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Efficacy of Publicly Accessible Tourniquets When Applied by Laypeople: A Systematic Review

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ADMINISTRATIVE INFORMATION

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 24 September 2025 and was last updated on 24 September 2025.

INTRODUCTION

Review question / Objective This systematic review aims to identify if tourniquets applied by laypeople with little to no training effectively control bleeding using a basic manikin or tourniquet trainer extremity.

Rationale Uncontrolled extremity hemorrhage is a leading cause of preventable trauma-related death, and immediate bleeding control before emergency services arrive can be lifesaving. While Stop the Bleed (STB) programs have demonstrated that trained laypeople can acquire hemorrhage control skills, most bystanders in public emergencies will not have formal training. At the same time, policies increasingly consider placement of bleeding control kits in public spaces, similar to automated external defibrillators (AEDs).Uncontrolled extremity hemorrhage is a leading cause of preventable trauma-related death, and immediate bleeding control before emergency services arrive can be lifesaving. While Stop the Bleed (STB) programs have demonstrated that trained laypeople can acquire hemorrhage control skills, most bystanders in public emergencies will not have formal training. At the same time, policies increasingly consider placement of bleeding control kits in public spaces, similar to automated external defibrillators (AEDs).

Despite this, existing reviews of STB programs have focused primarily on training-related outcomes—such as willingness, confidence, or self-reported knowledge; rather than the objective effectiveness of tourniquet application by untrained laypeople. Moreover, the literature remains unclear on how point-of-care aids (e.g., instruction cards, audiovisual guidance) influence success without formal training.

By narrowing the scope to tourniquets, arguably the most technically challenging hemorrhage control tool, this review provides novel insight into whether publicly available tourniquets could

function as a scalable public health intervention, independent of widespread STB training.

Condition being studied Uncontrolled extremity hemorrhage in prehospital or public settings.

METHODS

Search strategy The following search string was developed in consultation with a healthcare librarian:: tourniquet AND (layperson OR laypeople) AND ((bleeding AND control) OR (hemorrhage AND control) OR "stop the bleed") NOT surgery

The search was limited to the period of January 1, 2013, to August 31, 2023 to capture the modern era of formal layperson tourniquet training programs and the period after major public health campaigns like Stop the Bleed began to gain traction.

Participant or population Uncontrolled extremity hemorrhage in prehospital or public settings, where timely bleeding control is critical to prevent otherwise avoidable trauma-related mortality.

Intervention Application of commercially available extremity tourniquets by laypeople, with or without supplemental point-of-care instructional aids (e.g., visual cards, audiovisual guidance).

Comparator Laypeople applying a tourniquet without training and without point-of-care (POC) aids.

Study designs to be included Peer-reviewed randomized controlled trials (parallel or crossover) and prospective clinical trials that evaluated tourniquet application by laypeople.

Eligibility criteria Inclusion criteria: Participants: Laypeople, defined as individuals without professional healthcare licensure, formal medical training, or military medical roles (e.g., combat medics). Intervention: Application of commercially available extremity tourniquets, with or without supplemental point-of-care (POC) aids (e.g., manufacturer instructions, just-in-time cards, audiovisual guidance). Comparators: Laypeople applying tourniquets with no training/POC aids, with POC aids alone, with partial instruction, or with formal Bleeding Control (B-Con) training; comparisons across tourniquet device types under common training conditions. Outcomes: At least one measure of efficacy of tourniquet application (e.g., correct/incorrect placement, adequacy of tightness/occlusion, simulated blood flow control, application time, blood loss estimation). Study design: Peer-reviewed randomized controlled trials (parallel or crossover) and prospective clinical trials. Publication criteria: English-language, peer-reviewed journal articles, published between January 1, 2013 and August 31, 2023. Exclusion criteria: Participants with prior medical training, healthcare licensure, or military medical experience. Studies evaluating surgical or intraoperative tourniquet use. Studies not reporting outcomes related to tourniquet application efficacy. Case reports, observational studies without intervention, reviews, systematic reviews, and meta-analyses. Duplicate publications or inaccessible full texts.

Information sources The authors used EBSCOHost to simultaneously search the following databases: Cumulated Index in Nursing and Allied Health Literature (CINAHL) Ultimate, Academic Search Premier, Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews, and Medical Literature Analysis and Retrieval System Online (MEDLINE) with Full Text. To ensure comprehensive coverage, additional targeted searches were performed in PubMed, Trip, Google Scholar, ClinicalTrials.gov, medRxiv, and manufacturer websites (e.g., CAT, SOFT-T, SWAT-T, RMT).The authors used EBSCOHost to simultaneously search the following databases: Cumulated Index in Nursing and Allied Health Literature (CINAHL) Ultimate, Academic Search Premier, Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews, and Medical Literature Analysis and Retrieval System Online (MEDLINE) with Full Text.

PubMed, Trip, Google Scholar, ClinicalTrials.gov, medRxiv, and various tourniquet websites, including CAT, Rapid Application Tourniquet (RAT), Stretch Wrap and Tuck Tourniquets (SWAT-T), and Special Operations Force Tactical Tourniquets (SOFT-T) were searched separately.

Main outcome(s) Successful/effective tourniquet application, defined by correct placement and adequate tightness/occlusion as measured on a manikin or tourniquet trainer extremity. Typically reported as a binary outcome (success vs. failure).

Additional outcome(s) Time to application (seconds) until tourniquet secured.
Time to achieve hemostasis (when measured).
Estimated blood loss or manikin “patient status” indicators.
Tourniquet pressure (mmHg) when available.

Comparison of different tourniquet types (e.g., CAT, SOFT-T, SAM XT, RMT, elastic devices, improvised devices).
Effect of training or point-of-care aids (manufacturer instructions, just-in-time cards, audiovisual aids, web/video instruction, formal B-Con training) on success rates.

Data management Two reviewers (SB, CN) independently screened all titles and abstracts, followed by full-text review using Covidence systematic review software. Discrepancies at any stage were resolved through discussion, and a third reviewer (SR) was consulted if consensus could not be reached.

Quality assessment / Risk of bias analysis Risk of bias will be evaluated using the Cochrane RoB 2 tool (including the crossover-specific version when applicable). Two reviewers will independently assess each study, resolving discrepancies by consensus or third reviewer input.

Strategy of data synthesis Data from included studies will be synthesized narratively, organized around key domains: tourniquet type, presence/absence of training, and presence/absence of point-of-care aids. Outcomes will be summarized in structured tables and descriptive text, highlighting trends in success rates, time to application, and other relevant measures.

Subgroup analysis Subgroup analyses will be conducted narratively according to the following domains:
Tourniquet type
Training exposure
Point-of-care intervention type
Application conditions

Subgroup comparisons will be descriptive, highlighting relative success rates and limitations within each category.

Sensitivity analysis Due to heterogeneity in study designs, populations, and outcome measures, formal quantitative sensitivity analyses were not feasible. Instead, sensitivity was explored qualitatively by assessing whether the exclusion of studies at high risk of bias altered the overall conclusions.

Language restriction English Language.

Country(ies) involved United States.

Keywords Tourniquet; laypeople; hemorrhage control; Stop the Bleed; point-of-care; effective application; manikin.

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