Development and Validation of STORM-2: Surgical Teams for Role 2 Medicine

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Background

- Preventable morbidity and mortality overall in Ukraine are high, which is further exacerbated during wartime.
- A significant contributing factor to these phenomena is the variability of medical training and education across the country.
- The multi-disciplinary War Surgery Teams Course (STORM-2) was created by the Ukrainian Military Medical Academy (UMMA) and Global Response Medicine (GRM) to develop combat casualty care knowledge, skills, and abilities.
  - It utilizes clinical, live animal, and digital components.
  - The pilot course was completed in NOV2025.

Our **short-term goals** are to provide surgical team training to directly improve care for Ukrainian patients, to train Ukrainian senior physicians to teach the Course, and to use the Course as a vehicle to support the civilian trauma sector in Ukraine through driving standardized practice. The **long-term goal** is to align our Course within a broader plan for evidence-based, standardized military medical education in Ukraine that improves clinical outcomes and that supports national trauma standardization and readiness.

Methods

The STORM-2 course aimed to establish a unified, evidence-based national training program in Ukraine. Specific goals included validating standardized surgical techniques (**Table 1**) and implementing a sustainable 'Train-the-Trainer' framework (**Table 2**).

Table 1. Content of the Live Animal Course

Day	Content
Pre	Review JTS Clinical Practice Guidelines; Advanced Trauma Operative Management (ATOM) and ASSET Handbooks, DCR Handbook, Prolonged Combat Casualty Care (PCC) Requirements
1	Course foundations, damage control and transition to definitive care, role-level functions (specialty and multidisciplinary), case assessment, tourniquet syndrome (limb preservation, fasciotomy indications)
2	Approach to the surgical patient, crew resource management, surgery (orthopedics), anesthesiology
3*	Surgical skills: **(1)** iliac-femoral artery isolation, arteriotomy, stent placement, sutured arteriography, **(2)** iliac vein proximal and distal control with suture repair of small venotomy or ligation, **(3)** pre-peritoneal pelvic packing for pelvic fracture hemorrhage, **(4)** laparotomy, discussion of damage control techniques including leaving bowel in discontinuity, **(5)** medial visceral rotation with isolation of renal hilum and proximal and proximal / distal control of aorta and vena cava; nephrectomy, **(6)** create grade 3-4 hepatic injury, perform packing and Pringle maneuver for damage control hemostasis, **(7)** splenectomy, **(8)** thoracotomy; creation of lung injuries, repair of lung injuries with suture, tractotomy, wedge resection, stapled lobectomy, terminal stapled pneumonectomy. The anesthesiologist would perform single lung ventilation and hemodynamic support, particularly during cross clamping of the pulmonary hilum, **(9)** thoracotomy; identification and isolation of the great vessels including thoracic aortic cross clamping, **(10)** pericardiotomy, terminal creation and repair of atrial and ventricular injuries with suture or staples, **(11)** wound surgical debridement, and **(12)** surgical airway
4	Scenario training: extremity care, flap procedures
5	Scenario training: polytrauma, burns, mass casualty scenarios

Methods

Table 2. Train-the-Trainer Strategy

Year	Setup	UKR Instruction	U.S. Instruction	Key Objective
2026 / Q1	U.S.	Observation Only	Lead	Familiarization with curriculum and instructional methods
2026 / Q2	All	Day 1	Assist, mentor, feedback	Initial co-instruction and confidence building
2026 / Q3	UKR	Days 1-2	On-call support, feedback	Increased instructional ownership
2026 / Q4	UKR	Days 1-3	On-call support, feedback	Advanced co-instruction and leadership
2027 / Q1	UKR	All	Advisory support, if needed	Full instructional delivery with mentoring
2027 / Q2	UKR	All	Advisory support, if needed	Reinforcement of independent delivery
2027 / Q3+4	UKR	All	Advisory support, if needed	Preparation for fully independent program by 2028

Results

UMMA faculty (12) and fellows (5) practiced critical damage-control and hemorrhage-management techniques under realistic conditions. Structured observation, identification of essential competencies, and a dedicated skill-development session were included. Skills performance debriefings, logistical management, and team dynamics were included.

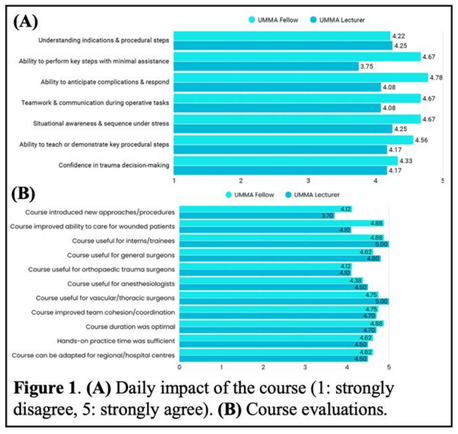

Figure 1. **(A)** Daily impact of the course (1: strongly disagree, 5: strongly agree). **(B)** Course evaluations.

Fellows rated all domains positively (4.3+ on a scale of 1-5), and both groups showed improvements in situational awareness, teamwork, and ability to teach. Fellows and lectures rated practical surgical stations as highly valuable (4.5-4.9), with the highest ratings for visceral rotation and liver packing/Pringle maneuver, indicating strong value for complex damage-control exposures (**Figure 1**).

Results

Three iterative deliveries refined STORM-2, as follows:

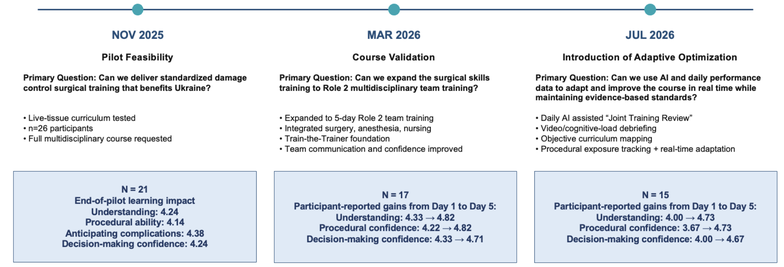

Figure 2. STORM-2 progressed from feasibility testing to curriculum validation to an adaptive learning system. Across iterations, learners increasingly emphasized complete patient flow, decision-making, repetition, and operational realism over additional didactic instruction.

Live scenario training

Video-enabled operative instruction with wearable camera and EEG

Conclusions

Our program combines Ukrainian frontline experience with international best practices to build standardized curricula, measurable competencies, and clinical research outputs that will inform national doctrine and guide future medical readiness. This model can be applied to other large scale, non-standardized systems and environments where civilian medical mobilization into combat casualty care may be necessary. Future initiatives include a digital education platform, large-scale expansion, and the mobilization of the Course across Ukraine. Finally, our tracking and reporting capabilities to provide live feedback to improve the Course in the short- and long-term.

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