2026 MILITARY HEALTH SYSTEM RESEARCH SYMPOSIUM

Addressing the Triage Training Gap:

Effects of Brief SALT Training on Triage Accuracy Among Nonmedical Military Personnel

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Breakout Session: Advances in Far-Forward (Roles 1/2) Clinical Care Provision

Abstract MHSRS-26-5153

Cleared
Security/PAO
2 July 2026

ACKNOWLEDGMENT

PROJECT TEAM & CONTRIBUTORS

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- MAJ Joseph Griggs, MC, USA, MD
- Samuel S. Pendergraft, PhD, PA-C

All individuals above have no conflicts to report.

INSTITUTIONS

- Wake Forest University School of Medicine

DISCLOSURES AND DISCLAIMER

DISCLOSURES

- The presenter has no relevant financial relationships to disclose.
- No commercial support was received for this project.
- The training video discussed is a freely available, noncommercial resource.

ETHICS REVIEW

- Reviewed and determined to be not human subjects research by the Wake Forest University School of Medicine Institutional Review Board (IRB #00122433), with concurrence from the US Army Special Operations Command Human Research Protection Program.

DISCLAIMER

- The views expressed in this presentation are those of the author and do not reflect the official policy or position of the US Government, the Department of War, the Department of the Army, or the Defense POW/MIA Accounting Agency.

THE OPERATIONAL PROBLEM

The Future LSCO Environment

CONTESTED EVACUATION

- Large-scale combat operations (LSCO) can overwhelm medical systems with mass-casualty (MASCAL) events.
- Russia-Ukraine: evacuation in days, not the golden hour.

WHO TRIAGES FIRST

- When medics are absent or overwhelmed, nonmedical personnel make the first triage decisions at the point of injury.
- A likely reality in the future LSCO environment.

THE COST OF MISTRIAGE

- Mistriage wastes scarce resources and costs lives.
- Over-triage diverts assets from critical casualties. Under-triage and critical errors risk preventable death.

Accurate triage, by both medical and nonmedical personnel, preserves resources and sustains the force.

Hodgetts TJ, et al. BMJ Mil Health. 2023. | Emergency War Surgery, 5th US Revision. 2018.

THE TRAINING GAP AND THE SALT METHOD

DOCTRINE WITHOUT A PIPELINE

- The US Army incorporated the SALT triage method into medical doctrine in 2021, yet formal training for nonmedical personnel remains absent from pre-deployment pipelines.
- SALT was designed as a simple, all-ages, all-hazards algorithm usable by responders with varying training, and it builds on the Delayed, Immediate, Minimal, Expectant (DIME) categories used since the Korean War.
- Brief SALT training is established among civilian first responders, but has not been extensively evaluated in a military training context.

PROJECT QUESTION

Can a brief, standardized SALT training video measurably improve triage accuracy among nonmedical military personnel?

- Quality improvement framing: assess and strengthen local triage training practice.
- Conceptual framework: Kirkpatrick training evaluation model, Levels 1 and 2 directly assessed.

SALT : Sort, Assess, Lifesaving Interventions, Treatment/Transport

These personnel are often first to reach casualties when medical assets are unavailable. The gap sits in an operationally important population.

ATP 4-02.4, Medical Platoon. 2021. | Lerner EB, et al. Disaster Med Public Health Prep. 2008.

METHODS: PROSPECTIVE PRE-POST QUALITY IMPROVEMENT

DESIGN AND POPULATION

- Prospective pre-post quality improvement project, reported per SQUIRE 2.0.
- 128 nonmedical active-duty Soldiers, 12 cohorts, Fort Bragg, January to May 2025.
- Delivered before Tactical Combat Casualty Care (TCCC) training to prevent confounding.
- Excluded: Army Medical Department specialties and current Emergency Medical Technician (EMT) certification.

INTERVENTION

- 22-minute standardized SALT triage training video.
- Freely available, noncommercial resource; no instructor required.
- Standardized delivery reduced variability and instructor bias.

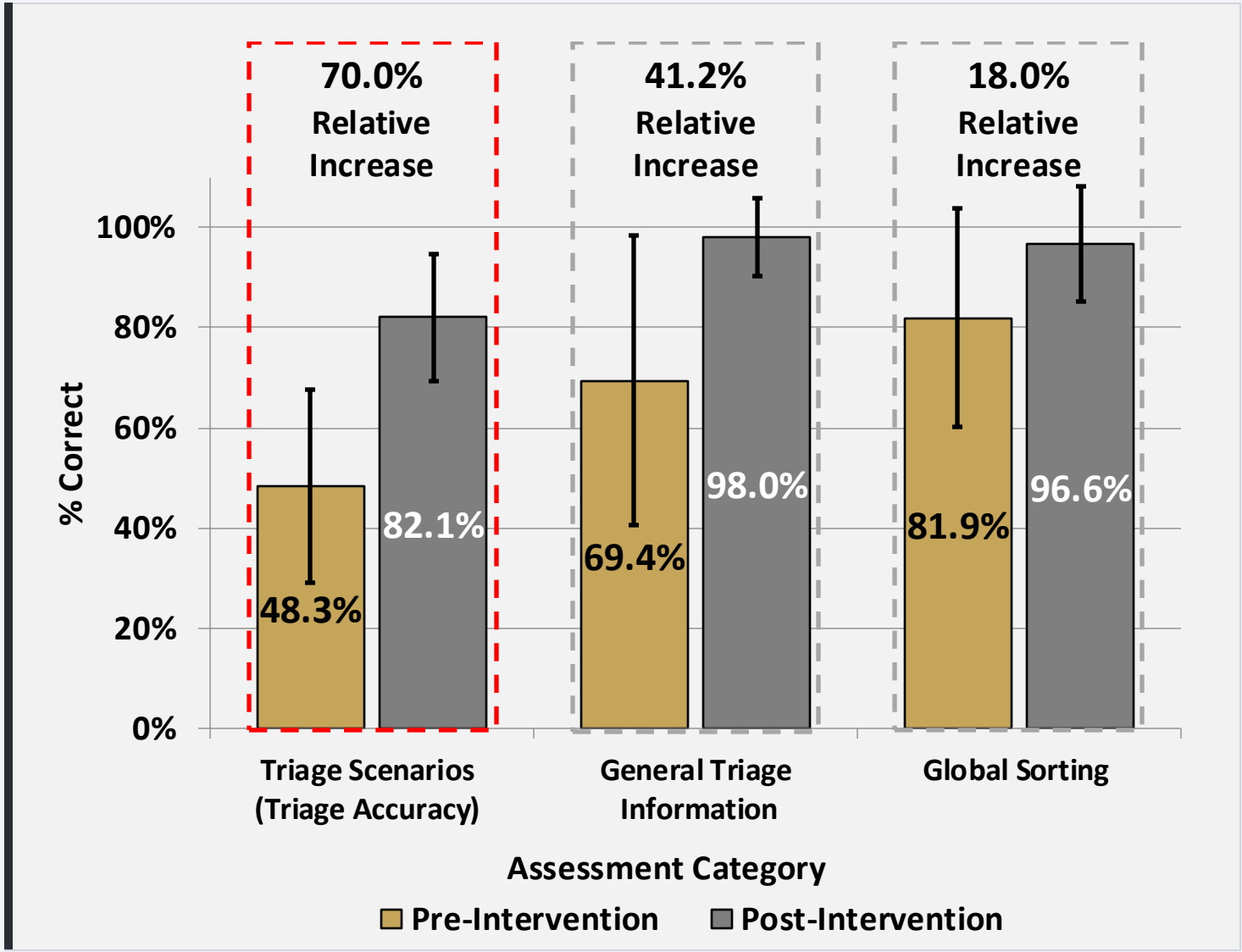
MEASURES AND ANALYSIS

- 15 paper-based triage scenarios, 5 knowledge and 6 sorting items, pre and post.
- Errors classified as over-triage, under-triage, or critical error.
- Content validated by 6 medical subject matter experts.
- Paired t-tests (alpha = .05); Wilcoxon sensitivity tests for Likert outcomes.

Cohort: mean age 29.4 years | 90.6% male | mean 6.8 years of service | 92% enlisted | 30.5% with combat deployments

SQUIRE 2.0: Standards for Quality Improvement Reporting Excellence (Ogrinc G, et al. BMJ Qual Saf. 2016). | Error taxonomy: Lee CW, et al. Prehosp Disaster Med. 2015.

PRIMARY RESULT: TRIAGE ACCURACY



+33.8
PERCENTAGE POINTS
(95% CI 30.4 TO 37.2)

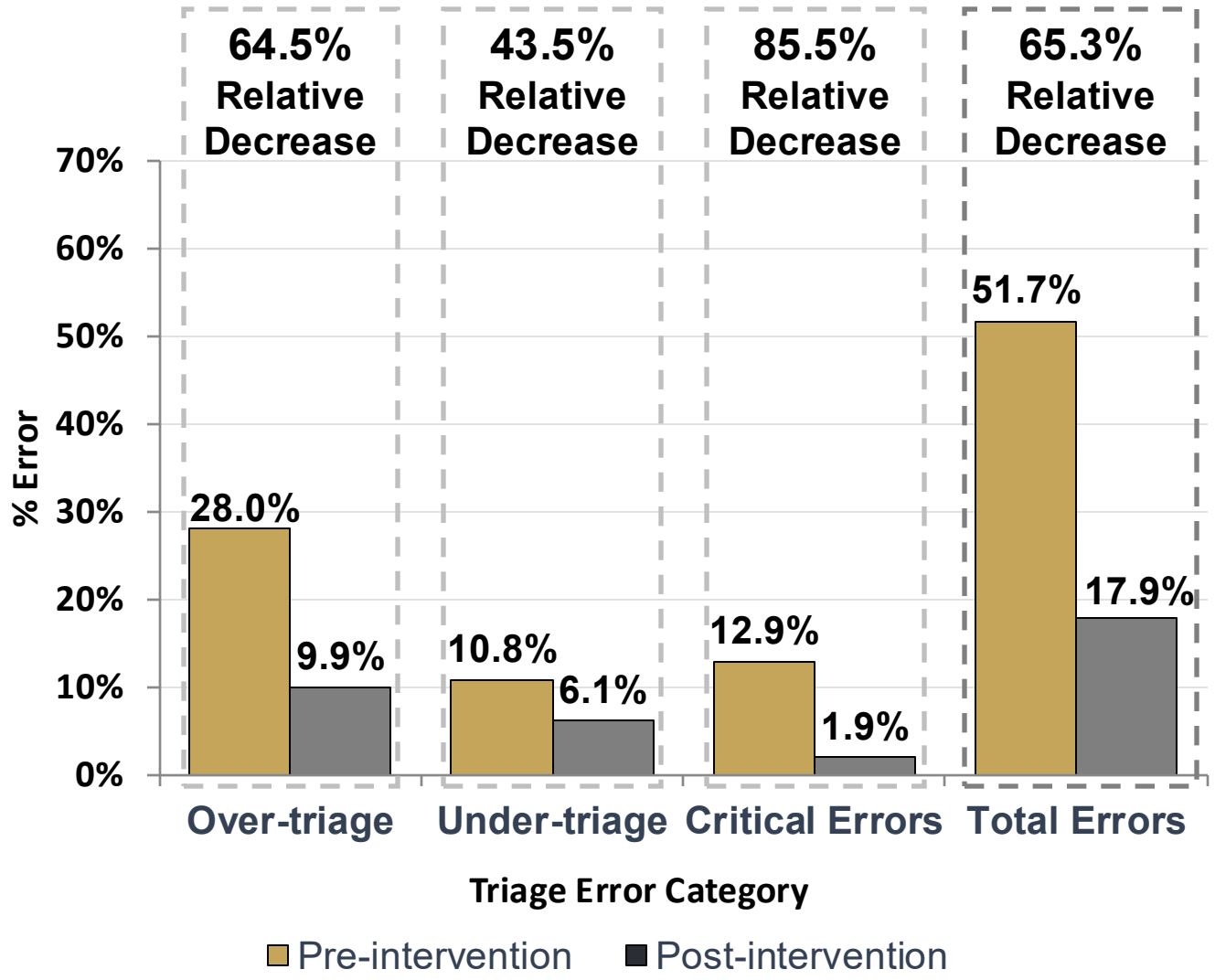
1.72
COHEN'S D, LARGE EFFECT

93.0%
OF PARTICIPANTS IMPROVED

p < .001
ALL THREE MEASURES

Triage accuracy increased from 48.3% to 82.1%, a 70.0% relative increase after one 22-minute video.

EVERY ERROR CATEGORY DECLINED



85.5%

RELATIVE REDUCTION IN CRITICAL ERRORS

12.9% TO 1.9% | p < .001

WHY IT MATTERS

- Critical errors risk irrevocable morbidity or mortality; their reduction is the most clinically important finding.
- Over-triage fell 64.5%, under-triage 43.5%, total errors 65.3%, all p < .001.

SCALED TO A 50-CASUALTY MASCAL

Pre-intervention (Baseline): Expected Triage Accuracy and Error Types in a 50-Casualty MASCAL

Post-intervention: Expected Triage Accuracy and Error Types in a 50-Casualty MASCAL

Counts reflect observed project percentages scaled to 50 casualties; non-integer values result from rounding. Error categories are mutually exclusive.

LEARNER REACTION AND PERCEIVED UTILITY

CONFIDENCE

+63.9%

RELATIVE INCREASE IN MEAN

3.02 TO 4.95
(7-point scale, P < .001)

SATISFACTION

+42.8%

RELATIVE INCREASE IN MEAN

3.97 TO 5.67
(7-point scale, P < .001)

RELEVANCE TO LSCO

6.16 / 7

POST-TRAINING MEAN

"VERY"
TO
"COMPLETELY RELEVANT"

LIKELIHOOD TO RECOMMEND TRAINING

6.30 / 7

POST-TRAINING MEAN

"LIKELY"
TO
"VERY LIKELY"

KIRKPATRICK FRAMING

- Level 1 (Reaction): satisfaction, perceived relevance to large-scale combat operations, and likelihood to recommend were all high after training.
- Level 2 (Learning): measured directly through the accuracy, knowledge, and sorting gains just shown.
- Levels 3 and 4 were assessed through self-report proxies; a companion qualitative analysis extends the evaluation.

Kirkpatrick D. Training & Development. 1996. | 7-point response scales per Gries K, et al. J Patient Rep Outcomes. 2017.

RESULTS IN CONTEXT, LIMITS IN VIEW

CONSISTENT WITH PRIOR SALT STUDIES

- Post-intervention accuracy of 82.1% sits within the 75% to 83% range reported in prior brief SALT training studies.
- Over-triage 9.9% (prior studies: 6.8% to 14%).
- Under-triage 6.1% (prior studies: 3.8% to 17%).
- Critical errors 1.9% (prior studies: 0.9% to 5.2%).
- First evaluation of this approach in a military training context.

LIMITATIONS

- No randomized control group; pre-post design cannot isolate the intervention effect.
- Identical pre- and post-test scenarios may introduce practice or testing effects; correct answers were never disclosed.
- Paper-based scenarios cannot reproduce the cognitive load and stress of a real MASCAL.
- Immediate post-testing only; retention in this population is unknown.
- Single installation; cohort clustering was not modeled.

Cone DC, et al. 2009; 2011. | Lerner EB, et al. 2010. | Deluhery MR, et al. 2011. | Lee CW, et al. 2015; 2016. | Nilsson A, et al. 2015. | Silvestri S, et al. 2017. | Celik DH, et al. 2019. | Kman N, et al. 2025.

IMPLEMENTATION: SCALABLE BY DESIGN

22 minutes

ONE STANDARDIZED VIDEO

$0

FREELY AVAILABLE RESOURCE

0

INSTRUCTORS REQUIRED

FITS EXISTING PIPELINES

- Practical complement to pre-deployment and unit-level training; pairs naturally with required TCCC instruction.
- SALT's lifesaving-interventions step prompts MARCH (Massive hemorrhage, Airway, Respiration, Circulation, Hypothermia/Head injury) actions during triage.
- Standardized terminology supports communication across echelons of care.

NEXT EVALUATION CYCLES

- Assess retention at follow-up intervals.
- Compare video with simulation and blended modalities; consider cluster-randomized designs.
- Evaluate performance under realistic cognitive and physical stress in field exercises and live MASCAL drills.

CONCLUSIONS

- Baseline triage accuracy below 50% quantifies a significant training gap among nonmedical military personnel who may conduct initial triage in LSCO.
- A 22-minute SALT video was associated with a 33.8-point accuracy gain and an 85.5% relative reduction in critical errors, immediately and at scale.
- Scalable, low-cost, standardized: well-suited to unit medical training and pre-deployment preparation, while retention and field performance are evaluated.

QUESTIONS

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MHSRS-26-5153

REFERENCES (1 OF 2)

1. Hodgetts TJ, Naumann DN, Bowley DM. Transferable military medical lessons from the Russo-Ukraine war. BMJ Mil Health. 2023:e002435. doi:10.1136/military-2023-002435
2. Emergency War Surgery: Fifth United States Revision. Borden Institute, US Department of Defense; 2018.
3. Department of the Army. Medical Platoon. Army Techniques Publication 4-02.4; 2021.
4. Lerner EB, Schwartz RB, Coule PL, et al. Mass casualty triage: an evaluation of the data and development of a proposed national guideline. Disaster Med Public Health Prep. 2008;2(S1):S25-S34. doi:10.1097/DMP.0b013e318182194e
5. Ogrinc G, Davies L, Goodman D, Batalden P, Davidoff F, Stevens D. SQUIRE 2.0 (Standards for Quality Improvement Reporting Excellence): revised publication guidelines from a detailed consensus process. BMJ Qual Saf. 2016;25(12):986-992. doi:10.1136/bmjqs-2015-004411
6. Lee CW, McLeod SL, Peddle MB. First responder accuracy using SALT after brief initial training. Prehosp Disaster Med. 2015;30(5):447-451. doi:10.1017/S1049023X15004975
7. Kirkpatrick D. Great ideas revisited. Techniques for evaluating training programs. Revisiting Kirkpatrick's four-level model. Training & Development. 1996;50(1):54-59.
8. Gries K, Berry P, Harrington M, et al. Literature review to assemble the evidence for response scales used in patient-reported outcome measures. J Patient Rep Outcomes. 2017;2:41. doi:10.1186/s41687-018-0056-3
9. Cone DC, Serra J, Burns K, MacMillan DS, Kurland L, Van Gelder C. Pilot test of the SALT mass casualty triage system. Prehosp Emerg Care. 2009;13(4):536-540. doi:10.1080/10903120802706252
10. Deluhery MR, Lerner EB, Pirrallo RG, Schwartz RB. Paramedic accuracy using SALT triage after a brief initial training. Prehosp Emerg Care. 2011;15(4):526-532. doi:10.3109/10903127.2011.569852

REFERENCES (2 OF 2)

11. Lee CW, McLeod SL, Van Aarsen K, Klingel M, Franc JM, Peddle MB. First responder accuracy using SALT during mass-casualty incident simulation. Prehosp Disaster Med. 2016;31(2):150-154. doi:10.1017/S1049023X16000091
12. Lerner EB, Schwartz RB, Coule PL, Pirrallo RG. Use of SALT triage in a simulated mass casualty incident. Prehosp Emerg Care. 2010;14(1):21-25. doi:10.3109/10903120903349812
13. Celik DH, Mencl FR, Debacker M, Kurland L, Wilber ST, Frey JA. Triage performance of school personnel using the SALT system. Prehosp Disaster Med. 2019;34(4):401-406. doi:10.1017/S1049023X1900462X
14. Kman N, Way D, Panchal AR, et al. Virtual reality simulation for assessment of hemorrhage control and SALT triage performance: a comparison of prehospital to in-hospital emergency responders. Prehosp Disaster Med. 2025;40(4):191-198. doi:10.1017/S1049023X25101349
15. Nilsson A, Åslund K, Lampi M, Nilsson H, Jonson CO. Improved and sustained triage skills in firemen after a short training intervention. Scand J Trauma Resusc Emerg Med. 2015;23(1):81. doi:10.1186/s13049-015-0162-7
16. Cone DC, Serra J, Kurland L. Comparison of the SALT and Smart triage systems using a virtual reality simulator with paramedic students. Eur J Emerg Med. 2011;18(6):314-321. doi:10.1097/MEJ.0b013e328345d6fd
17. Silvestri S, Field A, Mangalat N, et al. Comparison of START and SALT triage methodologies to reference standard definitions and to a field mass casualty simulation. Am J Disaster Med. 2017;12(1):27-33. doi:10.5055/ajdm.2017.0255