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THE FUTURE OF TRAINING WITH LIVE ANIMAL TISSUE ON THE TACTICAL MEDICINE COURSE

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JCSP SERVICE PAPER – PCEMI ÉTUDE MILITAIRE

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TACTICAL MEDICINE COURSE**

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THE FUTURE OF TRAINING WITH LIVE ANIMAL TISSUE ON THE TACTICAL MEDICINE COURSE

AIM

1. There is significant controversy surrounding the use of animals (referred to as live tissue) for purposes of medical training, most notably combat trauma training. Those opposed to the practice contend that it is cruel and unethical given the existence of high fidelity medical simulators (MEDSIM) which could be used instead. Those in favour argue that the training value from using live tissue exceeds that of MEDSIM and thus yields more proficient combat casualty care providers, which translates into more lives saved on the battlefield. The Royal Canadian Medical Service (RCMS) uses live tissue trauma training (LTTT) during the Tactical Medicine Course (TACMED), a course specifically designed for CAF Medical Technicians (Med Techs). The purpose of this service paper is to provide an overview of the positions for and against the use of LTTT, determine if there are high-quality MEDSIM alternatives to LTTT, review medical research studies comparing LTTT and MEDSIM, and finally make recommendations as to the way-ahead.

INTRODUCTION

2. Tactical medicine refers to the provision of lifesaving care on the battlefield.¹ The focus is on the management of those injuries that can quickly result in death if not managed in an expedient manner. Specifically, this includes injuries that result in massive hemorrhage, loss of airway, and inability to breathe. Massive hemorrhage is treated with specialized pressure dressings and tourniquets. Airway problems can be treated with devices known as nasopharyngeal airways or a surgical procedure to open the airway known as a

¹ E. Savage et al, *Tactical Combat Casualty Care in the Canadian Forces: lessons learned from the Afghan war*, Can J Surg, Vol. 54, Suppl., December 2011, 1.

cricothyroidotomy (which is indicated in certain dire circumstances). To address breathing concerns, Med Techs are taught procedures (such as needle decompression) to treat injuries to both the external chest wall and lungs (such as open chest wounds and tension pneumothoraces).

3. These tactical medicine skills are taught to Med Techs on the TACMED course which is a physically and mentally demanding ten-day course delivered by a civilian contracted company. The course was designed for CAF Med Techs who are deploying on Operations where troops are at high risk of sustaining combat injuries. During TACMED, Med Techs are taught a standardized approach to the management of combat injuries through the use of both MEDSIM and LTTT (typically with swine models). Med Techs are initially taught didactically in a classroom setting and then provided hands-on training with live tissue in a laboratory. This is followed by real-life scenarios in an intensely stressful, simulated combat environment where they must deliver casualty care to swine models which could have any number of combat injuries. If the Med Tech does not provide the proper standard of combat casualty care, the animal can die. Throughout the scenario, the animal is monitored by a veterinarian to ensure that it is deeply anaesthetized (and thus unconscious) and pain-free. This is achieved through the regular administration of intravenous medications similar to those used by anesthesiologists in a hospital operating room. If the animal has not died during the combat scenario, it is euthanized immediately on completion (and before regaining consciousness) in a humane manner with intravenous medications.

4. The value of this training cannot be overstated. In a 2013 study, it was determined that of the 4,596 combat deaths during Operation Iraqi Freedom and Operation Enduring Freedom, 87.3% of all injury mortality occurred in the pre-hospital environment (ie – before reaching the

hospital).² Of the deaths, 24.3% (976) were deemed potentially survivable (ie – had they received high quality combat casualty care in the field, they would have survived). As well, in 90.9%, the cause of death was massive hemorrhage. In summary, most deaths occurred in the pre-hospital environment due to massive hemorrhage and 24.3% of the deaths were avoidable had the injured soldiers received high quality combat casualty care.

5. Another study of combat casualties from the 75th Ranger Regiment, US Army Special Operations Command, between 2001 and 2010 found that 0% of their pre-hospital deaths were potentially survivable.³ This represents the lowest incidence of preventable deaths ever reported from a major conflict.⁴ This impressive statistic was largely attributed to the Combat Casualty Care Program that is taught to all Ranger personnel. Therefore, given that it is CAF Med Techs providing the combat casualty care in the pre-hospital environment, these studies serve to highlight that by providing top quality TACMED training, the number of preventable deaths will decrease (ideally to zero) and soldiers who otherwise would have died from their injuries, will survive.

DISCUSSION

6. Now, more than ever, there is considerable debate on whether the continued use of LTTT is ethically justified given the availability of high fidelity MEDSIM. In a 2012 study, 78.6% of NATO countries confirmed that they do not use animals for military medical training citing various reasons including legal prohibitions against animal use and availability of MEDSIM.

² B.J Eastridge et al, “*Death on the battlefield (2001-2011): implications for the future of combat casualty care.*” J Trauma Acute Care Surg. 2012 Dec;73(6 Suppl 5):S431-7, 908, www.ncbi.nlm.nih.gov/pubmed/23192066

³ Russ Kotwal et al, “Saving Lives on the Battlefield. A Joint Trauma System Review of Pre-Hospital Trauma Care in Combined Joint Operating Area – Afghanistan (CJOA-A). FINAL REPORT”, last updated 30 Jan 2013, <https://www.naemt.org/docs/default-source/education-documents/tccc/10-9-15-updates/centcom-prehospital-final-report-130130.pdf?sfvrsn=2>

⁴ Frank Butler and Lorne Blackburn, “*Battlefield trauma care then and now: A decade of Tactical Combat Casualty Care,*” J Trauma Acute Care Surg Volume 73, Number 6, Supplement 5.

However, six NATO countries (21.4%) including Canada, Denmark, Norway, Poland, the United States, and the United Kingdom (which uses laboratories in Denmark for medical training) reported that they do use animals (primarily pigs and goats) for certain types of combat casualty training including management of difficult airways, penetrating injuries, gunshot wounds, and hemorrhaging due to amputation.⁵ The preeminent civilian trauma training course, the Advanced Trauma Life Support (ATLS) course, has also replaced LTTT with MEDSIM.⁶

Arguments in favour of the use of LTTT

7. Those in favor of LTTT argue that it is a necessary component of combat casualty care training as it is superior to any MEDSIM that currently exists. LTTT offers a training experience that cannot be replicated by MEDSIM. The key difference is the inability for simulators to bleed. Those that can are not able to respond physiologically in the same way as live tissue.⁷ For example, those that use red-coloured water to simulate bleeding do not clot and do not respond physiologically to the medical interventions in the same way as live tissue.⁸ Advocates of LTTT also argue that while there is a role for MEDSIM, the use of simulation is a “training step; it is not the end of the training process”⁹. The ability for Med Techs to manage extensive injuries in animals is essential so that when they are faced with actual combat injuries, it is not their first time treating real injuries. Therefore, they are less likely to “freeze due to emotional shock” and

⁵ B.J Eastridge et al, “Death on the battlefield...”,908.

⁶ Luis Teodoro da Luz et al, “*Current use of live tissue training in trauma: a descriptive systematic review*,” *Can J Surg*, Vol. 58 (Issue 3 Suppl 3) June 2015, S125, <http://canjsurg.ca/wp-content/uploads/2015/05/58-3-S125.pdf>

⁷ Izawa Yoshimitsu et al, “*Ex-vivo porcine organs with a circulation pump are effective for teaching hemostatic skills*.” *World Journal of Emergency Surgery*. 2012, 7:5. <http://www.wjes.org/content/7/1/5>

⁸ Gary Martinic, “*Military ‘live tissue trauma training’ using animals in the US – its purpose, importance and commentary on military medical research and the debate on use of animals in military training*.” *Journal of Military and Veterans' Health* Volume 20 No. 4, <http://jmvh.org/article/military-live-tissue-trauma-training-using-animals-in-the-us-its-purpose-importance-and-commentary-on-military-medical-research-and-the-debate-on-use-of-animals-in-military-training/>

⁹ Dave Morehouse, “*Live Tissue Training Point Paper*,” Vice President Operations, Deployment Medicine International. <http://cdn.sandiegouniontrib.com/news/documents/2013/02/28/20c128fa-83ab-11de-b0a8-001cc4c002e0.pdf.pdf>

are instead able to focus on applying their tactical combat casualty care skills.¹⁰ Proponents also argue that LTTT is highly controlled to ensure that animals are treated humanely at all times. For example, in Canada, organizations that use animals for medical training of any type must be certified by the Canadian Council on Animal Care (CCAC). CCAC is the national organization “responsible for setting, maintaining, and overseeing the implementation of high standards for animal ethics and care in science throughout Canada.”¹¹ Advocates also note that the number of farm animals slaughtered for the food industry is orders of magnitude more than those used for LTTT. For example, in 2015, there were over 106 million pigs slaughtered for the food industry. The number used by the US military was under 3000 (all of which likely would have been slaughtered for food had they not been used by the military).^{12,13} The use of these animals for combat casualty training, however, could result in lives being saved. In summary, because LTTT results in more lives saved on the battlefield compared to simulators, it is morally and ethically justified.^{14,15}

Arguments opposed to the use of LTTT

8. The main organization in Canada that actively opposes the use of animals for LTTT is People for the Ethical Treatment of Animals (PETA). PETA argues that this practice is both inhumane and unethical given the availability of high-tech human simulators designed specifically for military trauma training. In accordance with one PETA activist, this is

¹⁰ Gary Martinic, “Military ‘live tissue trauma training...

¹¹ Canadian Council on Animal Care, “About the CCAC,” last accessed 2 Feb 2016, http://www.ccac.ca/en_/about

¹² The Humane Society of the United States, “Farm Animal Statistics: Slaughter Totals,” last accessed 2 Feb 2016, http://www.humanesociety.org/news/resources/research/stats_slaughter_totals.html

¹³ Dave Morehouse, “Live Tissue Training Point Paper...

¹⁴ Jim Hanson, “Save people, not pets,” *The Washington Times*, Tuesday, May 25, 2010, last accessed 2 Feb 2016, <http://www.washingtontimes.com/news/2010/may/25/save-people-not-pets/print/>

¹⁵ Dave Morehouse, “Live Tissue Training Point Paper...

“obviously more humane and effective than cutting apart, blowing up, shooting, and killing thousands of animals every year.”¹⁶

9. The legality of using LTTT has even made it to the US Congress. The “Battlefield Excellence through Superior Training Practices” bill was assigned to a congressional committee on 26 February 2015.¹⁷ If passed, this bill would “require the Secretary of Defense to use only human-based methods for training members of the Armed Forces in the treatment of severe combat injuries, and for other purposes.” Interestingly, the US website that tracks the status of bills indicates that, for a variety of reasons, this bill has a 0% chance of being enacted.

Human simulator alternatives to LTTT

10. While the aim of this paper is not to evaluate all the various types of human simulators that are presently available and make recommendations on any particular model, it is worth reviewing the marketplace availability of human simulators for military use. Indeed, if suitable simulators are not presently available, it is pointless to discuss alternatives to LTTT as the CAF will have no choice but to continue with the status quo. A simple ‘Google’ search quickly identified two models: one sold by ‘Trauma F/X’ and the other by ‘North American Rescue.’^{18,19} Both have developed simulators specifically for combat casualty medical training and as such could be possible alternatives to LTTT. They are rugged, remote-controlled, and extraordinarily life-like and can simulate all types of injuries including traumatic amputations, sucking chest

¹⁶ People for the Ethical Treatment of Animals, “Goats Hacked Apart in Military Training,” last accessed 2 Feb 2016, <http://prime.peta.org/2012/04/goats>

¹⁷ Gotrack.us, “S. 587: Battlefield Excellence through Superior Training Practices Act,” last accessed 2 Feb 2016, <https://www.govtrack.us/congress/bills/114/s587>

¹⁸ North American Rescue, “Operative Experience - Combat Trauma Simulators,” last accessed 2 Feb 2016, <https://www.narescue.com/media/NAR/product-info-sheets/PIS-CTS.pdf>

¹⁹ Trauma F/X, “Next Generation Trauma Simulation,” last accessed 2 Feb 2016, <https://www.kforcegov.com/traumafx/index.aspx>

wounds, burns, blast, and fragment wounds. All combat casualty care procedures that are currently taught to CAF Med Techs can be performed on these simulators.

Evidence for or against the use of LTTT

11. A literature review was conducted to determine if there was strong evidence supporting either LTTT or human simulator models as the most effective way to train combat casualty care providers. A ‘systematic review paper’ was found in the June 2015 Canadian Journal of Surgery. This review summarizes all studies that have been done concerning the use of live-tissue training in trauma alone or compared with other forms of simulation.²⁰ The principal objective was to determine if LTTT is better than any other method of simulation for acquiring trauma care skills. A total of 12 studies were identified that met the study inclusion criteria. Unfortunately, 10 of the 12 studies did not directly compare LTTT with other methods of trauma skills acquisition.

12. The overall conclusion was that while simulation improves knowledge, efficacy, competency, and surgical skills, there was not enough evidence to conclude that LTTT is better than other simulation methods. There were several factors in these studies that limited the conclusions that could be drawn in trying to determine which training modality is superior including the small sample sizes, different levels of training among the participants, different forms of interventions and simulators, absence of control groups in the majority of studies, and different outcomes assessed.

²⁰ Luis Teodoro da Luz et al, “*Current use of live tissue training in trauma...*”

13. The study further concludes that while a wide range of trauma training modalities exist, they each have limitations mostly with respect to bleeding in that they “do not respond in the same biological way that bleeding patients do in clinical practice.”²¹

For this reason, complex surgical skills are usually taught using live tissue. The authors explain that for this reason, the American College of Surgeons “supports the use and humane care and treatment of laboratory animals in research, education, teaching, and product safety testing in accordance with applicable local, state, and federal animal welfare laws.”²²

CONCLUSION

14. In conclusion, the use of live tissue in combat casualty training is a highly contentious topic. Advocates of LTTT are adamant that there is absolutely no substitute for the level of realism that can be achieved with LTTT. They insist that the animals are treated humanely and that LTTT has resulted in lower combat casualty mortality rates.

15. Opponents, however, argue that LTTT is unethical, inhumane, and represents unnecessary cruelty towards animals especially given the availability of technologically advanced human simulators that can mimic real-life combat casualties. They contend that these human simulators should replace LTTT.

16. Through a Google search, it was determined that there are indeed technologically advanced human casualty simulators that are now available that have been specifically designed for use in combat casualty training. It is possible that they could replace LTTT. Unfortunately, there is a lack of high quality objective evidence demonstrating their superiority over LTTT.

²¹ *Ibid.*, S131.

²² *Ibid.*, S131.

Indeed, in a June 2015 Systematic Review study that was conducted in order to determine if LTTT is better than MEDSIM for acquiring trauma care skills, the results were inconclusive.

RECOMMENDATIONS

17. Recommendations are as follows:

a. There is presently no solid evidence supporting PETAs position that human combat casualty simulators are equivalent to LTTT. There is, however, good evidence demonstrating that as a result of high quality combat casualty care training, an unprecedented number of soldiers are now surviving catastrophic combat trauma. While one cannot unequivocally attribute this success to the use of LTTT, it is reasonable to assume that it has played a role. Given this, it is recommended that the use of LTTT continue as an integral component of the TACMED course. The risk of discontinuing LTTT in favor of human casualty simulators without high quality evidence to support such a change is too great. It could translate into an increase in mortality rates amongst combat casualties, which is clearly unacceptable.

b. Given the lack of evidence supporting either position, it is recommended that a high quality, randomized-controlled study be conducted comparing LTTT to human casualty simulators in a combat environment to determine definitively which is superior in preparing CAF Med Techs for employment in a combat environment.

BIBLIOGRAPHY

- Yoshimitsu Izawa, Shuji Hishikawa, Tomohiro Muronoi, Keisuke Yamashita, Masayuki Suzukawa, and Alan T Lefor. "Ex-vivo porcine organs with a circulation pump are effective for teaching hemostatic skills." *World Journal of Emergency Surgery*. 2012, 7:5. <http://www.wjes.org/content/7/1/5>
- Eastridge BJ, Mabry RL, Seguin P, Cantrell J, Tops T, Uribe P, Mallett O, Zubko T, Oetjen-Gerdes L, Rasmussen TE, Butler FK, Kotwal RS, Holcomb JB, Wade C, Champion H, Lawnick M, Moores L, Blackbourne LH. "Death on the battlefield (2001-2011): implications for the future of combat casualty care." *J Trauma Acute Care Surg*. 2012 Dec;73(6 Suppl 5):S431-7. <http://www.ncbi.nlm.nih.gov/pubmed/23192066>
- Savage E, Forestier C, Withers N, Tien H, Pannell D. "Tactical Combat Casualty Care in the Canadian Forces: lessons learned from the Afghan war." *Can J Surg, Vol. 54, Suppl., December 2011*
- Shalin G. Gala, BA; Justin R. Goodman, MA; MAJ Michael P. Murphy, MC USAR; RADM Marion J. Balsam, MC USN (Ret.). "Use of Animals by NATO Countries in Military Medical Training Exercises: An International Survey." *Military Medicine*, 177, 8:907, 2012
- Martinic G, "Military 'live tissue trauma training' using animals in the US – its purpose, importance and commentary on military medical research and the debate on use of animals in military training." *Journal of Military and Veterans' Health Volume 20 No. 4*
- Morehouse D, "Live Tissue Training Point Paper," Vice President Operations, Deployment Medicine International.
<http://cdn.sandiegouniontrib.com/news/documents/2013/02/28/20c128fa-83ab-11de-b0a8-001cc4c002e0.pdf.pdf>
- Canadian Council on Animal Care, "About the CCAC," last accessed 2 Feb 2016, http://www.ccac.ca/en_/about
- Hanson J, "Save people, not pets," *The Washington Times*, Tuesday, May 25, 2010, last accessed 2 Feb 2016, <http://www.washingtontimes.com/news/2010/may/25/save-people-not-pets/print/>
- The Humane Society of the United States, "Farm Animal Statistics: Slaughter Totals," last accessed 2 Feb 2016, http://www.humanesociety.org/news/resources/research/stats_slaughter_totals.html
- People for the Ethical Treatment of Animals, "Goats Hacked Apart in Military Training," last accessed 2 Feb 2016, <http://prime.peta.org/2012/04/goats>

Govtrack.us, "S. 587: Battlefield Excellence through Superior Training Practices Act," last accessed 2 Feb 2016, <https://www.govtrack.us/congress/bills/114/s587>

North American Rescue, "Operative Experience - Combat Trauma Simulators," last accessed 2 Feb 2016, <https://www.narescue.com/media/NAR/product-info-sheets/PIS-CTS.pdf>

Trauma F/X, "Next Generation Trauma Simulation," last accessed 2 Feb 2016, <https://www.kforcegov.com/traumafx/index.aspx>

Teodoro da Luz L, Nascimento B, Tien H, Kim M, Nathens A, Vlachos S, Glassberg E. "Current use of live tissue training in trauma: a descriptive systematic review." *Can J Surg*, Vol. 58 (Issue 3 Suppl 3) June 2015

Kotwal R, Butler F, Edgar E, Shackelford S, Bennett D, Bailey J, "Saving Lives on the Battlefield. A Joint Trauma System Review of Pre-Hospital Trauma Care in Combined Joint Operating Area – Afghanistan (CJOA-A). FINAL REPORT", last updated 30 Jan 2013, <https://www.naemt.org/docs/default-source/education-documents/tccc/10-9-15-updates/centcom-prehospital-final-report-130130.pdf?sfvrsn=2>

Butler F, Blackburne L, "Battlefield trauma care then and now: A decade of Tactical Combat Casualty Care," *J Trauma Acute Care Surg* Volume 73, Number 6, Supplement 5.