Current Use of Live Tissue Training (LTT) in Trauma: A Descriptive Systematic Review

Luis Teodoro da Luz

Bartolomeu Nascimento

Savvas Vlachos

Michael J Kim

Elon Glassberg

Avery B Nathens

Homer Tien

Sunnybrook
HEALTH SCIENCES CENTRE
when it matters MOST

Training in trauma

Combination of approaches:

- **didactic lectures**
- **simulation-based platforms**
  - computer simulation
  - task trainers
  - mannequins (human patient simulation – HPS)
  - live tissue training
    - more complex surgical procedures
    - field exercises

Sunnybrook
HEALTH SCIENCES CENTRE
when it matters MOST

Live tissue training:

Facing increased scrutiny:

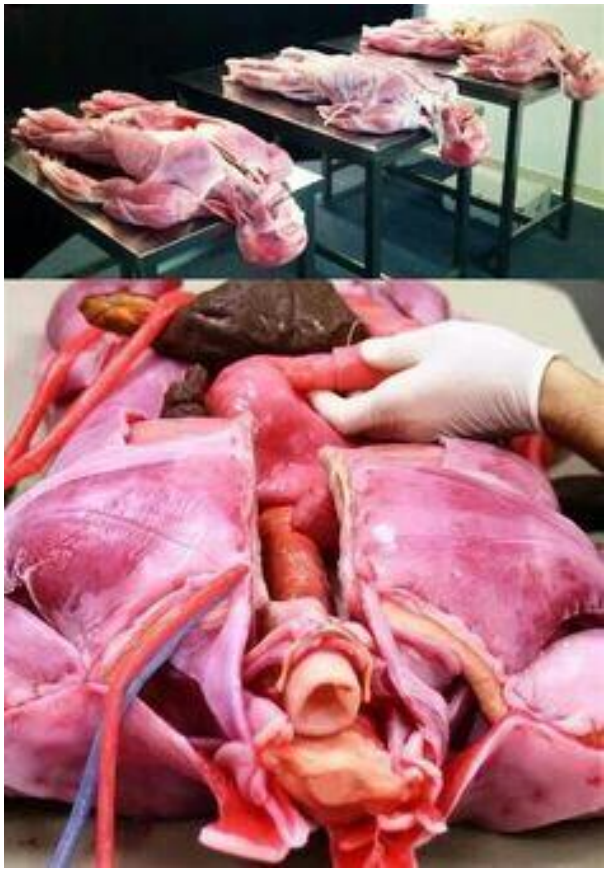
- focus on animal welfare
- improvement in medical simulation technology

US closed animal laboratories:

- dogs for ballistic wound management training
- monkeys in chemical weapons management exercises
- ATLS® moved from LTT to simulation based training

Sunnybrook
HEALTH SCIENCES CENTRE
when it matters MOST

?



rook
ES CENTRE
when it matters
MOST

The debate

Sunnybrook
HEALTH SCIENCES CENTRE
when it matters MOST

Washington Post, 2013

"While the military argues that the goats, pigs and other animals are anesthetized and haven't died in vain, activists say the practice is cruel and that human simulators can effectively replace live animals"

Sunnybrook
HEALTH SCIENCES CENTRE
when it matters MOST

Dr. TP, a Texas anesthesiologist who served in the U.S. Navy Medical Corps and took civilian trauma animal simulation course, states:

"In terms of actually learning skills, eye-hand coordination or learning much intellectually, it didn't really add anything." – Washington Post, 2013

Sunnybrook
HEALTH SCIENCES CENTRE
when it matters MOST

“MB, a former Army combat medic who served in Iraq after taking non LTT courses disagrees. He states that: the first time he treated a casualty after an artillery attack, he froze.

Later, he took a course in which he treated a sedated goat’s bleeding femoral artery...B said: “The exercise provided me with a sense of urgency.

“You don’t get that feeling from a mannequin.”

Sunnybrook
HEALTH SCIENCES CENTRE
when it matters MOST

The question: *What is the efficacy of LTT alone or when compared to other simulation methods in trauma training?*

Sunnybrook
HEALTH SCIENCES CENTRE
when it matters MOST

Information Sources and Search Technique

- PRISMA Guidelines

  Medline
  Embase
  Cochrane

  “live tissue training AND trauma”,

  “simulation AND trauma

  “simulation AND surgical training”

- No language restrictions

Sunnybrook
HEALTH SCIENCES CENTRE
when it matters MOST

Eligibility Criteria and Study Selection

Observational studies
Randomized controlled trials

Trauma skills acquisition with LTT exclusively
Compared to any other method of training

Two independent reviewers

Cohen`s Kappa used for agreement (0.79)

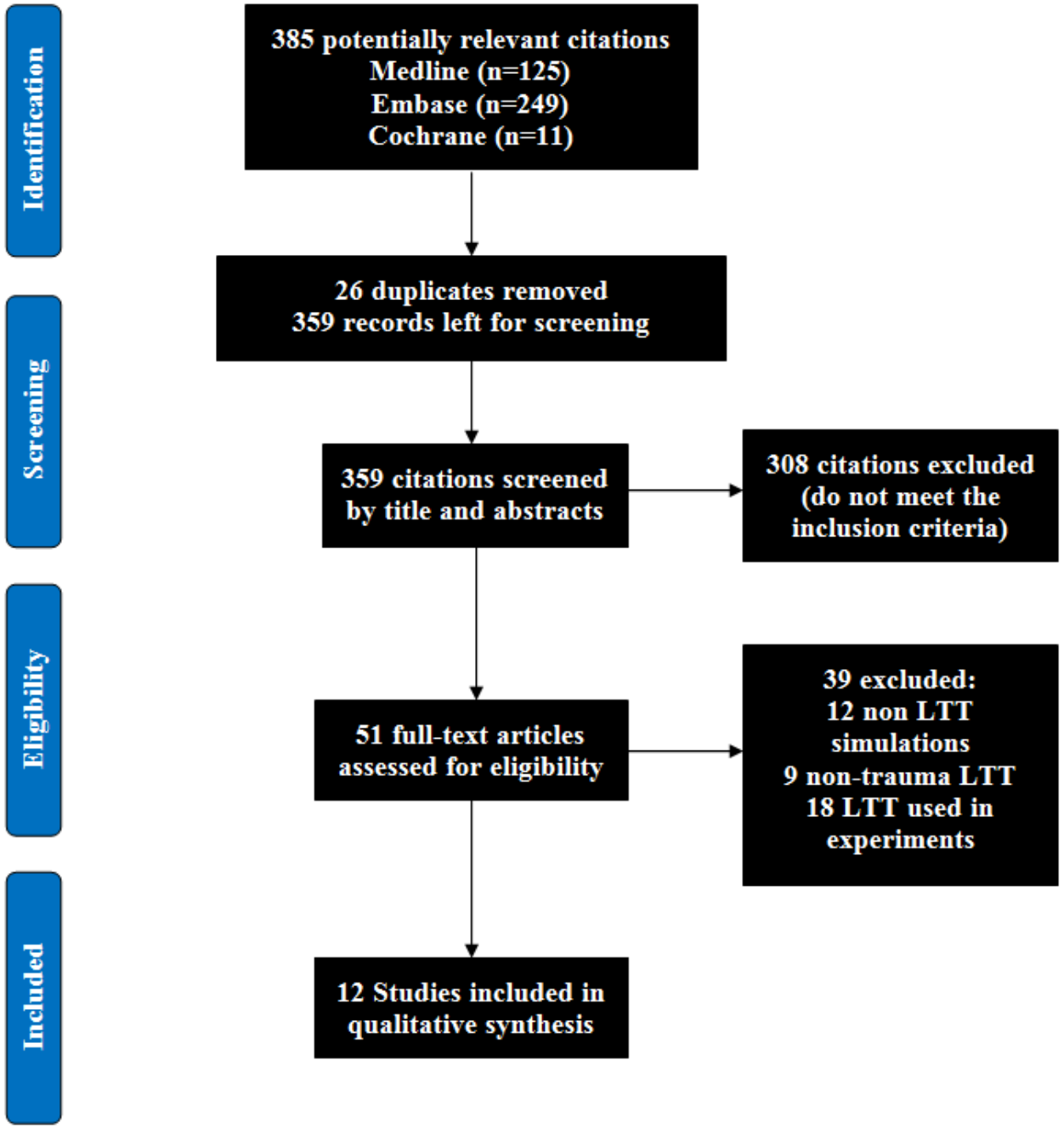
Third author for disagreement

Authors contacted, references analysed

Sunnybrook
HEALTH SCIENCES CENTRE
when it matters MOST

What did we find?

Sunnybrook
HEALTH SCIENCES CENTRE
when it matters MOST



Sunnybrook
HEALTH SCIENCES CENTRE
when it matters MOST

Study Characteristics

10 prospective observational cohorts

2 RCTs

8 in the military setting

4 in the civilian setting

8 anesthetized swine

1 anesthetized goat

3 did not report the type of LTT used

Sunnybrook
HEALTH SCIENCES CENTRE
when it matters MOST

Study Characteristics

10 studies with no comparison group

Pre and post test measurements

2 studies with control group

Adjunctive training modalities:

- HPS (human patient simulator)
- cadavers
- computer simulation
- video presentations
- moulage with human volunteers
- triage scenarios
- case discussions

Sunnybrook
HEALTH SCIENCES CENTRE
when it matters MOST

Table 3 – Newcastle-Ottawa score [6] for the cohort studies included in the systematic review.

Reference	Representativeness of participants	Selection of Non - exposed Cohort	Ascertainment of Exposure	Comparability of controls	Assessment of outcome	Follow up adequate to allow outcome to occur	Loss to follow up
Kluger 1991 [8]	Somewhat representative	No control group	Prospective cohort	No control	Prospective cohort	Yes	None reported
Jacobs 2001 [9]	Somewhat representative	No control group	Prospective cohort	No control	Prospective cohort	Yes	None reported
Jacobs 2003 [10]	Somewhat representative	No control group	Prospective cohort	No control	Prospective cohort	Yes	None reported
Gaarder 2004 [11]	Truly representative	No control group	Prospective cohort	No control	Prospective cohort	Yes	None reported
King 2006 [13]	Somewhat representative	No control group	Prospective cohort	No control	Prospective cohort	Yes	None reported
Tugnoli 2006 [14]	Somewhat representative	No control group	Prospective cohort	No control	Prospective cohort	Yes	None reported
Sohn 2007 [15]	Somewhat representative	No control group	Prospective cohort	No control	Prospective cohort	Yes	None reported
Sohn 2007 [16]	Somewhat representative	No control group	Prospective cohort	No control	Prospective cohort	Yes	None reported
Rubiano 2010 [17]	Somewhat representative	No control group	Prospective cohort	No control	Prospective cohort	Yes	None reported
Mclaughlin 2011 [19]	Somewhat representative	No control group	Prospective cohort	No control	Prospective cohort	Yes	None reported

Sunnybrook
HEALTH SCIENCES CENTRE
when it matters
MOST

Interventions

- lectures and microteachings
- penetrating injures to the abdomen, chest and neck
- penetrating injures to vascular structures
- management of bleeding on extremities
- damage control laparotomy
- pleural drain insertion
- tracheostomy/cricothyroidotomy
- DPL
- management of burns and inhalation injury
- vascular access
- field exercises

Sunnybrook
HEALTH SCIENCES CENTRE
when it matters MOST

Table 4 – Risk of bias assessment for randomized controlled trials (based on Cochrane Collaboration`s tool of assessing risk of bias) [7]

Reference	Random sequence generation	Allocation concealment	Blinding of participants and researches	Incomplete outcome data	Selective reporting	Baseline imbalance	Sample size
Bowyer 2005 [12]	High risk	High risk	Low risk	Low risk	Low risk	Low risk	Not calculated
Hall 2011 [18]	High risk	High risk	Low risk	Low risk	Low risk	Low risk	Not calculated

Sunnybrook
HEALTH SCIENCES CENTRE
when it matters
MOST

Randomized Controlled Trials

- Bowyer 2005

  DPL

  medical students (n = 40)

  computer simulator x anesthetized swine

  both performed DPL in a HPS model

  graphic interface simulator:
  improved technique ($p<0.002$)

Sunnybrook
HEALTH SCIENCES CENTRE
when it matters MOST

Randomized Controlled Trials

- Hall 2011
  - air force volunteers with no prior medical training
  - cricothyroidotomy and tube thoracostomy
  - anesthetized swine X HPS
  - human cadavers subsequently
  - no statistical difference
    - time for completion
    - better confidence in LTT group
    - tube placement
    - crico placement

Sunnybrook
HEALTH SCIENCES CENTRE
when it matters MOST

The answer: *The current body of evidence does not conclude better efficacy of LTT in trauma compared to other forms simulation.*

Sunnybrook
HEALTH SCIENCES CENTRE
when it matters MOST

KEY POINTS

Sunnybrook
HEALTH SCIENCES CENTRE
when it matters MOST

- small sample sizes
- different level of training participants
- different form of interventions and simulators
- absence of control groups
- different outcomes assessed
- no inclusion of reliability or validity data
- different types of surveys
- high risk for measurement bias

Sunnybrook
HEALTH SCIENCES CENTRE
when it matters MOST

NEXT STEPS

Sunnybrook
HEALTH SCIENCES CENTRE
when it matters MOST

- Simulation in trauma **improves knowledge**, performance, self-efficacy, self-confidence, self-awareness and surgical skills.
- Non LTT has **partially replaced LTT** in civilian and military settings, but has **not yet been able to completely substitute live animals**.
- The **development of more realistic simulators** needs to be furthered, in order that LTT can be discontinued in favor of more suitable and relevant training models.
- Both have important places in trauma training, however adequately **powered, well-designed, and unconfounded randomized controlled trials are lacking.**

Sunnybrook
HEALTH SCIENCES CENTRE
when it matters MOST

THANK YOU!

Sunnybrook
HEALTH SCIENCES CENTRE
when it matters MOST

RIO

TORONTO

SAO PAULO

Sunnybrook
HEALTH SCIENCES CENTRE
when it matters MOST