WORKSHEET for Evidence-Based Review of Science for First Aid

Worksheet author(s) | Date Submitted for review: Dec 1, 2008
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Leon Chameides |

Clinical question.

"In which circumstances is the application of a tourniquet appropriate?"

Is this question addressing an intervention/therapy, prognosis or diagnosis? Intervention

State if this is a proposed new topic or revision of existing worksheet: New topic

Conflict of interest specific to this question

Do any of the authors listed above have conflict of interest disclosures relevant to this worksheet? No economic conflict of interest; the above author also wrote the other tourniquet worksheet as well as the 2005 worksheet

Search strategy (including electronic databases searched).

**Embase:** – Bleeding or hemorrhage AND emergency treatment

**Medline:** – MESH search: Hemorrhage AND Emergency Care (in Pub med that includes First aid, bleeding, etc) AND Tourniquet; Hemorrhage AND Tourniquet (Keyword MeSH); Hemostatic techniques AND emergency care; Hemostatic techniques AND emergency treatment

Wounds and injuries AND Emergency care AND hemostatic techniques

**Cochrane Library** (Cochrane Central Register of Controlled Trials, Cochrane Database of Systemic Reviews, Cochrane DSR, ACP Journal Club, and DARE, All EBM Reviews): - Hemmorhage expl (in Ovid includes all subheadings)

State inclusion and exclusion criteria

Exclusion – Review articles, abstracts, non-peer reviewed articles, does not answer question

Number of articles/sources meeting criteria for further review:

118 articles reviewed; 20 were chosen for inclusion
## Summary of evidence

### Evidence Supporting Clinical Question

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<th>Kragh 2008(^A)</th>
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**Level of evidence**

Outcomes – Please define outcomes for this question, place them after letters below and use letters to identify studies which evaluate this outcome

- A = Hemorrhage control
- C = Hypothermia protective
- E =

- B =
- D = *Italics = Animal studies*

### Evidence Neutral to Clinical question

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<td>Carey 1996(^D)</td>
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<td>Wenke 2005(^B)</td>
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<td>Swanson 1991(^C)</td>
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**Level of evidence**

Outcomes – Please use the same outcomes as defined for the Evidence Supporting table above

- B – Elimination of distal pulse
- C – Hypothermia protective
- D – Epidemiology

### Evidence Opposing Clinical Question

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|                      | Pilgram-Larsen 1992\(^A\) |

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**Level of evidence**

Outcomes – \(^A\) Hemorrhage control
Vascular injury to the extremities is a common combat injury (Carey 1996;165; Mabry 2000;515; Patel 2004;201; Lakstein 2003;221;) and exsanguinations are a common cause of preventable deaths on the battlefield (Bellamy 1984;55). Tourniquets are effective in stopping hemorrhage on the battlefield (Kragh 2008;38; Lakstein 2003;221; Beekley 2008;28; Fasol 1989;467; Kragh 2007;274) but have not been recommended for routine civilian use because:

- Bleeding in civilian injuries is usually not as serious
- The potential serious adverse effects from tourniquets
- Difficulty in their proper use.

Armed forces, operating under battle conditions with the potential for multiple and severely injured individuals have encouraged the use of tourniquets during combat operations.

Severe and multiple injuries may however also occur in some civilian settings that resemble battlefield conditions. These include:

- The wilderness environment (Ela 2004;11;)
- Rural machinery injuries (Humphrey 1994;179)
- Mass casualty situations such as a terrorist attack, gang or police actions (Dorlac 2005;217)

If a tourniquet is used in these special circumstances either by a first aid worker or if the victim is alone by self application, certain principles should be adhered to:

- It is safer to use a well studied commercially available device than one that is improvised (King 2006;1061; Wencke 2005;776; Calkins 2000;379; Walters 2005;416;). In one study (Kragh 2008;38) only 25% of improvised tourniquets were effective. Three commercially available tourniquets that have been found to be reliable in combat and experimental situations are CAT (Combat Application Tourniquet), SOFTT (Special Operations Forces Tactical Tourniquet), and EMT (Emergency and Military Tourniquet) (Walters 2005;416; Kragh 2008;38). The EMT tourniquet is not recommended for lay rescuers because of the training required to use it properly.
- It takes a significant amount of pressure to eliminate the arterial pulse and the pressure required is directly related to the limb circumference. Thus it takes more pressure to eliminate the pulse in the leg than the arm.
- Adverse effects from tourniquets are directly related to the duration that they are applied. The time of tourniquet application should therefore be noted and prominently displayed on the victim so that the receiving facility is aware how long the tourniquet has been in place
- Cooling the distal limb as a method of tissue salvage should be considered in cases of prolonged evacuation to definitive care (Swanson 1991; Kelly 1992; Irving 1985).

Acknowledgements:

**Citation List**


Fair; LOE 5 Supporting


Neutral; Poor; LOE 5


Neutral; Fair; LOE 5


LOE 4; Poor


Neutral; Fair; LOE 4


Supporting; Fair; LOE 5


Neutral; Good; LOE 4


Neutral; Good; LOE 5


**Notes:** Retrospective (Jan 1999-April 2006) chart review of 11 patients with extremity hemorrhage treated by paramedics with tourniquet. 55% were gunshot victims, 27% stab victims and 18% lacerations. Mean tourniquet application time was 75 ± 38 minutes (range 37-167 minutes). 9 – lower extremity; 2 upper. One death. No neurologic deficits.

LOE 4; Poor


Neutral; Good; LOE 5

King RB, Filps D, Blitz S, Logsetty S. Evaluation of possible tourniquet systems for use in the Canadian Forces. *J Trauma.* 2006;60(5):1061-1071

Neutral; Fair; LOE 5

Supporting; Poor; LOE 5


Supporting; Fair; LOE 5;


Supporting; Fair; LOE 5


Neutral

**Quality of Evidence:**

**Comments on Study:** Review


Neutral; Good; LOE 5


Neutral; Fair; LOE 5


Opposing; Fair; LOE 4


Neutral; Fair; LOE 5


Neutral; Good; LOE 2 (prospective, randomized, not double blind)

Neutral; Fair; LOE 5