# Vascular Emergency Surgery: Simulated Exercises for Limb Salvage (VESSELS): A Preliminary Analysis of a Military General Surgery Resident Education Curriculum

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## Background

- Military surgeons must deliver care in resource-constrained environments
- General surgery residency often lacks sufficient preparation for the complexities of battlefield trauma, given the increasing use of minimally invasive and endovascular techniques.
- Vascular injuries are five times more prevalent in modern combat compared to previous wars.
- Residents need enhanced knowledge and open surgical skills to manage vascular injuries effectively.
- Simulation-based training offers a promising approach to supplement vascular trauma education in residency.
- VESSELS supplemental curriculum: A longitudinal simulation-based program designed to bridge the gap in vascular injury management training.
- Evaluate the effectiveness of the VESSELS curriculum in enhancing military surgical residents' preparedness for vascular trauma.

## Methods

- Walter Reed National Military Medical Center General Surgery residents, including trainees from PGY-1, 2, 3, and 5, were given a didactic and technical skills curriculum on managing traumatic vascular emergencies
- Curriculum included a case-based group discussion and the performance of vascular anastomoses and shunt placement.
- Residents were separated into small groups consisting of a chief resident, a junior resident, and an intern under the guidance of vascular and trauma surgeons.
- Residents completed pre- and post-knowledge and attitudes assessments to evaluate the impact of the curriculum.

## Results

- Ten residents completed knowledge assessments, six of which had increased knowledge assessment scores by an average of 13% (range 8-24%).
- Of the thirteen residents who completed the post-assessment attitudes questionnaire, nine agreed or strongly agreed that the curriculum increased their confidence in their ability to work in vascular surgery.
- Overall, junior residents had lower confidence levels than senior residents.
- However, there was an increase in confidence levels in knowledge and technical abilities among the residents who participated.

**Table 1: Comparison of in-person pre and post-assessments knowledge based multiple choice questions**

| Training Level | Pre Assessment Mean (%) | Post Assessment Mean (%) |
|---|---|---|
| PGY 1 | 76.9 | 92.3 |
| PGY 2 | 88.5 | 84.6 |
| PGY 3 | 92.3 | 92.3 |
| PGY 5 | 80.75 | 92.3 |




**Figure 1: 3D Printed Vascular Shunt Model**



**Figure 2: Skills assessment set up of VESSELS curriculum**

## Limitations

- Small sample size limited statistical power and ability to draw definitive conclusions.
- First iteration of the curriculum likely contributed to limited participant numbers.
- Incomplete assessments (pre vs. post) affected matching and impact analysis.
- Lack of PGY-level stratification may have impacted skill progression outcomes.

## Conclusion

- Longitudinal simulation-based curricula may be beneficial in teaching military residents the technical skills and decision-making needed in the deployed, austere setting
- VESSELS curriculum may also improve resident confidence in approaching vascular trauma patients
- Future studies plan to increase participation among residents, quantify improvement from the curriculum, and enhance the hands-on experience of the curriculum.

## References

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2. Patel, JA., et al. "A contemporary, 7-year analysis of vascular injury from the war in Afghanistan." Journal of vascular surgery. 2018.

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