (WHO, ECHO, OCHA, ERF, etc.). Finally, the dark blue part represents the contribution of the Afghan government, which started in 2012 and stopped in 2022.



Table 1: Surgical patients admitted, by cause of injury, sex, age and intra-hospital mortality (2007–2022, Anabah, Kabul and Lashkar-Gah hospitals)

	Admitted Patients*	War Surgery (%)	Other Emergency Surgery ^{1} (%)	Elective Surgery ° (%)	>15 Years (%)	Female (%)	Intrahospital Death (%)
TOTAL (2007-2022)	120,226	70,234 (58.4)	38,039 (31.6)	11,953 (9.9)	34,003 (28.3)	24,245 (20.2)	4,280 (3.6)
2022	10,018	2,775 (27.7)	6,429 (64.2)	814 (8.1)	4,075 (40.7)	2,250 (22.5)	192 (1.9)
2021	9,015	5,821 (64.6)	2,582 (28.6)	612 (6.8)	2,829 (31.4)	1,958 (21.7)	369 (4.1)
2020	8,236	5,021 (61.0)	2,531 (30.7)	684 (8.3)	2,460 (29.9)	1,748 (21.2)	314 (3.8)
2019	9,269	6,186 (66.7)	2,056 (22.2)	1,027 (11.1)	2,091 (22.6)	1,912 (20.6)	214 (2.3)
2018	9,853	7,106 (72.1)	2,031 (20.6)	716 (7.3)	2,252 (22.9)	1,850 (18.8)	390 (4.0)
2017	9,257	6,254 (67.6)	2,077 (22.4)	926 (10.0)	2,076 (22.4)	1,832 (19.8)	373 (4.0)
2016	9,108	6,600 (72.5)	1,686 (18.5)	822 (9.0)	2,161 (23.7)	1,941 (21.3)	331 (3.6)
2015	8,059	5,893 (73.1)	1,435 (17.8)	731 (9.1)	1,488 (18.5)	1,587 (19.7)	302 (3.7)
2014	7,390	5,151 (69.7)	1,512 (20.5)	727 (9.8)	1,935 (26.2)	1,479 (20.0)	286 (3.9)
2013	7,007	4,631 (66.1)	1,750 (25.0)	626 (8.9)	1,937 (27.6)	1,296 (18.5)	240 (3.4)
2012	5,807	3,320 (57.2)	1,852 (31.9)	635 (10.9)	1,795 (30.9)	1,077 (18.5)	196 (3.4)
2011	5,879	2,850 (48.5)	2,183 (37.1)	846 (14.4)	1,927 (32.8)	1,182 (20.1)	179 (3.0)
2010	5,372	2,476 (46.1)	1,946 (36.2)	950 (17.7)	1,778 (33.1)	1,011 (18.8)	214 (4.0)
2009	6,676	2,277 (34.1)	3,477 (52.1)	922 (13.8)	2,329 (34.9)	1,278 (19.1)	311 (4.7)
2008	5,851	2,334 (39.9)	2,869 (49.0)	648 (11.1)	1,927 (32.9)	1,109 (19.0)	204 (3.5)
2007	3,429	1,539 (44.9)	1,623 (47.3)	267 (7.8)	943 (27.5)	735 (21.4)	165 (4.8)

* Data do not include surgical patients of the maternity department.

^ Trauma surgery in Kabul and Lashkar Gah Hospitals; Trauma and Emergency surgery in Anabah Hospital

° Service available only in Anabah Hospital

The fast-changing frontlines of the conflict forced the organisation to adapt quickly to emerging needs. Hospitals were established where fighting was most intense: first in Anabah, in response to the Northern Alliance's engagement with the Taliban in the north-east before 2001; later in Kabul and Lashkar-Gah, where the international military coalition fought Al-Qaeda and the Taliban from 2001 until their withdrawal in 2021. As the number of war-related casualties decreased after the withdrawal, the volume of trauma patients increased due to road accidents and violence, enabled by improved security but exacerbated by deteriorating infrastructure and overcrowded transport. Landmines and interpersonal violence remain persistent threats. The situation has been further complicated by international economic sanctions on the Taliban government, which have worsened poverty and deepened the humanitarian crisis. Surgical care was most acutely affected; Funk et

al. estimated that fewer than 300 operating theatres were available in public hospitals across the country¹⁶. Contini et al., based on a survey of hospitals outside Kabul, reported severe structural problems and staff shortages, with certified surgeons present in only 63.6% of facilities and anaesthetists in just 27.2%⁸. With many specialist health workers leaving Afghanistan after the return of the Taliban, and severe restrictions now imposed on women, the future of the health system remains deeply uncertain. In this context, EMERGENCY has continued to provide free care to approximately 120,000 patients requiring surgery, performing around 180,000 procedures over the years (Tables 1 and 2). Nearly 695,000 outpatient consultations were delivered for trauma patients, whether war-related or not (Table 1, Figure 2). Assessing the quality of treatment remains challenging in the absence of benchmarking data, but the overall intra-hospital mortality was 3.6%, including among patients with



Table 2: Lashkar-Gah hospital activity: comparison of first semesters of 2021 and 2022

	01/2021 – 06/2021 n (%)	01/2022 – 06/2022 n (%)	p-value Odds Ratio [95% CI]
OPD activity	12,976	20,778	-
Emergency Room (ER) patients	4,418 (34.0)	12,835 (61.8)	-
War/Violence	2,523 (57.1)	551 (4.3)	<0.001 32.0 [28.9-35.6]
Other trauma surgery	1,747 (39.5)	12,228 (95.3)	<0.001 0.0 [0.03–0.03]
Dead on arrival	148 (3.3)	56 (0.4)	<0.001 8.2 [5.9–11.3]
Follow-up visits	8,558 (66.0)	7,943 (38.2)	-
Admissions	2,719	3,141	-
Admitted patients	1,938 (71.3)	2,671 (85.0)	-
War/Violence	1,594 (82.2)	364 (13.6)	<0.001
Bullet	891 (55.9)	111 (30.5)	<0.001
Shell	526 (33.0)	82 (22.5)	<0.001
Mine	130 (8.2)	16 (4.4)	0.014
Stab	47 (2.9)	155 (42.6)	<0.001
Other trauma surgery	344 (17.8)	2,307 (86.4)	<0.001
Female	278 (14.3)	538 (20.1)	<0.001
≤14y	618 (31.9)	1,680 (62.9)	<0.001
Readmissions	781 (28.7)	470 (15.0)	-
LOS(days)	4.6	3.9	-
Operations	3,436	3,556	-
War/Violence	3,127 (91.0)	980 (27.6)	<0.001
Operations per patient	2.1	3.1	-
Other Trauma	309 (9.0)	2,576 (72.4)	<0.001
Operations per patient	1.9	1.4	-
Operated patients	1,634	2,106	-
<24h surgical mortality	30 (1.8)	23 (1.1)	0.07
Overall 30-day mortality*	65 (4.0)	39 (1.9)	<0.001

* inclusive of <24h deaths



Table 3: Maternity Centre in Anabah: obstetric activity (2007–2022)

	Live Births	Deliveries	Caesarean Sections	Maternal Deaths	Maternal Mortality Ratio (MMR)	Neonatal Deaths	Neonatal Mortality Rate (NMR)
2022	5,466	5,484	376	4	73.2	64	13.0
2021	5,438	5,678	379	7	128.7	82	15.1
2020	5,634	5,793	364	4	71.0	66	11.7
2019	6,655	6,698	419	3	45.1	68	10.2
2018	7,316	7,560	446	6	82.0	155	21.7
2017	7,260	7,345	397	5	68.9	187	25.4
2016	6,230	6,330	424	3	48.2	130	20.8
2015	5,645	5,656	332	2	35.4	88	17.9
2014	4,903	4,895	398	8	163.2	70	14.3
2013	4,226	4,383	377	6	142.0	31	7.3
2012	3,683	3,736	397	5	135.8	73	19.8
2011	3,734	3,750	355	3	80.3	90	24.1
2010	3,000	3,142	337	-	-	-	-
2009	2,220	2,303	205	-	-	-	-
2008	1,473	1,598	181	-	-	-	-
2007	831	872	86	-	-	-	-

severe, untreatable injuries such as head trauma. The shift from war-related to civilian trauma presents a major challenge, requiring updated diagnostic and surgical capabilities. The Anabah Maternity Centre in the rural Panjshir valley remains well-established, with steadily improving maternal mortality ratio and neonatal mortality rate, despite predominantly admitting complex cases. These improvements largely reflect in-hospital efforts. Further gains would depend on expanded antenatal and postnatal care and greater access to family planning.

EMERGENCY's healthcare delivery model closely aligns with the Global Surgery 2030 principles, which advocate for surgical care that is safe, affordable, timely, and universally available. The three surgical hospitals and maternity centre remained functional during and after the war, accepting and treating patients without discrimination by gender, ethnicity, religion, political affiliation, or social class. All hospitals operate 24/7 and are staffed by both local and international healthcare workers, capable of responding to emergencies at any time. Care is provided completely free of charge, including medications, follow-up visits, counselling, transport, and basic necessities such as food and hygiene products. Patient safety is a central concern, monitored through regular audits, statistical performance reports, and continuing education. Mortality remains the key outcome tracked and is consistently reported across facilities (Tables 1, 2 and 3). The time from injury to surgery is

minimised through EMERGENCY's network of First Aid Posts (FAPs), which provide early stabilisation and rapid ambulance transport. Financial sustainability has been maintained through a combination of private donations and institutional support from WHO, OCHA, ECHO, and the Elective Recovery Fund. Between 2012 and 2021, additional support came from the Afghan government. As illustrated in Figure 3, the average annual expenditure over the past five years has been approximately €10.95 million, with 32% allocated to national staff, 25% to pharmacy and equipment, and 13% to international staff and logistics. These figures offer a rare and useful insight into the resource requirements for operating a sustainable surgical network in a low-resource, conflict-affected context.

While our retrospective analyses provide valuable insights, this study is limited by the lack of detailed information on patients' pre-existing conditions, injury severity, and long-term outcomes. Furthermore, the absence of a comprehensive electronic data system restricts more granular analysis of subgroups or care trajectories. The ability to benchmark outcomes remains limited by contextual factors, such as the absence of comparable public data and variability in patient mix. As such, outcomes such as mortality must be interpreted with caution, particularly when assessing high-acuity trauma patients whose survival may be affected by delayed presentation or transport conditions.



The shift in patient demographics and injury types underscores the need for flexible, adaptive surgical programmes in post-conflict settings. As emergency war surgery gives way to broader civilian trauma and general surgical care, hospital systems must evolve accordingly. In maternal health, expanding the continuum of care beyond in-hospital services will be essential to improving outcomes further. The financial and operational data presented here provide an important reference point for similar initiatives in other low-resource settings. EMERGENCY's ongoing success, despite increasing constraints on funding and personnel, highlights the critical value of long-term neutrality, integration with local communities, and resilience in humanitarian health delivery. It offers a replicable framework for sustaining surgical and obstetric services during and after conflict, reaffirming that essential healthcare can be delivered consistently and ethically, even under the most difficult circumstances.

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Data sharing: Due to ethical and logistical considerations, individual-level data cannot be made publicly available. Aggregated data reported in this study may be made available upon request to the corresponding author.

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GAIT statement¹⁷ for Generative AI use: Generative AI was used for language editing in this manuscript. No content generation, data analysis, or substantive rewriting was performed. The authors take full responsibility for the accuracy and integrity of the work.

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