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| Question |
| **Should pressure points compared with direct pressure be used for adults and children with severe, life-threatening external bleeding?** |
| **Population:** | Adults and children with severe, life-threatening external bleeding |
| **Intervention:** | Pressure applied to the artery proximal to the wound (pressure point) |
| **Comparison:** | Direct manual pressure or direct pressure to the wound with a compression dressing, compression bandage, or compression device |
| **Main outcomes:** | Death owing to bleeding, cessation of bleeding (restoration of hemostasis), and time to hemostasis, death from any cause, decrease in bleeding, and adverse effects (e.g. wound infection, limb loss, re-bleeding, pain related to an intervention). Where possible, the EtD tables also include information regarding outcomes related to provider ability to use / ease of use / feasibility / satisfaction (for method of bleeding control) and predictors of use/response (for method of bleeding control). |
| **Setting:** | All studies performed in the out-of-hospital setting (direct evidence), as well as studies providing indirect evidence about the effects of interventions collected in combat (military) settings, simulations (i.e. human volunteers, human cadaver or other models excluding animal models), and studies performed in the hospital setting that clinical content experts judged as performed in sufficiently similar conditions to still be informative.  |
| **Perspective:** | Of the first aid provider and/or patient |
| **Background:** | Traumatic injury is a leading cause of morbidity and mortality and a major cause of death from traumatic injury is uncontrolled bleeding. Tourniquets and hemostatic dressings have the potentially to prevent morbidity and mortality from traumatic bleeding. Therefore it is easy to see that first aid care is essential to help prevent injury related morbidity and mortality, as injured persons can exsanguinate from severe injuries in only a few minutes.Current first aid recommendations for an individual with severe, life-threatening external bleeding include applying direct pressure as standard therapy. Tourniquets and hemostatic dressings have been found to control bleeding effectively, therefore may be considered for use when standard measures are unable to control hemorrhage or in the situation where a first aid provider is unable to use standard first aid practices (for tourniquets) or for body areas where a tourniquet cannot be applied or is unable to control bleeding (for hemostatic dressings). There is no or limited data supporting the use of pressure points, elevation, or localized cold therapy.  |
| **Conflict of interests:** | None identified |

# Assessment

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| ProblemIs the problem a priority? |
| Judgement | Research evidence | Additional considerations |
| ○ No○ Probably no○ Probably yes● Yes○ Varies○ Don't know | Traumatic injury is the leading cause of injury related morbidity and mortality throughout the world, resulting in millions of hospitalizations each year. The leading cause of preventable mortality in injured patients is uncontrolled hemorrhage (Jacobs 2016 67). Hemorrhage is cited as the primary cause of death in 35% of traumatic mortalities and often contributes to death ultimately attributed to other causes (Kauvar 2006 S3). In addition, trauma related deaths disproportionality affects those in low and middle income countries where well established pre-hospital trauma systems may not exist (World Health Organization 2018). | There is no data available that suggests that pressure points should be used to treat life-threatening hemorrhage.  |
| Desirable EffectsHow substantial are the desirable anticipated effects? |
| Judgement | Research evidence | Additional considerations |
| ○ Trivial○ Small○ Moderate○ Large● Varies○ Don't know |

| **Certainty assessment** | **№ of patients** | **Effect** | **Certainty** | **Importance** |
| --- | --- | --- | --- | --- |
| **№ of studies** | **Study design** | **Risk of bias** | **Inconsistency** | **Indirectness** | **Imprecision** | **Other considerations** | **application of pressure points** | **direct pressure (manual or pressure dressings)** | **Relative(95% CI)** | **Absolute(95% CI)** |
| Cessation of bleeding - Simulation |
| 4 | observational studies  | serious a | not serious  | serious b | serious c | none  | Among four simulation studies, one with approximately 100 iterations of a variety of pressure points by providers or devices in a manikin model reported that all stopped simulated bleeding as measured by wound flow and femoral arterial pressure.(Kragh 2013 1276) A study with 10 healthy participants receiving manual compression in 3 different pressure points/arteries showed that the number of participants with successful cessation of distal Doppler signal for 60 seconds ranged from 10-30%.(Swan 2009 672) A third study with healthy volunteers showed that cessation (measured by Doppler signal) occurred in 25/27 (93%) participants using compression by transducer at the femoral artery.(Garrick 2016 S126) A forth study with 11 healthy volunteers showed that complete vessel occlusion (measured by mean arterial blood flow velocity) was achieved in 8/11 (73%), 6/11 (55%) and 1/11 (9%) of applications for brachial, femoral and abdominal artery, respectively.(Slevin 2009 154) | ⨁◯◯◯VERY LOW  | CRITICAL  |
| Time to hemostasis - Simulation |
| 1  | observational studies  | serious a | not serious  | serious b | serious d | none  | One simulation study (Kragh 2013 1276) included a manikin model testing 5 different pressure point methods (e.g., digital, kettlebell, heel of hand, knee, and combat ready clamp) resulting in approximately 100 iterations. In this study the average time was 10 to 60s as measured by distal flow of stimulated blood, and the shortest time was with digital compression of the pressure point.  | ⨁◯◯◯VERY LOW  | CRITICAL  |

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 | One simulation study with cadaver models demonstrated that use of pressure points cease blood flow with an average time of 10 to 60 seconds; however, there was no control for comparison. Three simulation studies with healthy volunteers and cadaver models demonstrated cessation of bleeding with use of pressure points; however, bleeding did not cease in all cases. There was no control for comparison.  |
| Undesirable EffectsHow substantial are the undesirable anticipated effects? |
| Judgement | Research evidence | Additional considerations |
| ○ Large○ Moderate○ Small○ Trivial○ Varies● Don't know |

| **Certainty assessment** | **№ of patients** | **Effect** | **Certainty** | **Importance** |
| --- | --- | --- | --- | --- |
| **№ of studies** | **Study design** | **Risk of bias** | **Inconsistency** | **Indirectness** | **Imprecision** | **Other considerations** | **application of pressure points** | **direct pressure (manual or pressure dressings)** | **Relative(95% CI)** | **Absolute(95% CI)** |
| Complications/Adverse events - Simulation |
| 1 | observational studies  | serious a | not serious  | serious b | serious d | none  | In a study of 27 healthy participants receiving compressions with transducer to femoral artery had no complications and no one experienced pain causing termination of participation. (Garrick 2016 S126) | ⨁◯◯◯VERY LOW  | IMPORTANT  |

 | One simulation study with healthy volunteers showed no adverse effects with pressure point use.Three simulation studies with healthy volunteers and cadaver models found that simulated bleeding did not cease in all cases. Due to the source of the data, and the proxy measures of the outcomes, we cannot determine the true undesirable effects.  |
| Certainty of evidenceWhat is the overall certainty of the evidence of effects? |
| Judgement | Research evidenceThe certainty of the evidence across all outcomes was determined to be very low. Certainty downgrades were due to risk of bias, indirectness and imprecision.  | Additional considerations |
| ValuesIs there important uncertainty about or variability in how much people value the main outcomes? |
| Judgement | Research evidence | Additional considerations |
| ○ Important uncertainty or variability○ Possibly important uncertainty or variability● Probably no important uncertainty or variability○ No important uncertainty or variability | No research evidence | There is task force agreement that prevention of mortality due to bleeding is a valued and critical outcome; however there is no specific research evidence regarding the value of pressure points or direct pressure specifically. The main goal is to have rapid, effective bleeding cessation. |
| Balance of effectsDoes the balance between desirable and undesirable effects favor the intervention or the comparison? |
| Judgement | Research evidence | Additional considerations |
| ○ Favors the comparison● Probably favors the comparison○ Does not favor either the intervention or the comparison○ Probably favors the intervention○ Favors the intervention○ Varies○ Don't know | Pressure point use demonstrated cessation of bleeding in some simulation studies; however, data regarding success varied. None of the studies had a control for comparison. Among four simulation studies, one with approximately 100 iterations of a variety of pressure points by providers or devices in a manikin model reported that all stopped simulated bleeding as measured by wound flow and femoral arterial pressure.(Kragh 2013 799) A study with 10 healthy participants receiving manual compression in 3 different pressure points/arteries showed that the number of participants with successful cessation of distal Doppler signal for 60 seconds ranged from 10-30%.(Swan 2009 672) A third study with healthy volunteers showed that cessation (measured by Doppler signal) occurred in 25/27 (93%) participants using compression by transducer at the femoral artery.(Garrick 2016 S126) A forth study with 11 healthy volunteers showed that complete vessel occlusion (measured by mean arterial blood flow velocity) was achieved in 8/11 (73%), 6/11 (55%) and 1/11 (9%) of applications for brachial, femoral and abdominal artery, respectively.(Slevin 2009 154)In a study of 27 healthy participants receiving compressions with transducer to femoral artery had no complications and no one experienced pain causing termination of participation. (Garrick 2016 S126) |  |
| Resources requiredHow large are the resource requirements (costs)? |
| Judgement | Research evidence | Additional considerations |
| ○ Large costs○ Moderate costs● Negligible costs and savings○ Moderate savings○ Large savings○ Varies○ Don't know | No research evidence | Both intervention and comparator use manual compression or pressure dressings therefore use approximately the same amount of resources.  |
| Certainty of evidence of required resourcesWhat is the certainty of the evidence of resource requirements (costs)? |
| Judgement | Research evidence | Additional considerations |
| ○ Very low○ Low○ Moderate○ High● No included studies | No research evidence |  |
| Cost effectivenessDoes the cost-effectiveness of the intervention favor the intervention or the comparison? |
| Judgement | Research evidence | Additional considerations |
| ○ Favors the comparison● Probably favors the comparison○ Does not favor either the intervention or the comparison○ Probably favors the intervention○ Favors the intervention○ Varies○ No included studies | No research evidence | Though both have similar costs associated with them, as pressure points do not consistently cease hemorrhage, further resources would likely be required, thus decreasing cost-effectiveness.  |
| EquityWhat would be the impact on health equity? |
| Judgement | Research evidence | Additional considerations |
| ○ Reduced○ Probably reduced● Probably no impact○ Probably increased○ Increased○ Varies○ Don't know | No research evidence | Both intervention and comparator use manual compression or pressure dressings therefore use approximately the same amount of resources, neither an exorbitant amount, therefore there would be minimal impact on equity.  |
| AcceptabilityIs the intervention acceptable to key stakeholders? |
| Judgement | Research evidence | Additional considerations |
| ○ No○ Probably no● Probably yes○ Yes○ Varies○ Don't know | No research evidence  | The use of pressure points would be acceptable in principle though as success of intervention is at times limited, as per the research, the use may be less acceptable when there are better options.  |
| FeasibilityIs the intervention feasible to implement? |
| Judgement | Research evidence | Additional considerations |
| ○ No○ Probably no● Probably yes○  Yes○ Varies○ Don't know | No research evidence | This intervention is slightly more difficult to implement, as more training is required on location of pressure points, however only minimally so, therefore still feasible.  |

# Summary of judgements

|  | **Judgement** |
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| **Problem** | No | Probably no | Probably yes | **Yes** |  | Varies | Don't know |
| **Desirable Effects** | Trivial | Small | Moderate | Large |  | **Varies** | Don't know |
| **Undesirable Effects** | Large | Moderate | Small | Trivial |  | Varies | **Don't know** |
| **Certainty of evidence** | **Very low** | Low | Moderate | High |  |  | No included studies |
| **Values** | Important uncertainty or variability | Possibly important uncertainty or variability | **Probably no important uncertainty or variability** | No important uncertainty or variability |  |  |  |
| **Balance of effects** | Favors the comparison | **Probably favors the comparison** | Does not favor either the intervention or the comparison | Probably favors the intervention | Favors the intervention | Varies | Don't know |
| **Resources required** | Large costs | Moderate costs | **Negligible costs and savings** | Moderate savings | Large savings | Varies | Don't know |
| **Certainty of evidence of required resources** | Very low | Low | Moderate | High |  |  | **No included studies** |
| **Cost effectiveness** | Favors the comparison | **Probably favors the comparison** | Does not favor either the intervention or the comparison | Probably favors the intervention | Favors the intervention | Varies | No included studies |
| **Equity** | Reduced | Probably reduced | **Probably no impact** | Probably increased | Increased | Varies | Don't know |
| **Acceptability** | No | Probably no | **Probably yes** | Yes |  | Varies | Don't know |
| **Feasibility** | No | Probably no | **Probably yes** | Yes |  | Varies | Don't know |

# Type of recommendation

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| --- | --- | --- | --- | --- |
| Strong recommendation against the intervention | Conditional recommendation against the intervention | Conditional recommendation for either the intervention or the comparison | Conditional recommendation for the intervention | Strong recommendation for the intervention |
| X | ○  | ○  | ○  | ○  |

# Conclusions

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| Recommendation |
| We recommend against the use of pressure points in comparison with direct pressure by first aid providers when treating people with severe, life-threatening external bleeding (strong recommendation, based on very low certainty of evidence). |
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| Justification |
| * We considered the low certainty of evidence surrounding the use of pressure points for life-threatening bleeding and placed considerable value in the fact that that there is no direct human evidence that the use of pressure points is effective in the treatment of life-threatening external bleeding.
* While there is some evidence that lay providers are able to use pressure points and that pressure points may halt some forms of bleeding it is the opinion of the Task Force that this evidence is not sufficient to validate the use of pressure points in life-threatening external bleeding.
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| Subgroup considerations |
| N/A |

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| Implementation considerations |
| N/A |

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| Monitoring and evaluation |
| N/A |

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| Research priorities |
| Research is required to determine if first aid providers can appropriately locate pressure points and if there is a role for the use of pressure points for adjunctive therapy in the setting of severe, life-threatening bleeding.  |

**References**

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