

Electronic Medical Systems as Platforms for Trauma Registry-based Knowledge Acquisition in the Unified Medical Space in Ukraine

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AUTONOMOUS REANIMATION AND EVACUATION



RESEARCH INSTITUTE & INNOVATION CENTER

A PROGRAM OF THE GENEVA FOUNDATION

2026 MHSRS
05 August 2026
Kissimmee, FL





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- Animal studies presented here have been conducted in compliance with the Animal Welfare Act, the implementing Animal Welfare Regulations, and the principles of the Guide for the Care and Use of Laboratory Animals
- Member of scientific advisory board for SeaStar Medical, USA and Entegron, USA, Fresenius, USA (past)
- Consultant Mission Mobile Medical, USA (past)
- Past President of the International Society for Complex Acute Illness (voluntary position, past)
- **Inventor Multimodal Extracorporeal Life Support (MELS)**

Medical Data Logging in the Past



- Post-soviet inheritance of the medical system
- No National registry
- Pen/paper-based medical record keeping
- Case history archives
- No infrastructure for analysis of data although each hospital has a full-time medical statistics team
- Research only carried out as part of PhD dissertations and largely depended (still does) on enthusiasm and drive of the PhD candidate
- Despite the above, arguably, Ukraine has the higher ratio of MD/PhDs around

МЕДИЧНА ДОКУМЕНТАЦІЯ
Форми первинної облікової документації № 001/М
Затверджено наказом МОЗ України № 13.01.2016 р. №201
З урахуванням наказу МОЗ України № 13.01.2016 р. №201

ІНФОРМОВАНА ДОБРОВОЛЬНА ЗГОДА ПАЦІЄНТА
НА ПРОВЕДЕННЯ ДІАГНОСТИКИ, ЛІКУВАННЯ
ТА НА ПРОВЕДЕННЯ ОПЕРАЦІЇ ТА ЗНЕБОЛЕННЯ

Informed consent for data use

Інформацію про характер мого (моєї дитини) захворювання, особливості його перебігу, діагностики та лікування.
Я ознайомлений(а) з планом обстеження і лікування. Отримав(ла) в повному обсязі роз'яснення про характер, мету, орієнтовну тривалість діагностично-лікувального процесу та про можливі несприятливі наслідки під час його проведення, про необхідність дотримання визначеного лікарем режиму в процесі лікування. Зобов'язуюсь негайно повідомляти лікуючого лікаря про будь-яке погіршення самопочуття (стан здоров'я дитини). Я проінформований(а), що недотримання рекомендацій лікуючого лікаря, режиму прийому призначених препаратів, безконтрольне самолікування можуть ускладнити лікувальний процес та негативно позначитися на стані здоров'я.
Мені надали в доступній формі інформацію про ймовірний перебіг захворювання і наслідки у разі відмови від лікування.
Я мав(ла) можливість задавати будь-які питання, які мене цікавлять, стосовно стану здоров'я, перебігу захворювання і лікування та одержав(ла) на них відповіді.
Я даю згоду на внесення до локальної інформаційної госпітальної системи, яка ведеється закладом охорони здоров'я, моїх (моєї дитини) персональних даних, у тому числі даних щодо стану мого здоров'я, поставлених мені діагнозів, призначеного лікування та його перебігу.
Я погоджуюсь із використанням та обробкою моїх персональних даних за умови дотримання їх захисту відповідно до вимог Закону України «Про захист персональних даних».

Medical Informational Systems: 2024

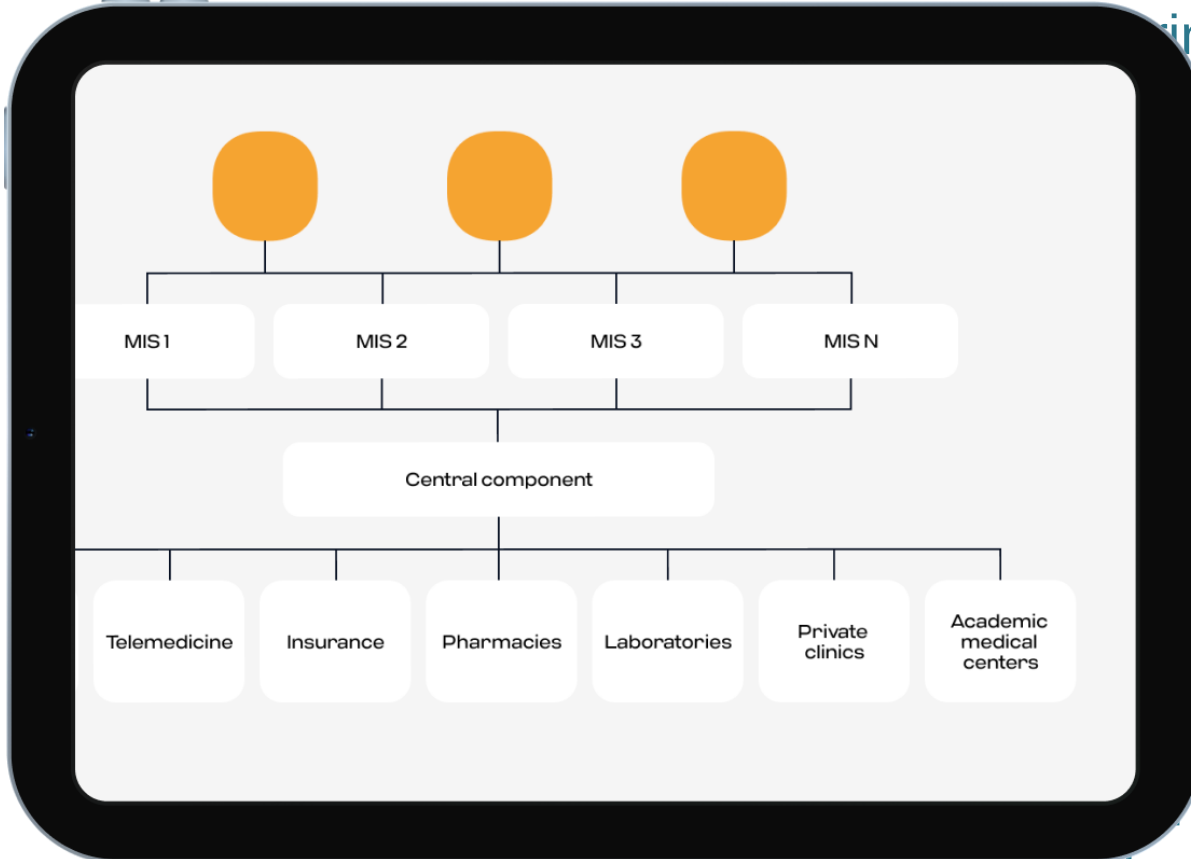


- *“Digitalization is primarily about simplifying procedures for patients,” Liashko said. “But at the same time, it is a significant step towards greater transparency, accountability, and accessibility of medical care in general. Ukraine confidently demonstrates that it is ready to implement new technologies for the development of the medical system, even in wartime conditions.”*
- Implemented information systems that connect millions of Ukrainians
- hundreds of thousands of medical workers, and tens of thousands of healthcare institutions
- such as the electronic healthcare system, electronic surveillance and continuous professional development systems, the e-Stock and MedData systems, and a single web portal for vacant positions in healthcare institutions
- Digital tools like electronic referrals and prescriptions, medical reports for e-hospitals, medical reports on birth, and COVID vaccination certificates





- Ukraine is a fertile ground for medical innovation



In Ukraine, the electronic healthcare system has surpassed 5 billion medical records

Юлія Мирська

5 months ago



Karolina Kaboompics

- Main purpose of MISs in Ukraine today: track hospital expenses and reimbursement

Digital Era (2022-2024-2026 t.b.c.)

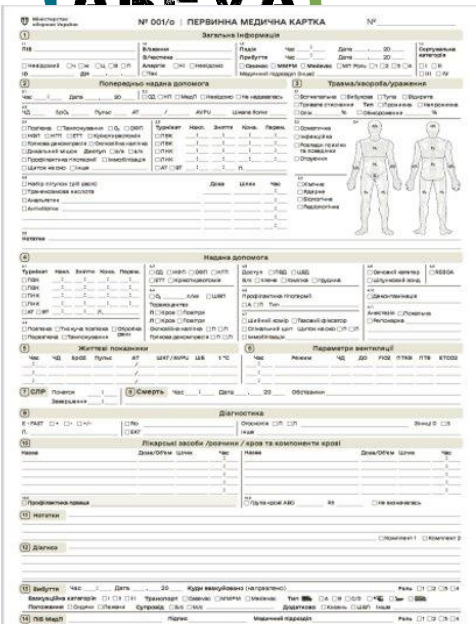
2022 – Identification of the issue and start of the discussion

2023 – Launch of the ePMC (Electronic Primary Medical Card) project

2024 – Development and approval of the ePMC legislation

2025 – Deployment of the ePMC within the Armed Forces of Ukraine (AFU)

2026 – Deployment of the ePMC across all Defense and Security Forces




Міністерство охорони здоров'я України № 001/о | ПЕРВІННА МЕД

Загальна Інформ

1. ПІВ

2. Попередньо надана допомога

3. Надана допомога

4. Життєві показники

5. Смерть

6. Діагностика

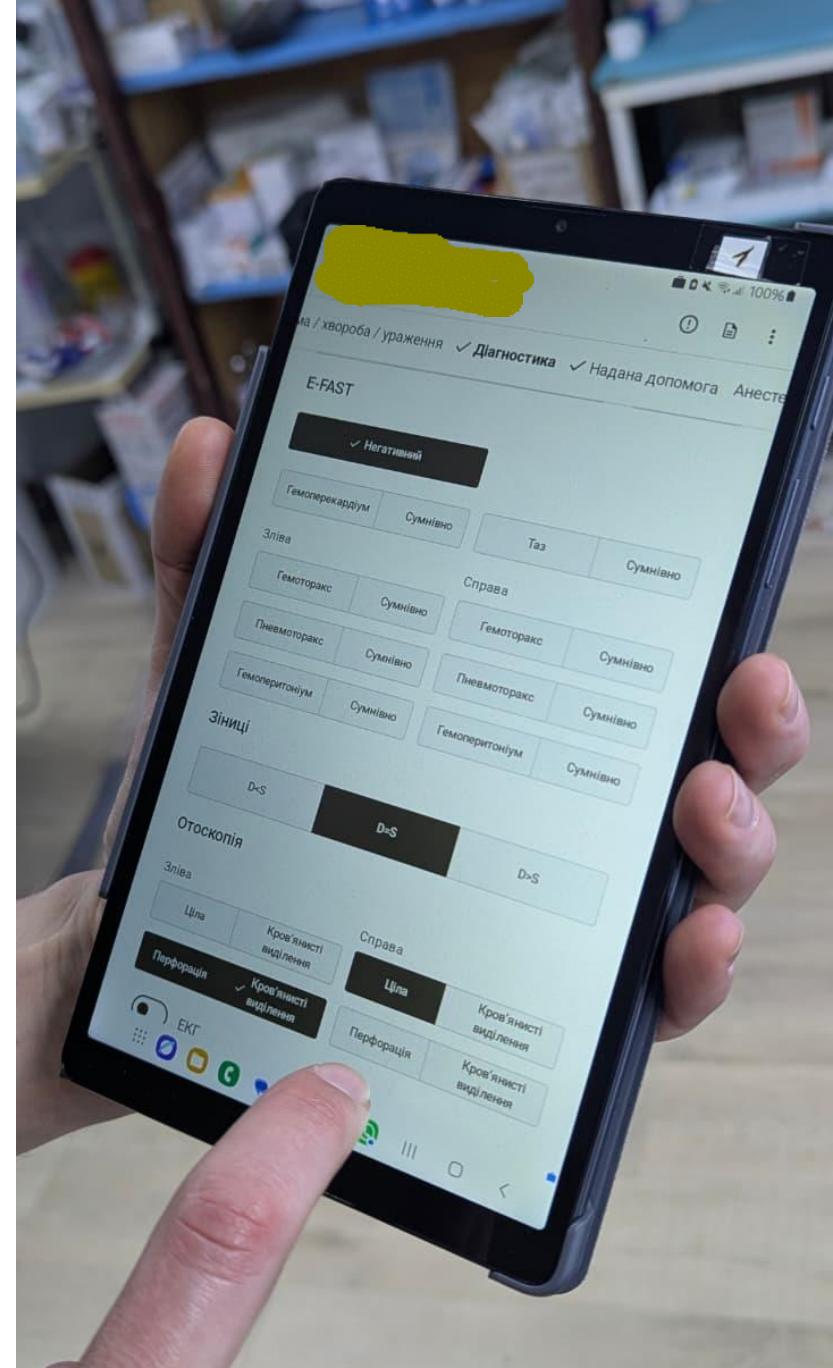
7. Лікарські засоби / дошки / хро

8. Вихідні



Oleksandr Danyliuk MD, frontline surgeon

25



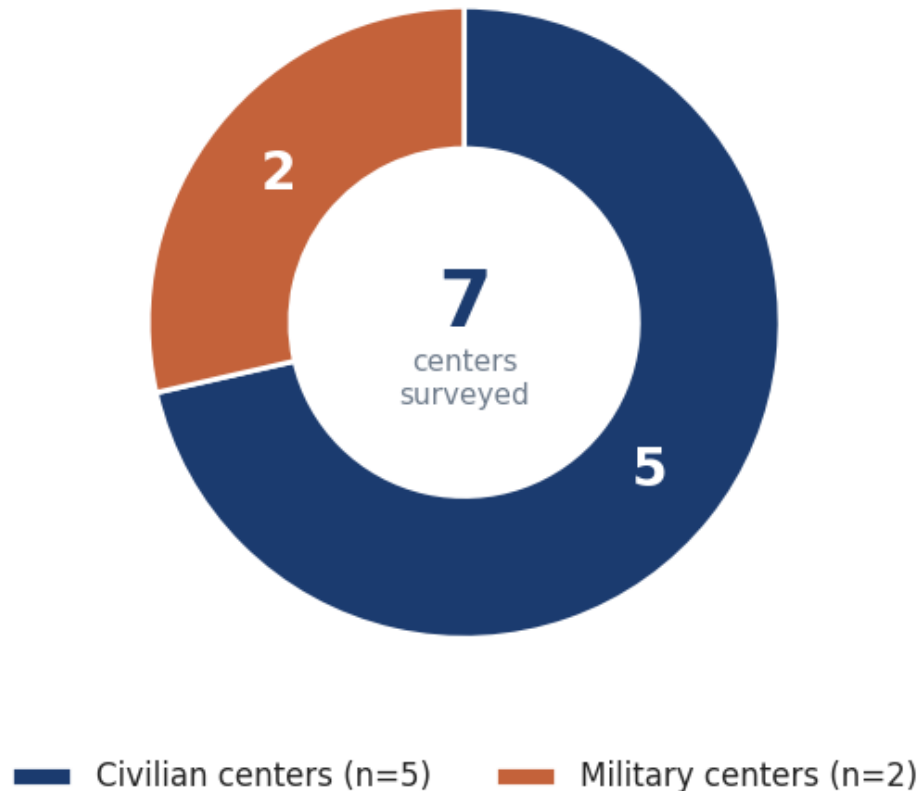
- **Objective:** Describe the current eHealth MIS landscape in Ukraine, features, utilization, and potential integration with the AREVATR and DoDTR registries.

Methods and Results

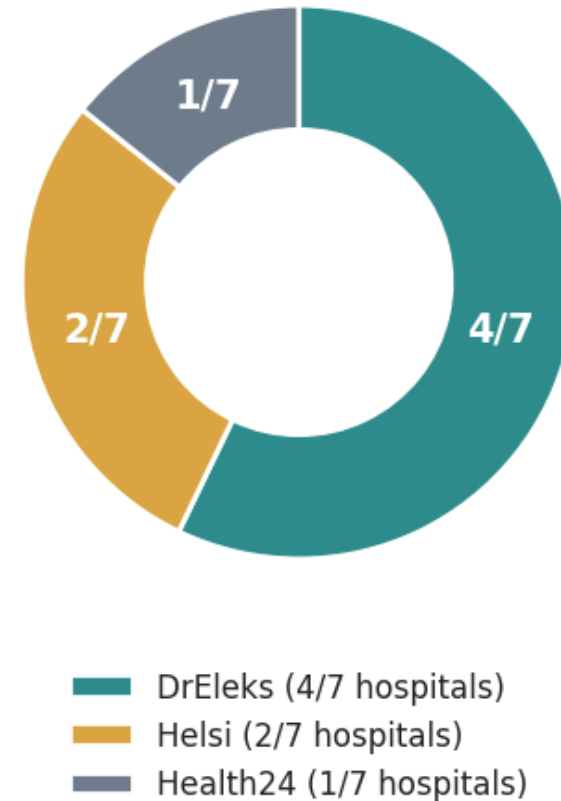


Methods: Survey of MIS military (n=2) and civilian (n=5) centers across Ukraine where the AREVATR has been implemented.

Surveyed MIS Centers Across Ukraine



MIS Software Utilized





Methods and Results

MIS Features Across Surveyed Centers

Present in all centers (7/7)

- ✓ Electronic interoperability with eHealth for hospital billing
- ✓ Non-research use case
- ✓ ICD coding system
- ✓ Unstructured mechanism of injury description
- ✓ Unstructured prehospital care data (primarily paper-based)
- ✓ Inter-institution data exchange via printed patient summaries

Absent in all centers (0/7)

- ✗ QA/QC protocol available
- ✗ Keyword searchability
- ✗ AIS/ISS scoring system





Death on the battlefield (2001–2011): Implications for the future of combat casualty care

Brian J. Eastridge, MD, Robert L. Mabry, MD, Peter Seguin, MD, Joyce Cantrell, MD, Terrill Tops, MD, Paul Uribe, MD, Olga Mallett, Tamara Zubko, Lynne Oetjen-Gerdes, Todd E. Rasmussen, MD, Frank K. Butler, MD, Russell S. Kotwal, MD, John B. Holcomb, MD, Charles Wade, PhD, Howard Champion, MD, Mimi Lawnick, Leon Moores, MD, and Lorne H. Blackbourne, MD

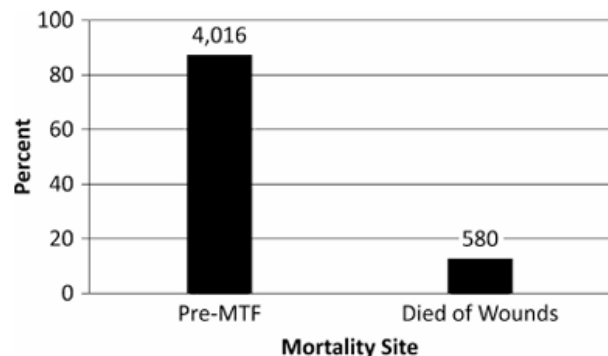


Figure 1. Battlefield mortality location.

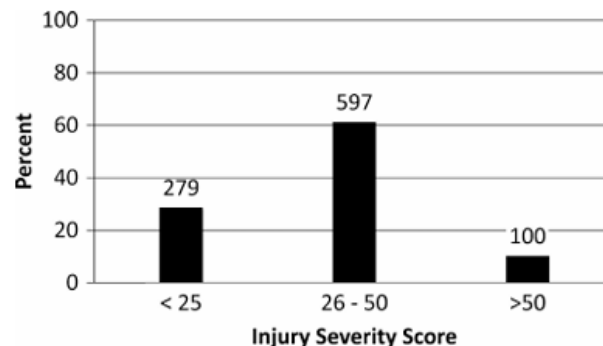


Figure 3. ISS PS pre-MTF deaths.

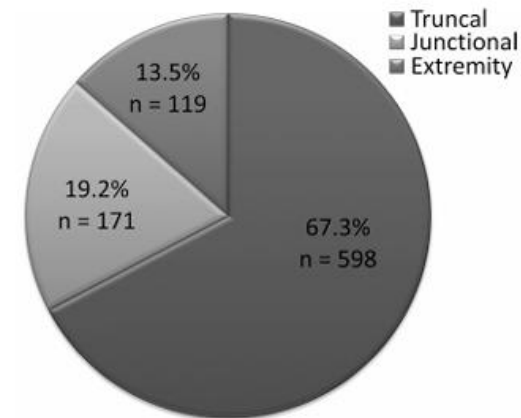


Figure 5. Anatomic focus of lethal PS hemorrhage.

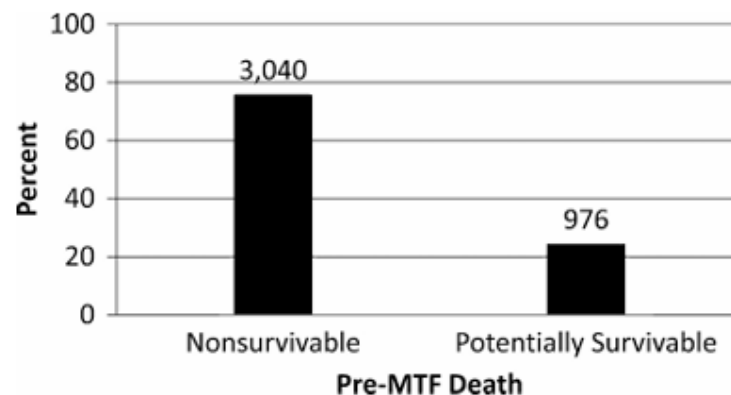


Figure 2. Survivability pre-MTF casualties.

TABLE 1. Injury Focus of Patient With NS Injuries Who Died Instantaneously or Acutely Before Admission at a MTF (pre-MTF)

Cause of Death	Instantaneous (n = 1,619)	Acute (n = 1,624)
Brain injury	38.3% (620)	53.0% (753)
High spinal cord injury	—	9.2% (131)
Dismemberment	31.6% (512)	—
Heart/thoracic injury	23.6% (383)	21.8% (310)
Open pelvic injury	—	6.5% (93)
Other	6.5% (104)	9.5% (134)

Values are percentages of the total deaths and the number of deaths.

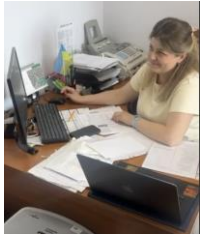
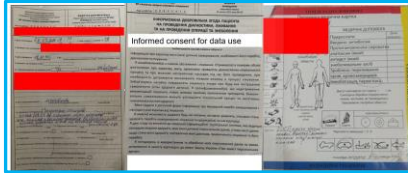
AREVA Trauma Registry



AREVA Registry of Battlefield Injuries



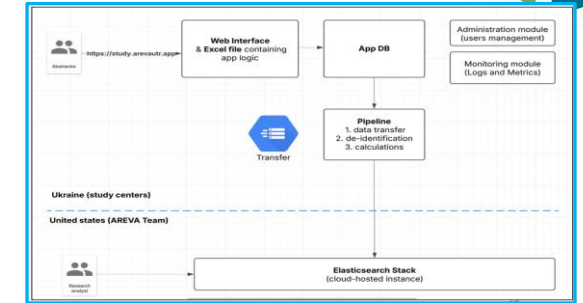
Retrospective info from case reports



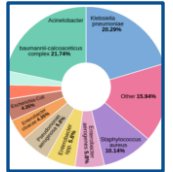
Manual Entry to Database

Trauma database user inputs

DEMOGRAPHICS Baseline patient characteristics. 0/9 questions completed	VITAL SIGNS 0/12 questions completed	TRAUMATIC INJURIES 0/50 entries added	ICD SURVEILLANCE 0/2 questions completed
TOURNIQUET 0/5 entries added	AMPUTATIONS 0/4 entries added	INVASIVE PROCEDURES 0/100 entries added	BLOOD 0/100 entries added
HOSPITAL COURSE 0/3 questions completed	PATHOGENEMIA 0/20 entries added	OUTCOMES 0/2 questions completed	



Analysis



Battlefield

Point of Injury

Data?

Kill Zone

Data?

Survival

Data?

Open access

Commentary

Trauma Surgery
& Acute Care Open

Clues to survival in future LSCOs are to be found in the current war in Ukraine

Andriy Batchinsky,¹ Konstjantyn Gumeniuk,² John B Holcomb ³



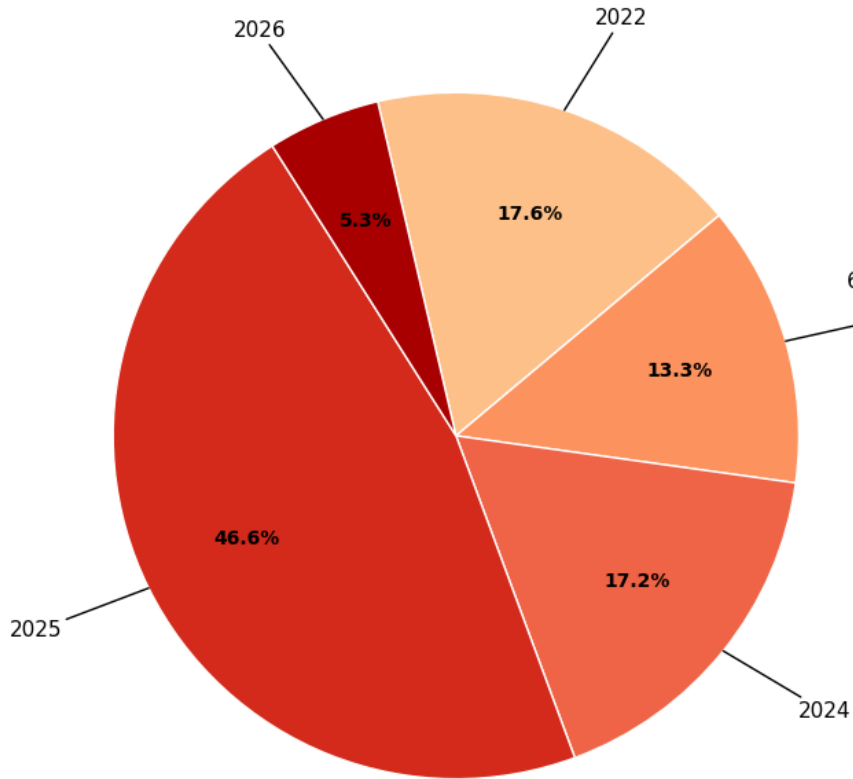
- Data pull: “areva - 2026-06-19T07_25_36.037Z”
- Raw registry CSV loaded with multi-encoding support and automated text repair to preserve non-ASCII entries (e.g., Cyrillic entries)
 - **9,806 total entries** (includes duplicate entries)
- Duplicate entries identified at the encounter level using: ***patient ID + center + level***
- Within each duplicate group, retained the most complete record (max non-missing fields)
- Removed redundant rows while preserving all unique clinical data across sites
 - De-duplicated dataset reduced to **6,038 entries**
 - **Total unique patient IDs: 2,772**

Demographics

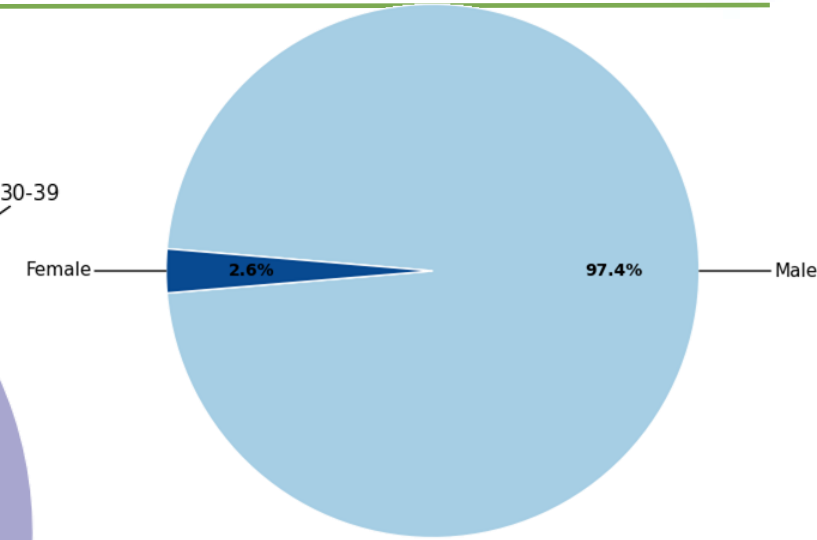
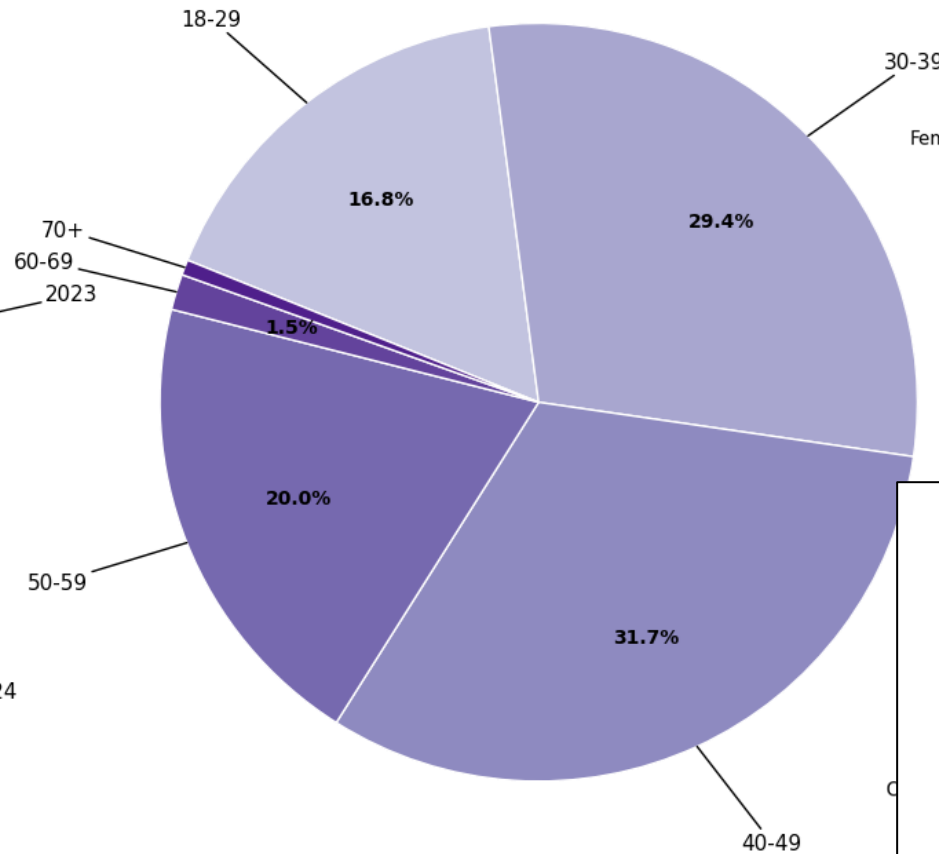
Patient Sex Distribution



Year of Injury Distribution



Patient Age Distribution



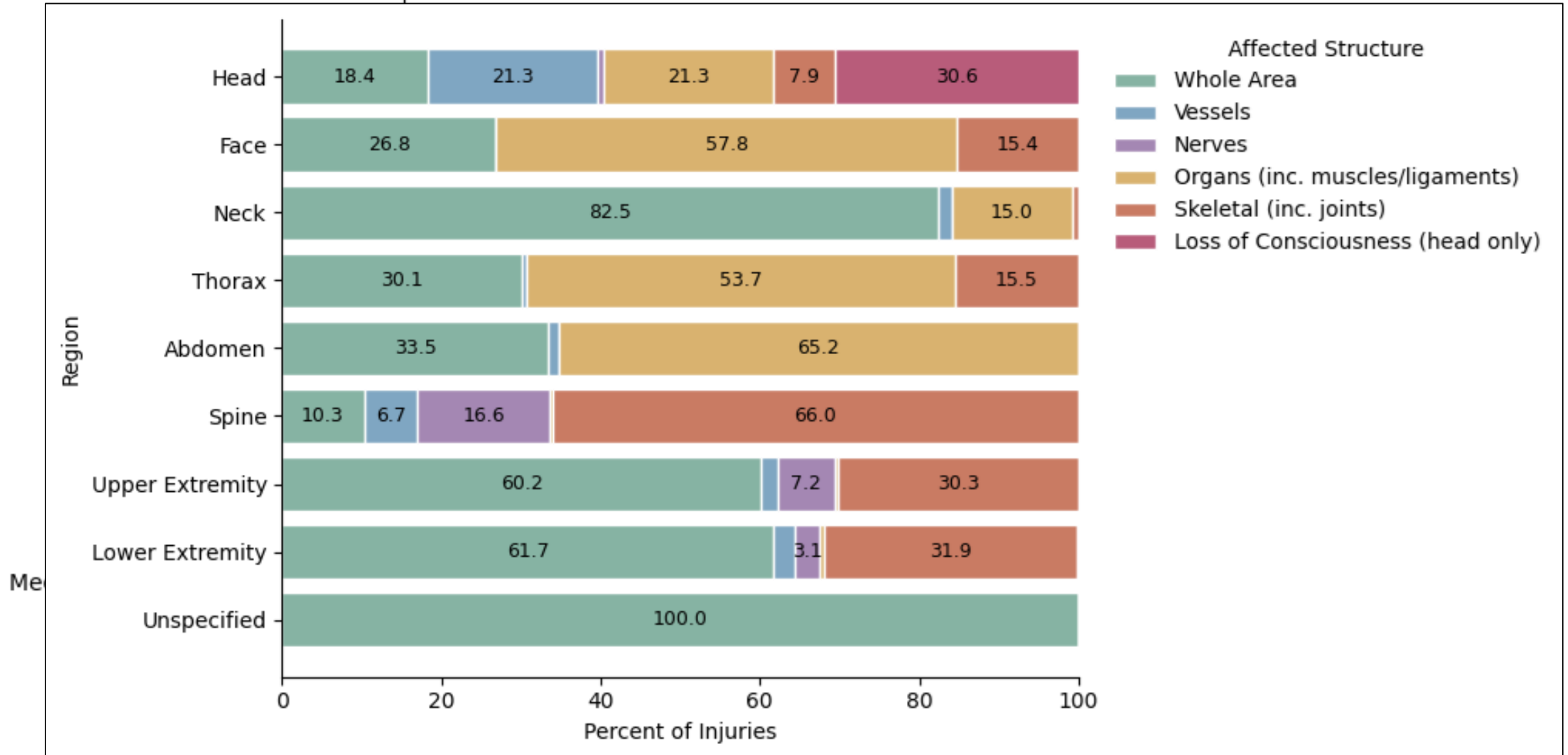
Civilian/Military status not available

Age	N=2759	41.0 [33.0–48.0]
Sex	Male N=2687	Female N=73
Status	Military =	Civilian =

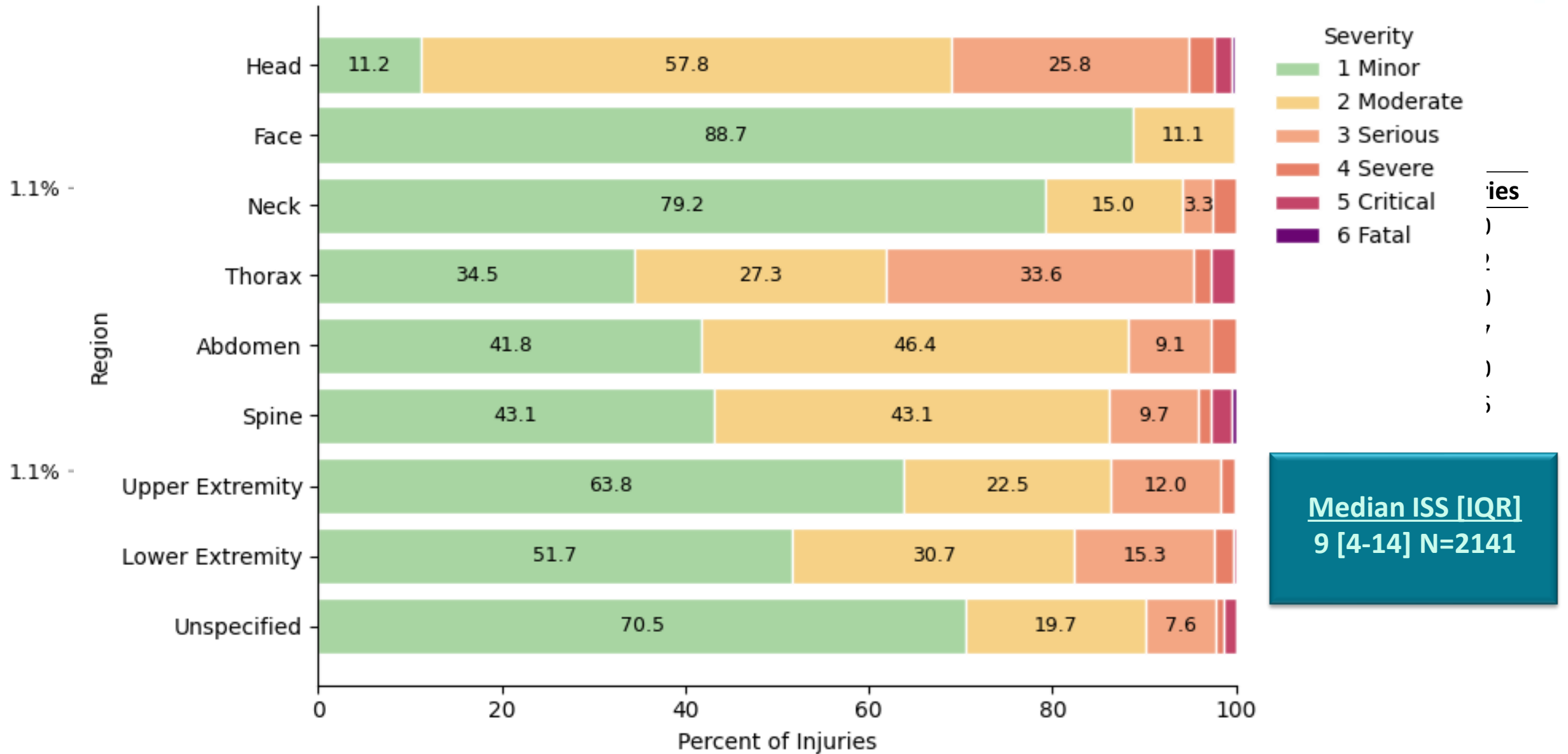


Mechanism of Injury

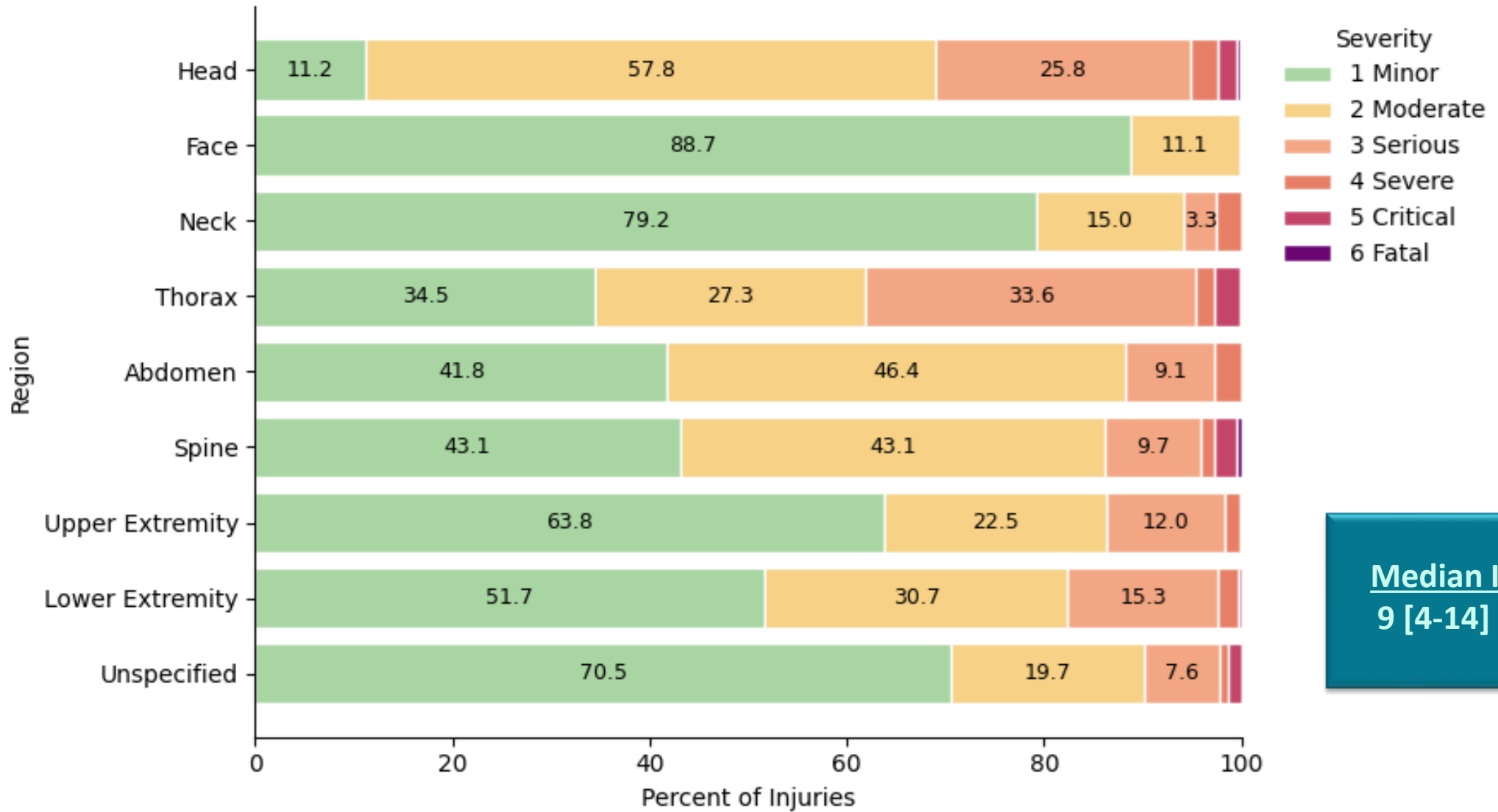
Mechanism of Injury



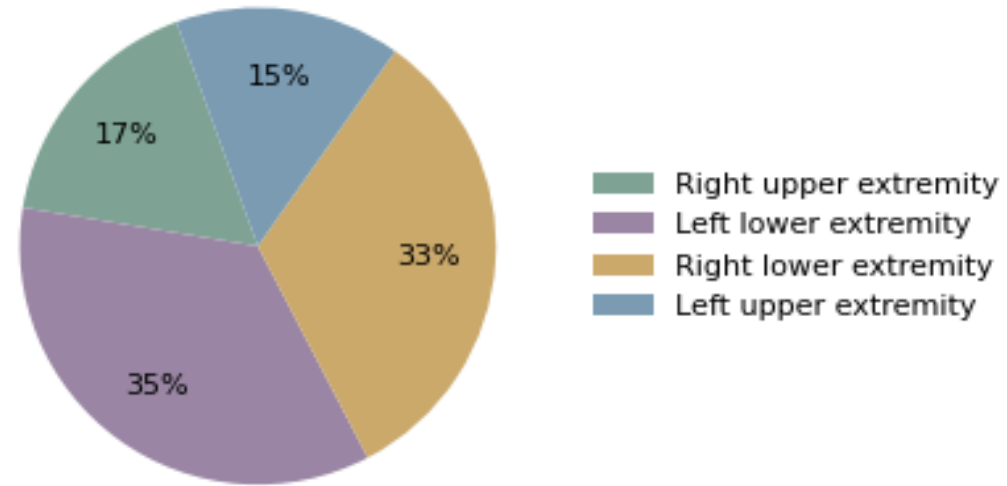
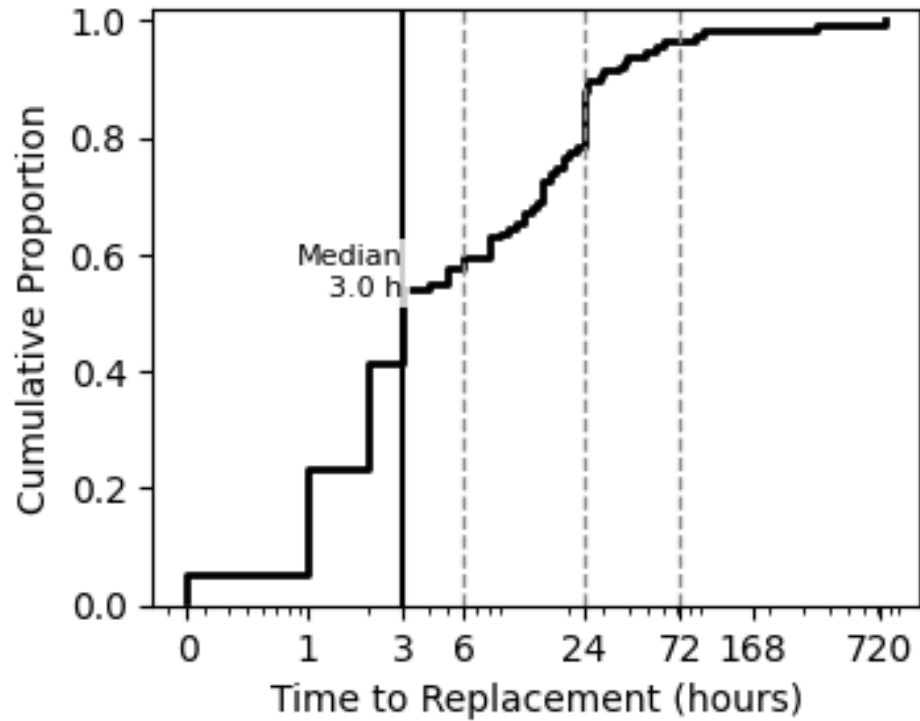
AIS Injury Locations



AIS Injury Severity by Locations (Percentages)



Median ISS [IQR]
9 [4-14] N=2141



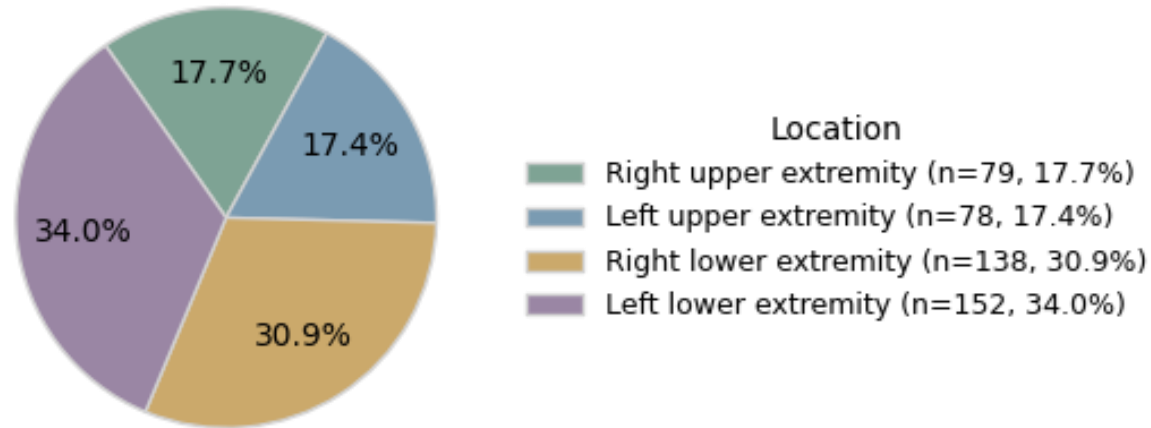
Time to Replacement	
Metric	Value
<i>n</i> TQs	116
25th Percentile (hours)	2
Median (hours)	3
75th Percentile (hours)	17.5
>6 hours (<i>n</i> TQs)	47
>24 hours (<i>n</i> TQs)	14
>72 hours (<i>n</i> TQs)	4
>168 hours (<i>n</i> TQs)	2

Type	n
Unknown	189
CAT	42
Dnipro	7
TQ1	4

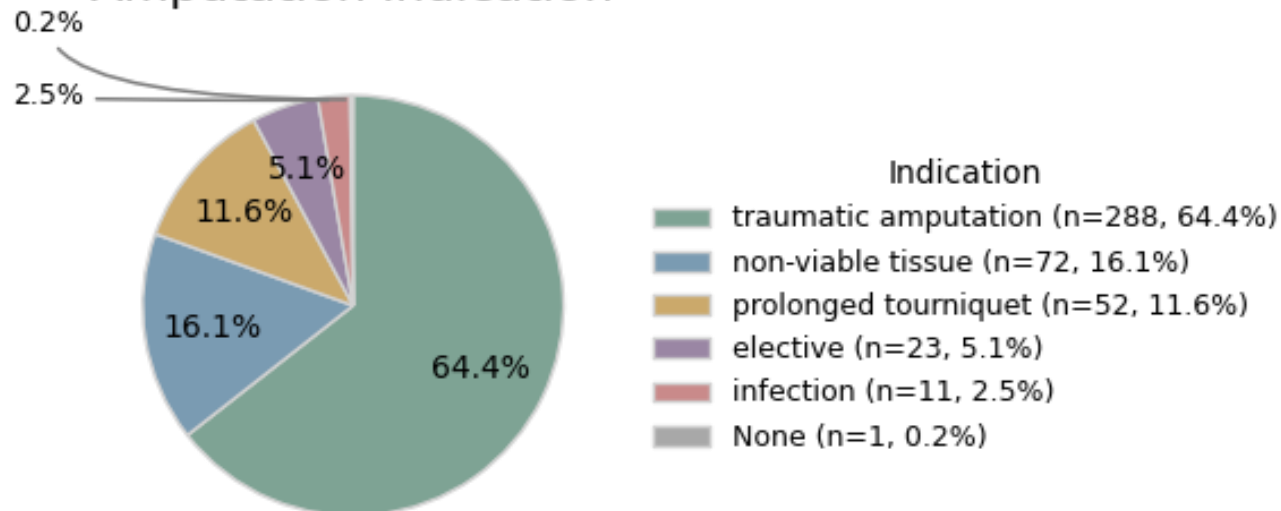
Amputations



AmputationLocation

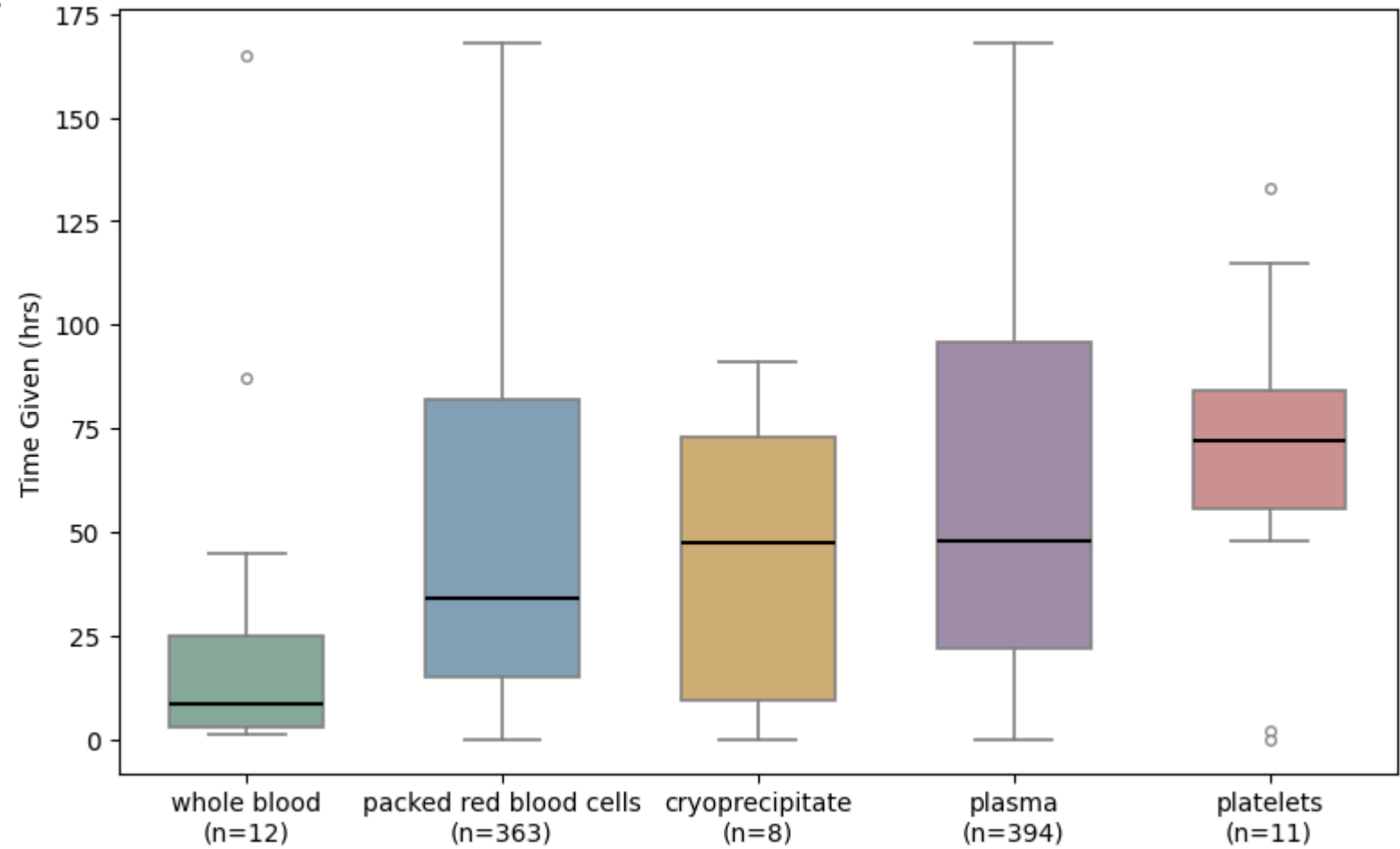
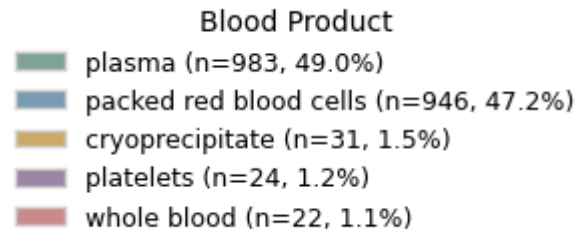
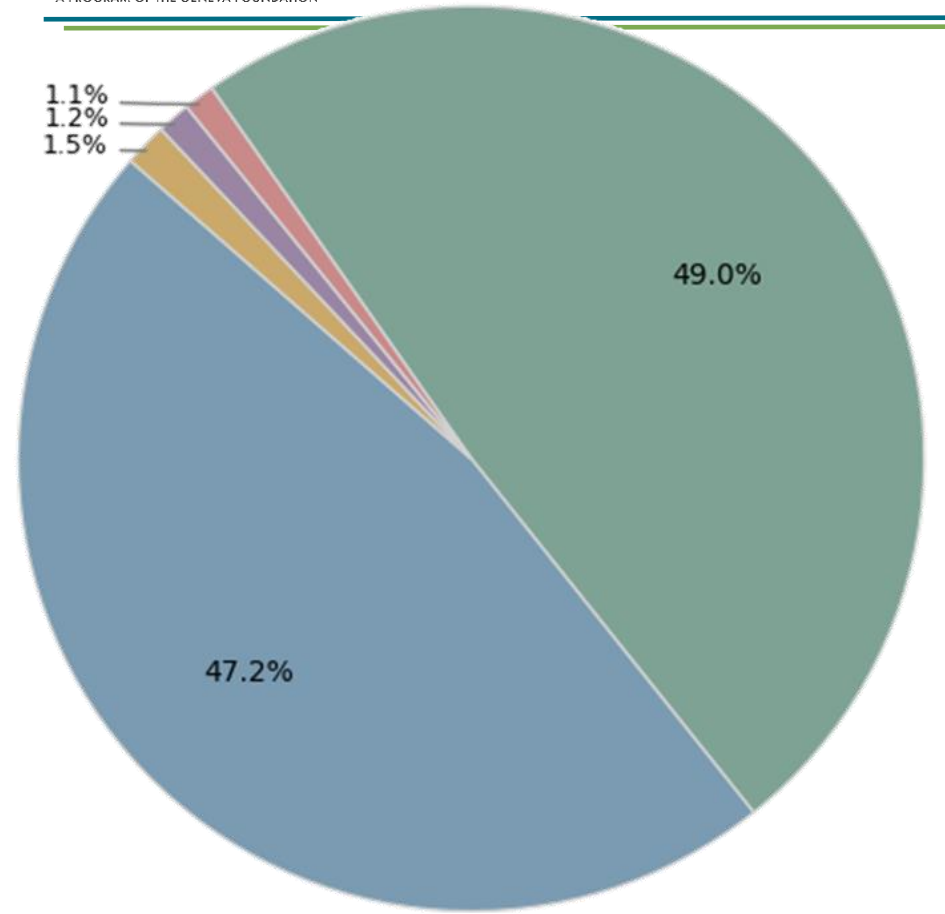


Amputation Indication



Detailed Location	N=
below knee, at or above ankle	100
at hip or at buttock	75
other fingers, single or multiple	47
at shoulder	43
foot, partial or complete	42
at or above knee, below hip	39
below elbow, at or above wrist	26
other toes, single or multiple	24
at or above elbow, below shoulder	18
hand, partial or complete	16
great toe	10
thumb	7

Blood Products





- Electronic systems in Ukraine mature quickly and will likely surpass U.S. despite war
- Current focus is on medical reimbursement, not research
- AREVA TR offers seamless integration of research capabilities with searchable use
- As of 5 Aug 2026, AREVA TR has 3250 pt records and over 12 000 Role based entries
 - If AREVA TR is integrated into the Ukrainian electronic systems, it would provide DoW TR level capabilities with instant searchability, analysis and reporting
- Work with Ukrainian MOD and MOH is ongoing and AREVA TR is slated to continue in the years to come with scope and projected usability for decades



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