Meeting the Need for Reconstructive Surgery in Palestine 2025-2026

Delphi Method Research Team

Soft Tissue Injuries Research Team

Munitions and Injuries Research Team

Duke | GLOBAL HEALTH INSTITUTE

Validating a Tool to Assess Surgical Infrastructure

Delphi Method Research Team

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Initial Reconstructive Surgery Capacity Assessment Tool

Assessment Tool for Reconstructive Surgery Capabilities in Conflict Regions

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General facility information	1
Infrastructure & Medications	2
Personnel	3
Anesthesia supplies	4
Surgical supplies	5

GENERAL QUESTIONS		
	Date of Assessment (dd/mm/yyyy):	
	Name of personnel filling out form:	
	Professional title of personnel filling out form:	
	Name of health care facility:	
	Address of health care facility:	
	Contact information health care facility:	

BASIC FACILITY INFORMATION				
Facility Affiliation (select all that apply)	Public	☐	NGO - Supported	☐
	Private	☐	Internationally Funded	☐
	Faith Based / Mission	☐	Other - Specify:	☐
	Military/Police Hospital	☐		
Facility Type	Field Hospital	☐	Hospital	☐
	☐	☐	Other - Specify:	☐
Area Served	Blockaded/ Isolated Areas	☐	Rural	☐
	Refugee Camp	☐	Urban	☐

See full tool here:

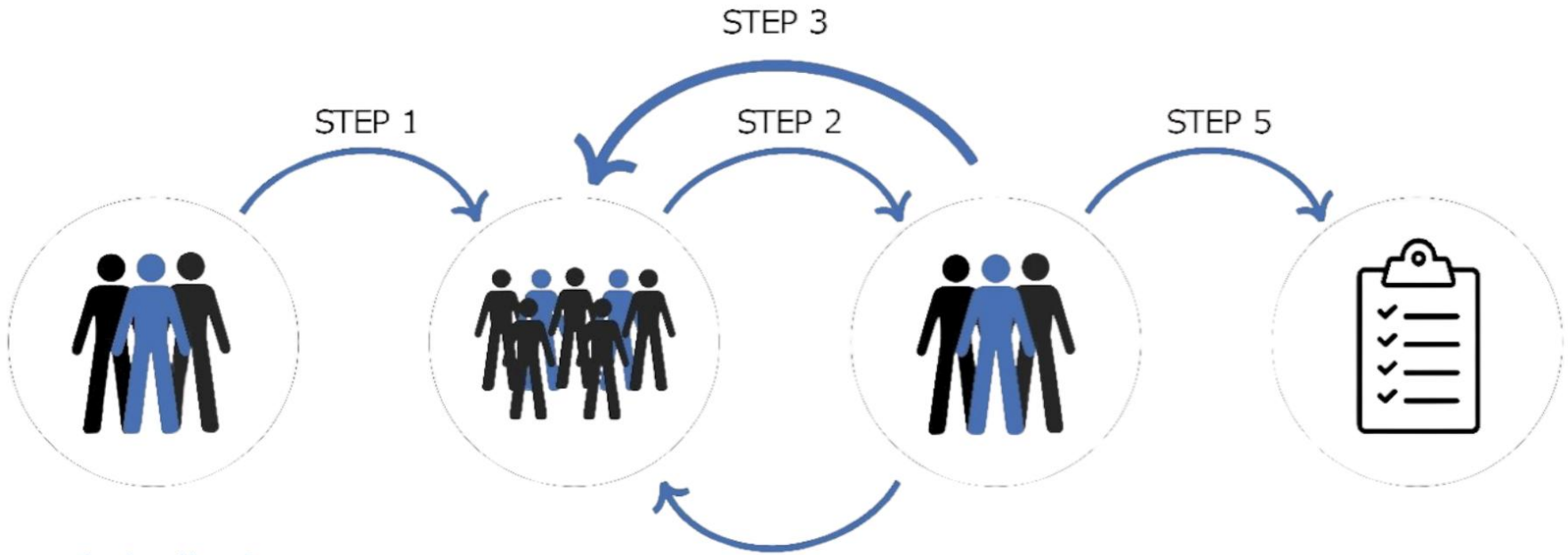
The 2024–2025 team started the development of an Assessment Tool for Reconstructive Surgery Capabilities in Conflict Regions. The tool was organized into 5 main domains. Building on this foundation, our team undertook the validation and refinement of the tool through a rigorous modified Delphi consensus process.

Our goal is to assess the internal capacity and external supports available to deliver comprehensive reconstructive surgical care in conflict-affected settings starting with Gaza.

1) What is the Delphi Method?

2) How do we develop and validate a tool to assess reconstructive surgical capacity and needs in conflict-affected settings?

Using the Delphi Method



Tool Distribution & Response Collection

The research team distributed the initial reconstructive surgery capacity assessment tool via Qualtrics survey to 110 experts across reconstructive surgical specialties with experience in conflict and low-resource settings, who evaluated each tool item

Tool Revision

Research Team Collated Round 1 responses, flagged contested items (≥33% removal), incorporated newly suggested items, and developed color-coded Round 2 Excel instrument

Re-evaluation

Round 1 respondents reviewed contested and newly added items, providing keep/remove decisions with written justification

Final Tool

Validated Assessment Tool
Consensus-based reconstructive surgery capacity assessment tool finalized

Barber, A. R. J., Stanley, G. H. M., Goh, S. L. L., Hamill, C., & Findlay, M. (2024). *Delphi technique in plastic surgery research priority setting: A systematic review*. **Australasian Journal of Plastic Surgery, 7**(1), 88487. https://doi.org/10.34239/ajops.88487

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Expert Selection / Methods

- "Expert" defined as individuals who 1) have provided reconstructive surgical care in low-resource and/or conflict zone settings and 2) have completed residency in a reconstructive surgical specialty
- Initial contact list generated via three methods: targeted search of professional medical societies, web searches of relevant NGOs and humanitarian organizations, and a structured literature review using PubMed and ResearchGate

The three methods yielded 20, 32, and 57 experts respectively, for an initial contact list of 109 experts

The panel expanded to 110 through snowball sampling referrals collected at the end of Round 1 surveys

Both purposive and snowball sampling methods were employed to ensure broad, diverse geographic and specialty representation

Round 1

A Qualtrics survey was sent to a contact list of 110 experts. The survey asked respondents to select keep, remove, or modify for each item on the tool related to their area of practice. Round 1 received feedback from 28 esteemed surgeons and anesthesiologists who have extensive experience in conflict and resource limited settings across more than 25 countries.

	Keep this item as is	Remove this item	Modify this item
Microsuture (sizes of 8-0, 9-0, 10-0)	○	○	
Venous couplers	○	○	
Bone anchors	○	○	
Bone wax	○	○	
Bone cement	○	○	
Antibiotic beads / antibiotic cement	○	○	
External fixators / frames	○	○	
Sterile implantable hardware	○	○	
K-wires	○	○	
Tendon allograft	○	○	
Hunter rods	○	○	

When asked how well the current version of the tool assessed a health system's ability to provide comprehensive reconstructive surgical care in a conflict setting, we received an average score of 6.04 on a scale of 1-10.

Round 2

For the second Delphi survey round, our team created a color-coded sheet marking changes made from Round 1. Responses from the primary round were compiled and recommendations to remove an item with more than 33% consensus were removed before Round 2. All additions were added for review, and comments recommending changes to an item were considered based on whether the recommended changes occur elsewhere in the tool.

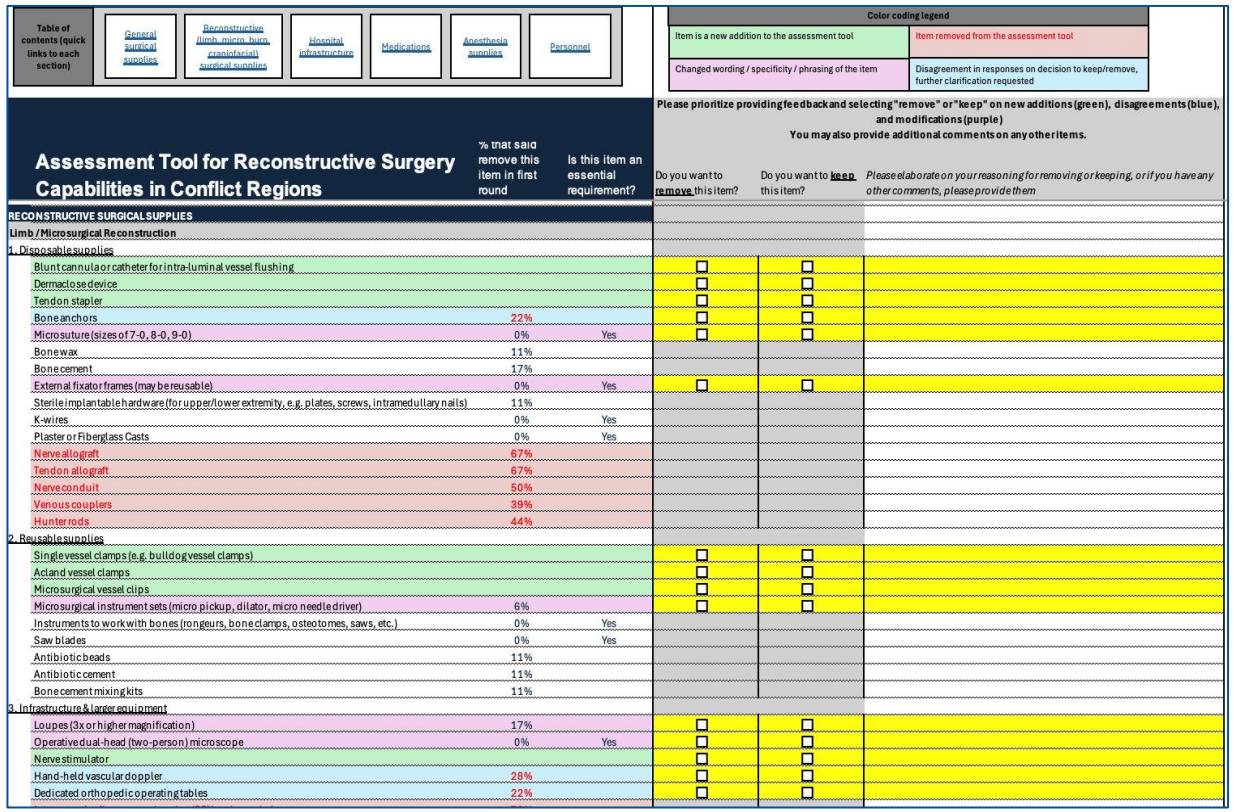

Table of contents (quick links to each section)

General surgical supplies | Reconstructive (limb, micro, burn, craniofacial) surgical supplies | Hospital infrastructure | Medications | Anesthesia supplies | Personnel

Color coding legend

Item is a new addition to the assessment tool	Item removed from the assessment tool
Changed wording / specificity / phrasing of the item	Disagreement in responses on decision to keep/remove, further clarification requested

Please prioritize providing feedback and selecting "remove" or "keep" on new additions (green), disagreements (blue), and modifications (purple)
You may also provide additional comments on any other items.

Assessment Tool for Reconstructive Surgery Capabilities in Conflict Regions	% that said remove this item in first round	Is this item an essential requirement?	Do you want to remove this item?	Do you want to keep this item?	Please elaborate on your reasoning for removing or keeping, or if you have any other comments, please provide them
RECONSTRUCTIVE SURGICAL SUPPLIES					
Limb / Microsurgical Reconstruction					
1. Disposable supplies					
Blunt cannula or catheter for intra-luminal vessel flushing			☐	☐	
Dermaclose device			☐	☐	
Tendon stapler			☐	☐	
Bone anchors	22%		☐	☐	
Microsuture (sizes of 7-0, 8-0, 9-0)	0%	Yes	☐	☐	
Bone wax	11%				
Bone cement	17%				
External fixator frames (may be reusable)	0%	Yes	☐	☐	
Sterile implantable hardware (for upper/lower extremity, e.g. plates, screws, intramedullary nails)	11%				
K-wires	0%	Yes			
Plaster or Fiberglass Casts	0%	Yes			
Nerve allograft	67%				
Tendon allograft	67%				
Nerve conduit	50%				
Venous couplers	39%				
Hunter rods	44%				
2. Reusable supplies					
Single vessel clamps (e.g. bulldog vessel clamps)			☐	☐	
Acland vessel clamps			☐	☐	
Microsurgical vessel clips			☐	☐	
Microsurgical instrument sets (micro pickup, dilator, micro needle driver)	6%		☐	☐	
Instruments to work with bones (rongeurs, bone clamps, osteotomes, saws, etc.)	0%	Yes			
Saw blades	0%	Yes			
Antibiotic beads	11%				
Antibiotic cement	11%				
Bone cement mixing kits	11%				
3. Infrastructure & larger equipment					
Loupes (3x or higher magnification)	17%		☐	☐	
Operative dual-head (two-person) microscope	0%	Yes	☐	☐	
Nerve stimulator			☐	☐	
Hand-held vascular doppler	28%		☐	☐	
Dedicated orthopedic operating tables	22%		☐	☐	

Instead of another Qualtrics survey, the 28 respondents from Round 1 were asked to respond directly into an Excel file, marking keep/remove for the items that did not achieve consensus in Round 1 and leaving comments justifying their answers.

Influence of attack, munition, infrastructure, and population density types on injuries requiring reconstructive interventions in Gaza

Munitions and Injuries Research Team

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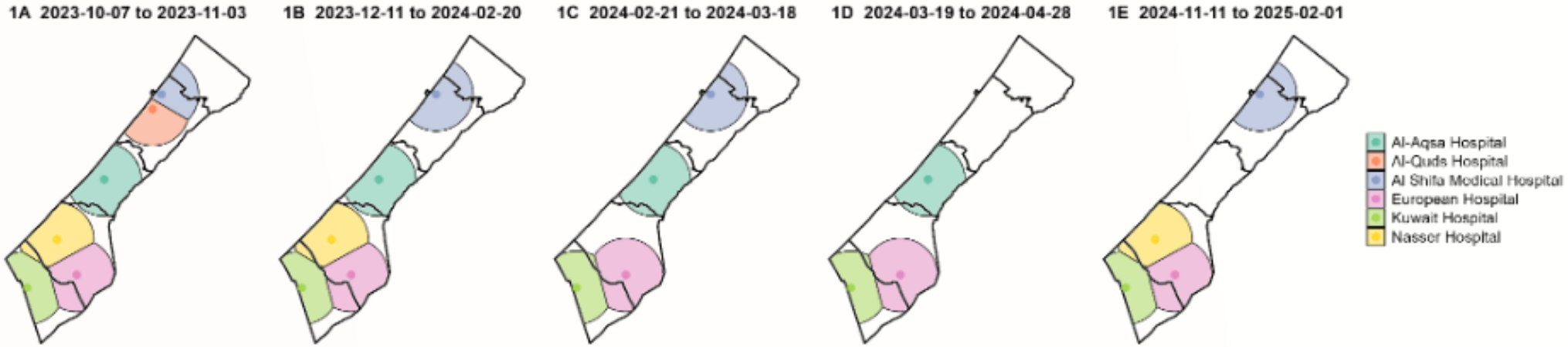
Project Goals

1) **Analyze patient data from the past 3 years in Gaza** for calculating catchment area of open hospitals.
2) **Determine patterns in injury data** based on the following geographic characteristics:
    - Attack Type
    - Population Density
    - Infrastructure Level
    - Munitions Data
3) **Infer implications** for Gaza's healthcare system

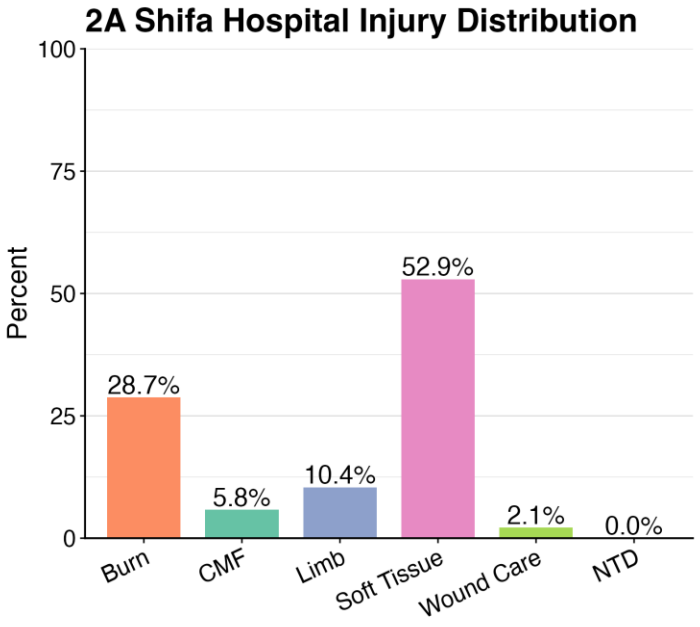
Key Findings

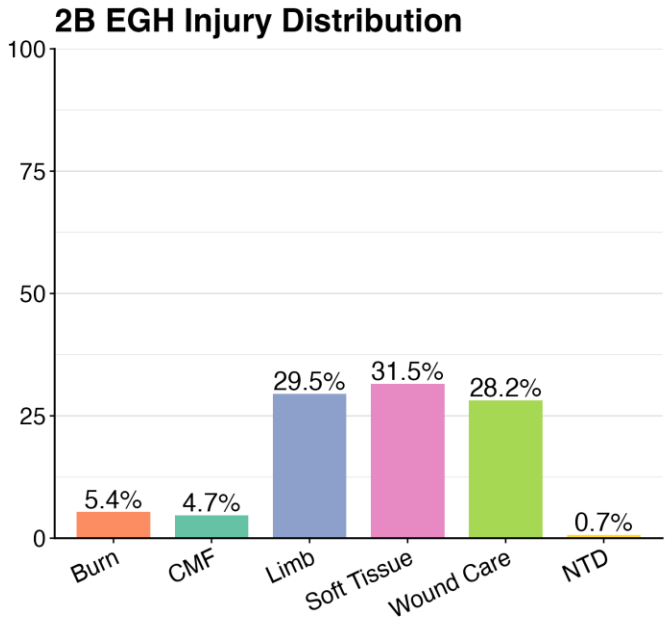
- **Injury types** vary by hospital catchment area
- **Air/Drone** attacks follow IDF targeting and **Palestinians**, not infrastructure
- Living in **Camp** infrastructure is tied with higher **Burn** injuries
- **Rockets and Missiles** are used to target **infrastructure**, resulting in **Wound Care** and **Limb** injuries
- **Knowing** the "type of attack" can help hospitals prepare for more **common** types of **injuries**

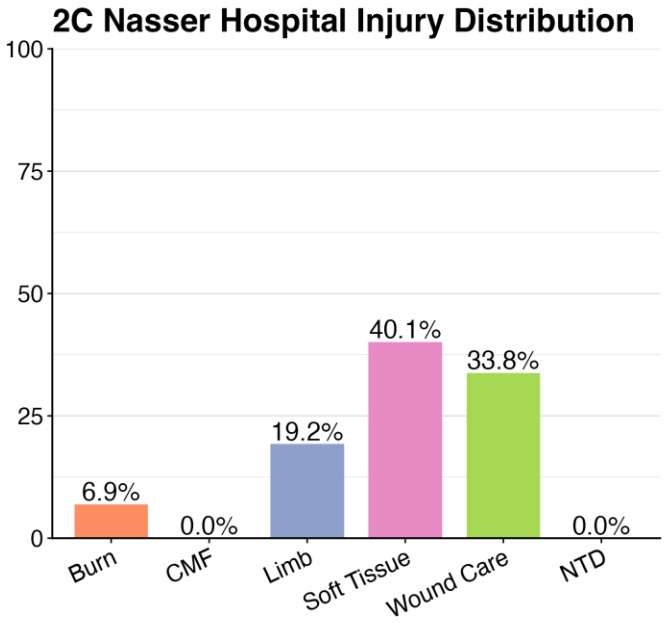
Hospital Catchment Area Mapping



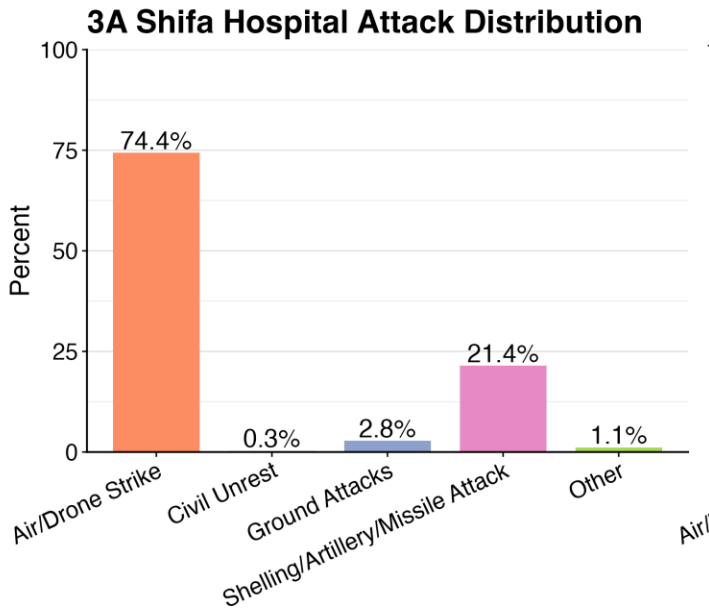
Injury Distribution by Hospital

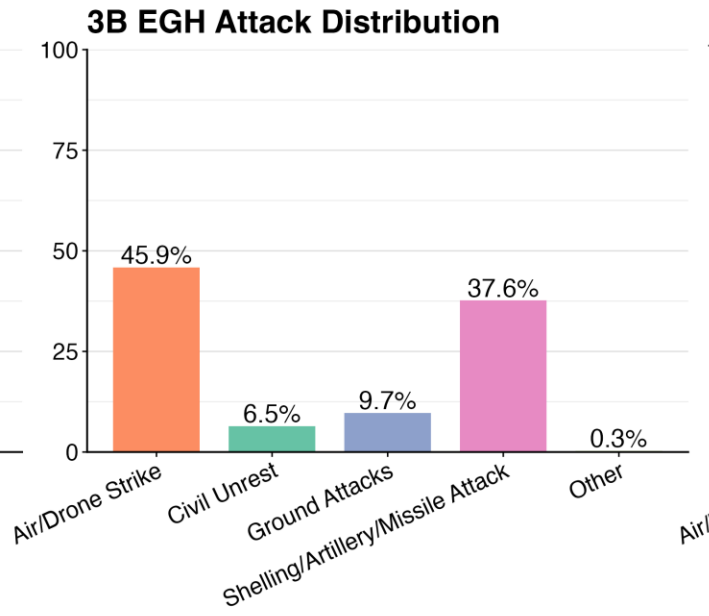


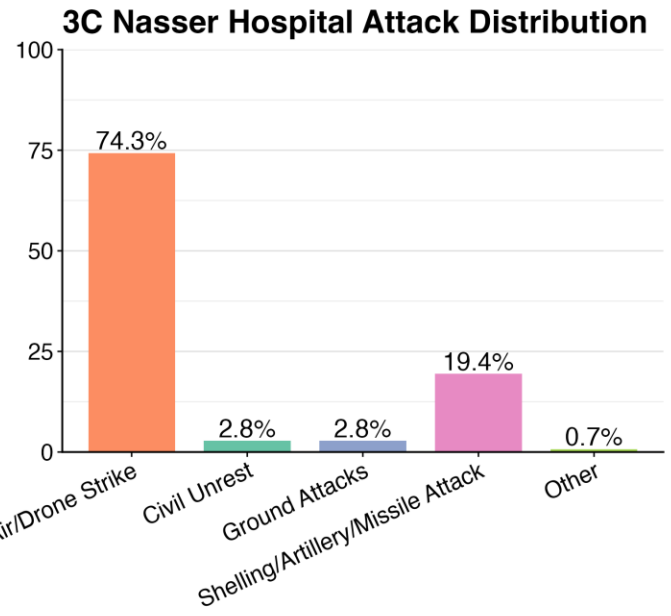




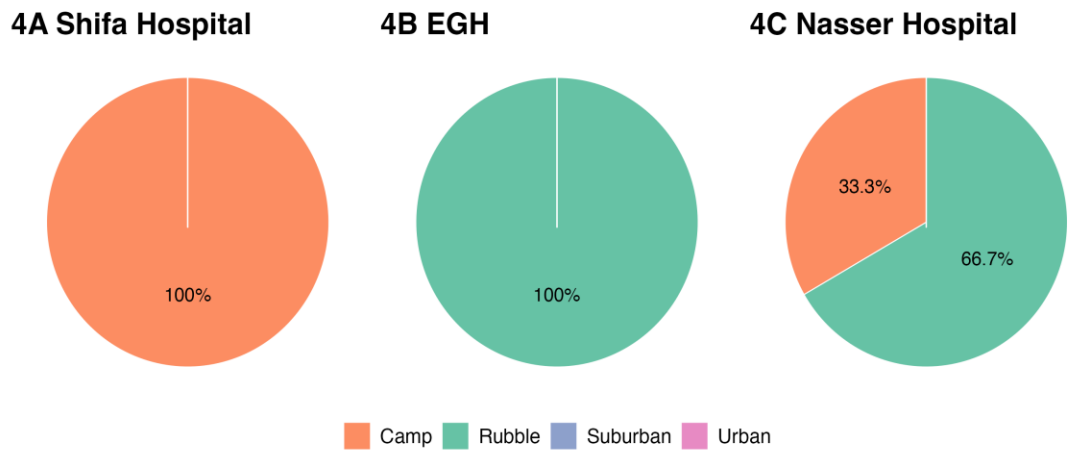
Attack Distributions by Hospital

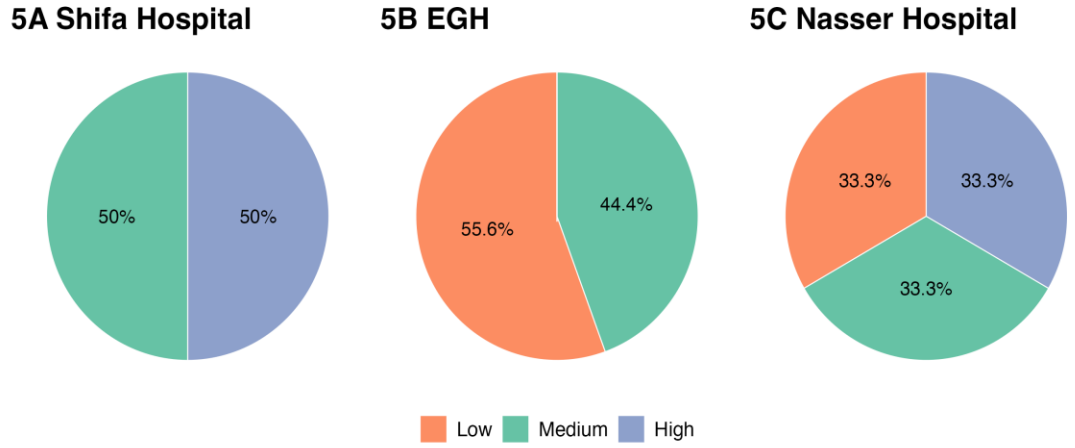




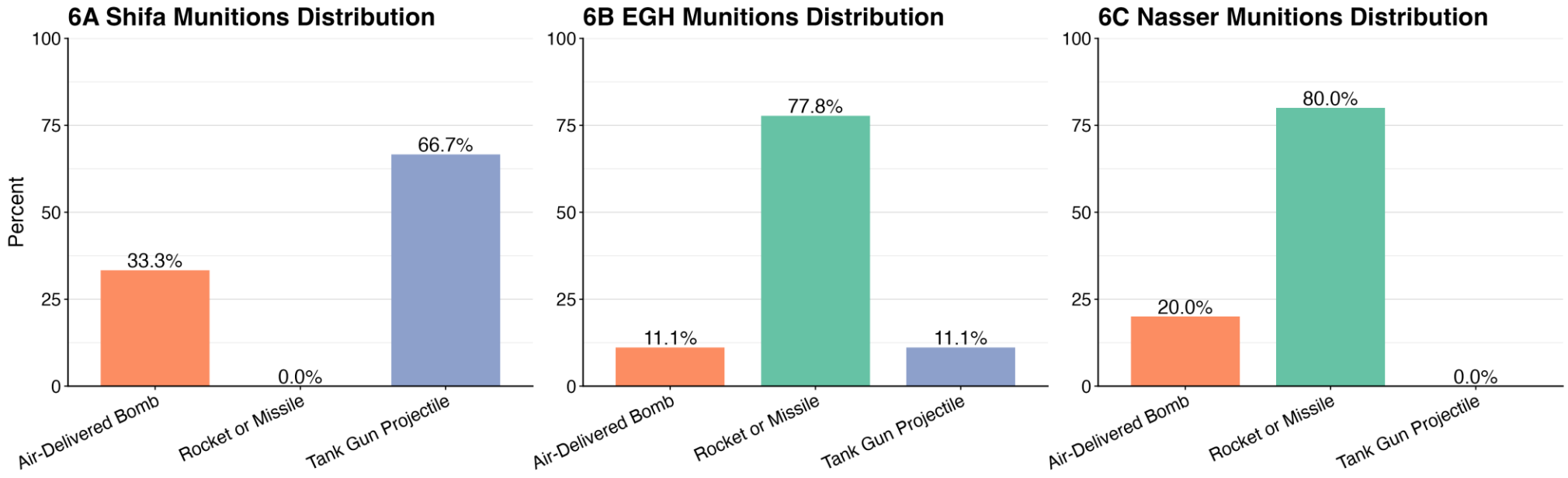


Infrastructure and Population Density by Hospital





Munition Types by Hospital



Soft Tissue Injury in Gaza Group

Soft Tissue Research Team

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Project Goals

1) **Characterize injury patterns** among civilians in Gaza requiring operative management
2) **Quantify operative burden per patient**, including number and types of procedures
3) **Assess key injury components**, including:
    - Soft tissue damage
    - Burns
    - Fractures
4) **Identify implications for reconstructive surgical needs**

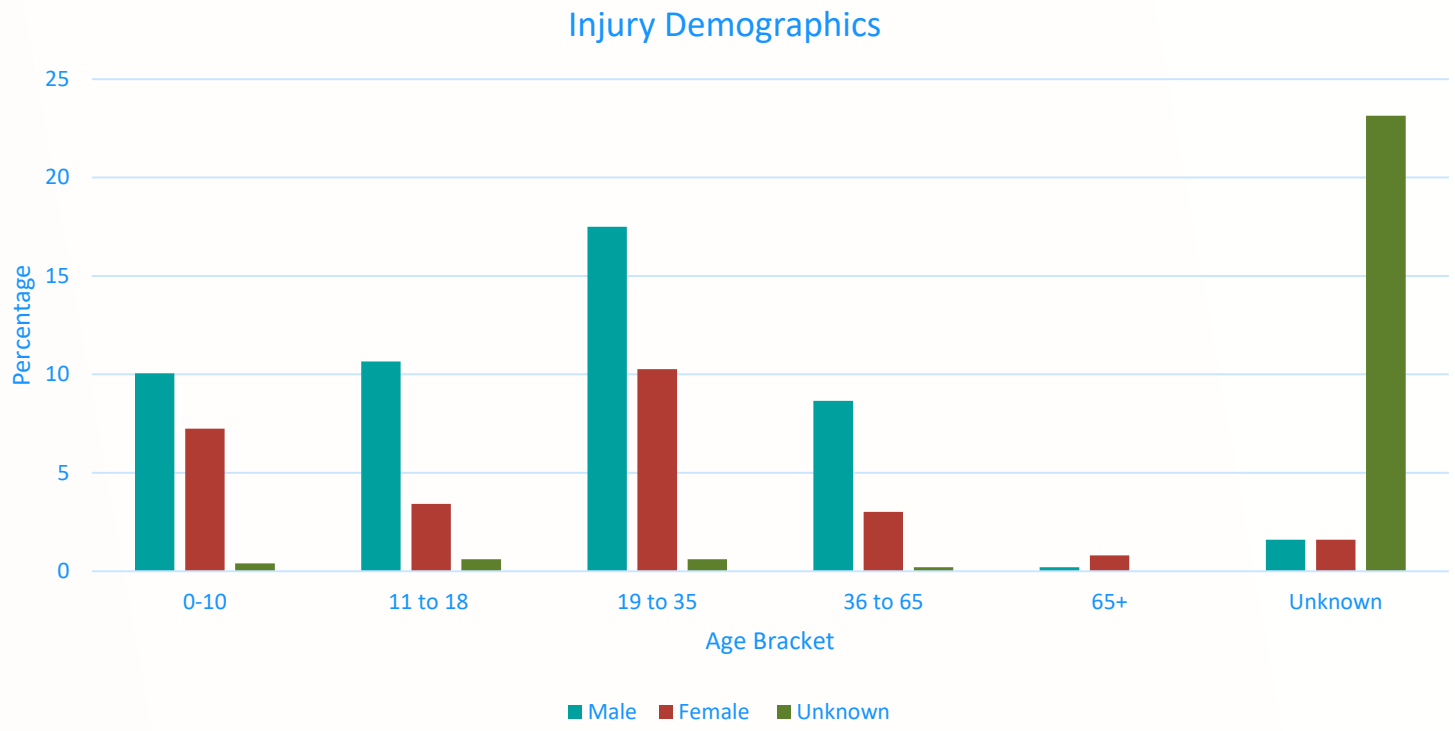
Methods

Compiled data from hospital logs provided by surgeons at Al Shifa Medical Hospital, European Hospital, Nasser Hospital, Al-Quds Hospital, Kuwait Hospital, and Al-Aqsa Hospital.

Standardized data for patients who had soft tissue injuries. We focused on procedures involving skin grafts (SSGs and FTGs), flaps, dressings, and closures. We also looked at burns and fractures.

Performed analysis on demographics (gender and age), procedures performed, anatomical location of injury, mechanism of injury, injury type, and surgeons.

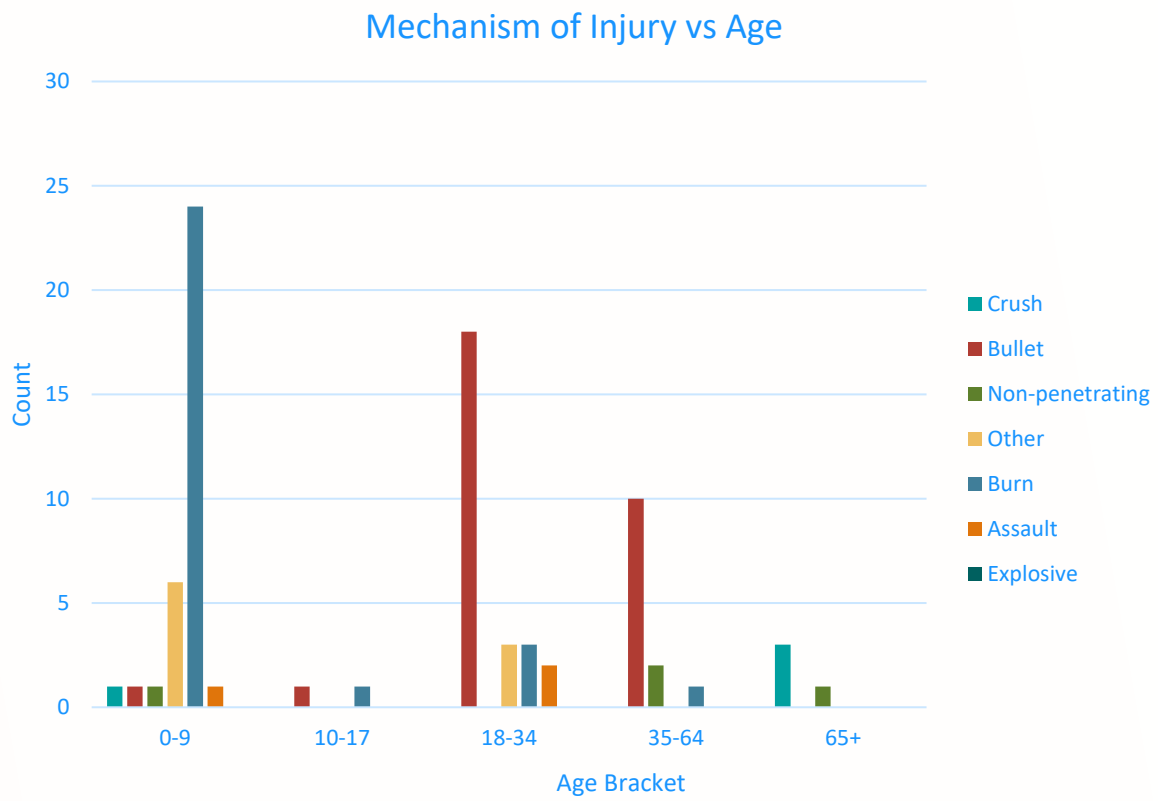
Injury Demographics



Overall takeaways:

- Injuries are most common in **young adults (19–35)**, especially among males.
- **Males are consistently more likely to be injured** than females across known age groups.
- The **“Unknown” category undifferentiated by age or gender stands out**.

Mechanism of Injury by Age



Overall takeaways:

- **Burn injuries dominate in children (0–9)**, far exceeding all other mechanisms.
- **Bullet injuries peak in young adults (18–34)** and remain notable in 35–64.
- **Young adults (18–34) show the greatest diversity of injury mechanisms.**
- **Injury counts decline with age**, with minimal cases in 65+.

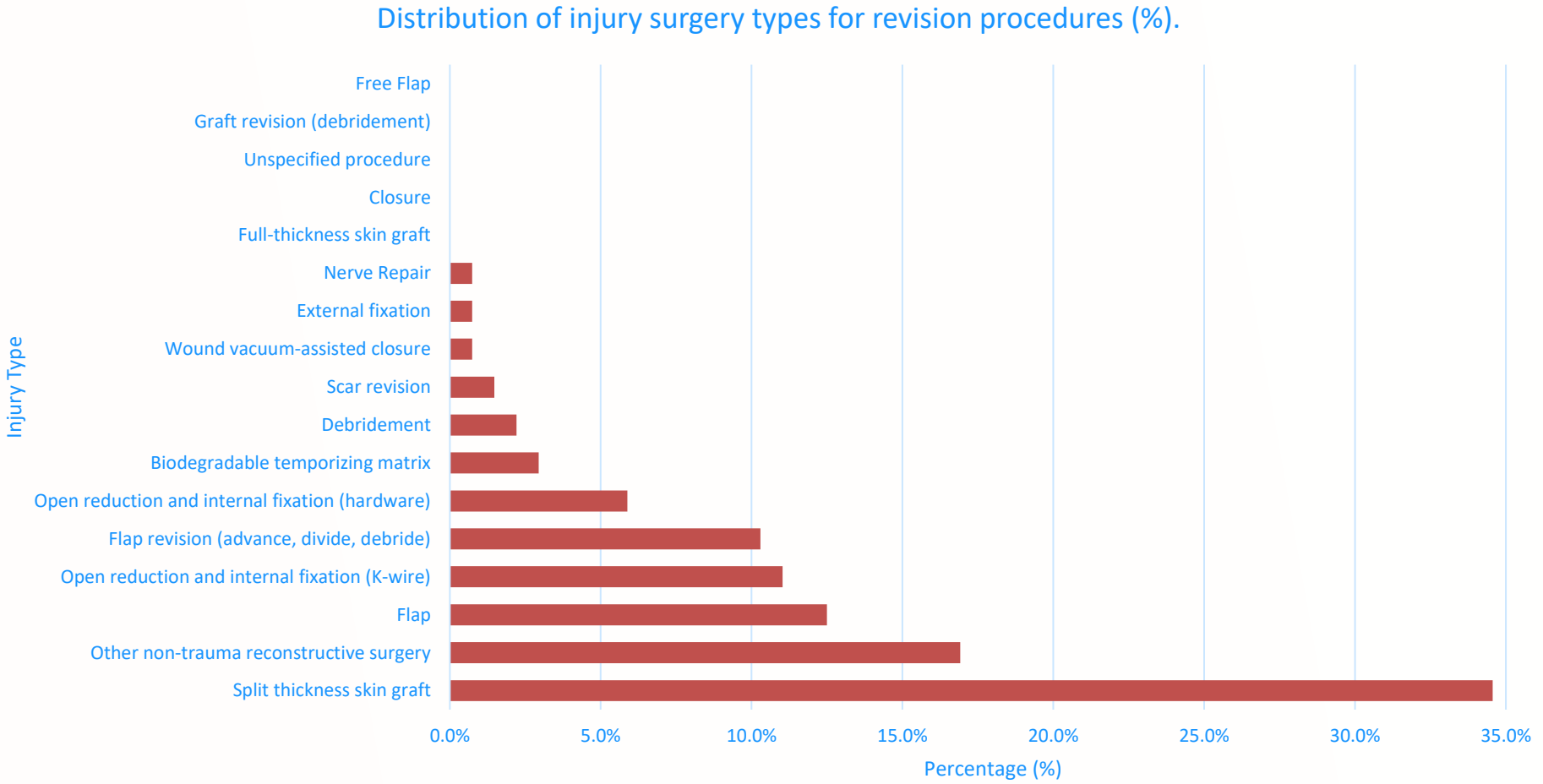
Demographic Conclusions

- Young men under the age of 35 are the largest demographic group affected by soft tissue injuries, highlighting a clear age and gender disparity in injury patterns.

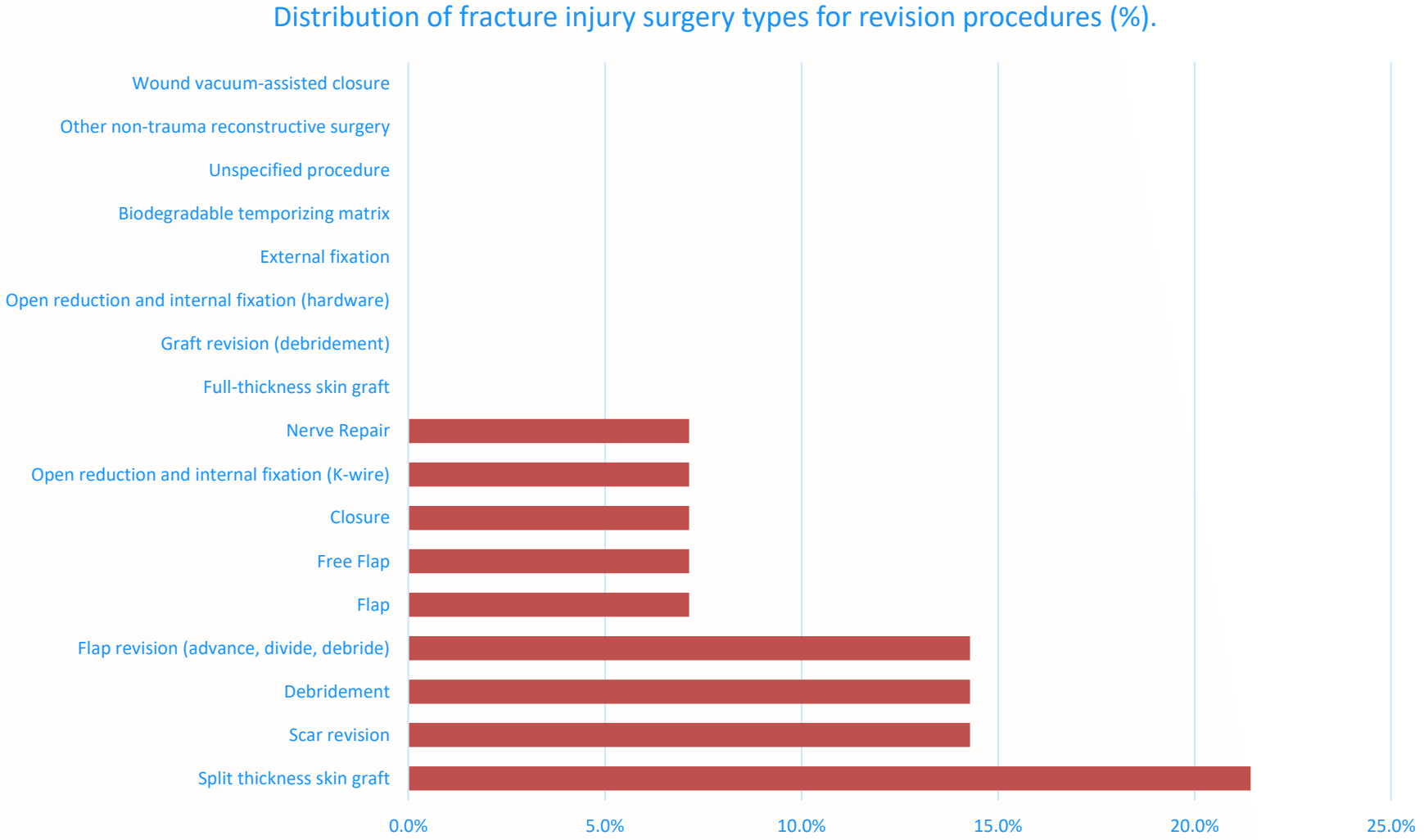
- Mechanisms of injury also vary significantly by age: children are disproportionately affected by burn-related injuries, whereas adults, particularly young adults, are more likely to experience soft tissue injuries from bullet-related trauma.

- To conclude, the disparities we see in injuries by age, gender, and mechanism highlight how civilian life, especially vulnerable groups like children, is being disproportionately impacted. This underscores the urgent need for targeted medical response, but also points to broader structural violence shaping who is injured, how, and with what long-term consequences.

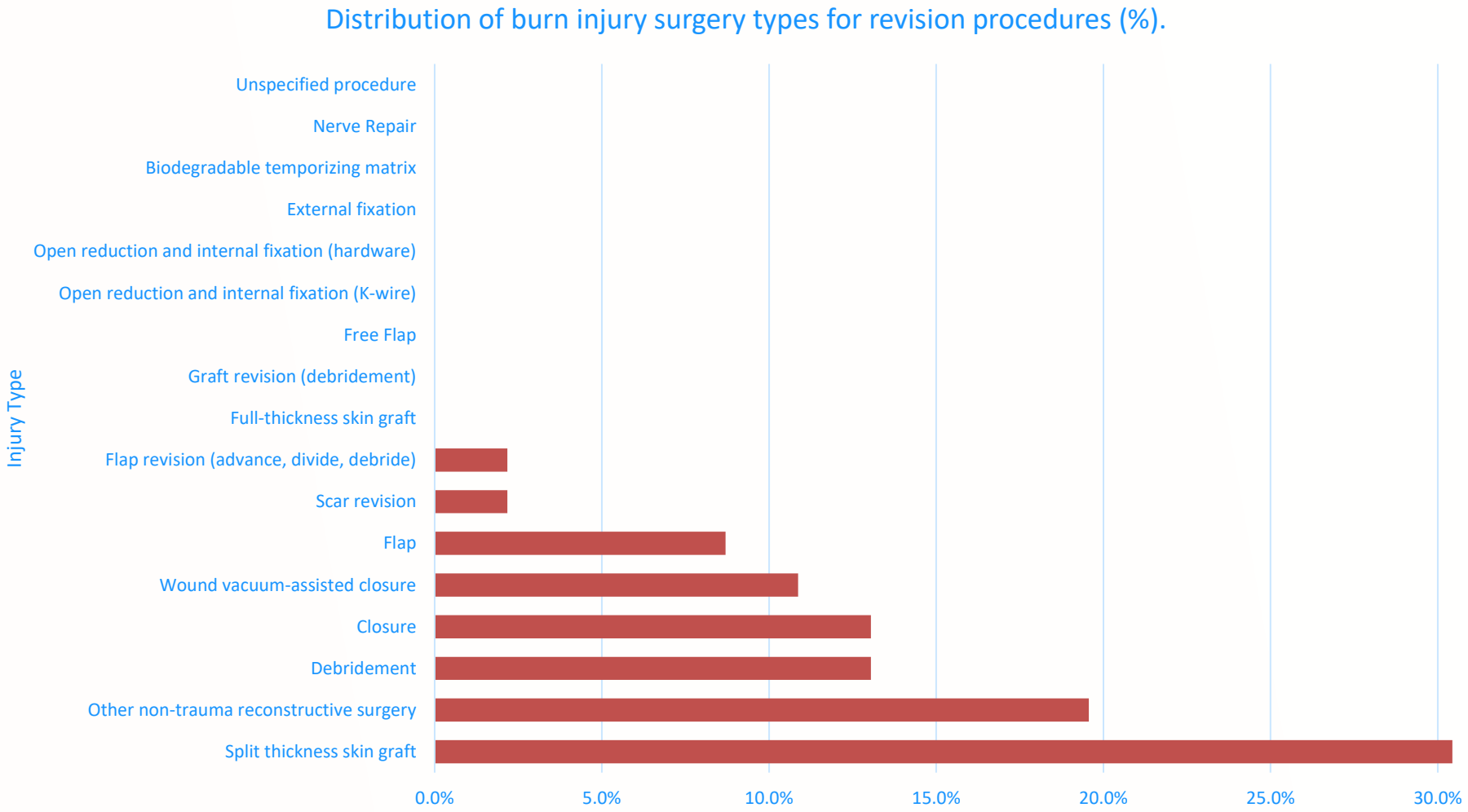
Surgical Procedures



Fractures


Distribution of fracture injury surgery types for revision procedures (%).
Wound vacuum-assisted closure
Other non-trauma reconstructive surgery
Unspecified procedure
Biodegradable temporizing matrix
External fixation
Open reduction and internal fixation (hardware)
Graft revision (debridement)
Full-thickness skin graft
Nerve Repair
Open reduction and internal fixation (K-wire)
Closure
Free Flap
Flap
Flap revision (advance, divide, debride)
Debridement
Scar revision
Split thickness skin graft
0.0%
5.0%
10.0%
15.0%
20.0%
25.0%

Burns


Distribution of burn injury surgery types for revision procedures (%).
Injury Type
Unspecified procedure
Nerve Repair
Biodegradable temporizing matrix
External fixation
Open reduction and internal fixation (hardware)
Open reduction and internal fixation (K-wire)
Free Flap
Graft revision (debridement)
Full-thickness skin graft
Flap revision (advance, divide, debride)
Scar revision
Flap
Wound vacuum-assisted closure
Closure
Debridement
Other non-trauma reconstructive surgery
Split thickness skin graft
0.0%
5.0%
10.0%
15.0%
20.0%
25.0%
30.0%

Key Takeaways

• **Surgical Procedures:** High operative burden with repeated, staged interventions, dominated by soft tissue and wound care procedures due to blast-related injuries.

• **Fractures:** Less frequent but more complex, often occurring alongside soft tissue damage and requiring combined orthopedic and reconstructive management.

• **Burns:** Significant and disproportionately affect children, driven by explosive/incendiary mechanisms and requiring extensive, long-term care in resource-limited settings.

Thanks for your attention!