Senior Project Proposal
Kei S.
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I. **Title of Project:** Stop the Bleed: Ensuring Preparedness

II. **Contact Information:**
- BASIS Advisor's Name: Trent McDowell
- Internship Location: Northern Arizona Healthcare Corporation: Trauma Services
- On-site Advisors:

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III. **Statement of Purpose:**

Stop the Bleed programs are critical initiatives modeled after the proven effectiveness of military tourniquet techniques that equip individuals with life-saving skills crucial in emergencies, particularly in scenarios like school shootings. These programs teach techniques for effective control, recognizing that individuals can bleed out in a matter of minutes, often before an ambulance arrives (emergency services typically take an average of 7 minutes to reach the scene). Thus, it is crucial for those present to be well-trained and capable of providing immediate medical assistance. Assessing the effectiveness of these programs is vital given the alarming rise in school shootings. This research will evaluate the efficacy of Stop the Bleed training programs in adequately preparing school faculty to respond effectively during medical emergencies, especially within the context of school shootings.

The assessment of these programs' effectiveness is crucial for several reasons. First, assessing problems with the effectiveness of these programs ensures that school staff receive the necessary training to promptly respond to life-threatening situations, potentially saving lives in critical moments. Second, identifying any shortcomings in these programs is essential for improvement, allowing for targeted enhancements in training methodologies. Lastly, evaluating whether school faculty have properly received

and comprehended the information conveyed in these programs is pivotal for optimizing faculty preparedness and response during emergencies.

Main Question:

- How effective are Stop the Bleed training programs in adequately preparing school faculty to respond effectively during medical emergencies, specifically within the context of school shootings?

Sub Questions:

- What is the extent of implementation of Stop the Bleed training programs across schools, and how does this correlate with faculty participation and completion rates?
- How comprehensively do school faculty understand and retain the principles taught in Stop the Bleed training, specifically regarding techniques like tourniquet application and other life-saving measures?
- To what extent do school faculty feel confident in their ability to respond to medical emergencies, particularly during school shootings, following completion of Stop the Bleed training programs?

IV. Background:

My fascination with the medical field was ignited by a series of events that underscored the importance of emergency preparedness, particularly in the context of school safety amidst the alarming rise in incidents like school shootings. Witnessing the urgent need for effective response strategies prompted my personal pursuit of understanding basic medical procedures and emergency protocols, with a specific focus on their practical application within the school environment.

Exploring this intersection between emergency preparedness and practical application has been an evolving journey. While my formal exposure to this specific area has been limited, my inherent curiosity and passion for comprehending the nuances of immediate medical care in high-pressure situations have driven my independent studies.

My educational background, especially my exposure to structured analysis and critical thinking through my AP Statistics course, has fortified my analytical capabilities. This discipline has equipped me with a systematic approach to interpreting data and conducting methodical assessments.

The convergence of emergency preparedness and its direct application within the school setting deeply resonates with me. The prospect of contributing to the evaluation of the Stop the Bleed training programs is not only an academic pursuit but also a commitment to enhancing the safety and well-being of students and staff. This opportunity aligns with my aspirations to bridge the gap between theoretical knowledge and practical implementation in emergency situations.

V. Prior Research:

The compilation of research on Stop the Bleed programs provides a comprehensive view of the challenges, efficacy, and potential improvements in equipping individuals to respond effectively to emergencies, particularly severe bleeding scenarios.

Several studies highlight the critical need for a more comprehensive assessment and enhancement of these programs. Dhillon et al.[1] uncover a concerning disparity between participants' intention to acquire necessary materials, like tourniquets, after training and the actual procurement of these materials. This discrepancy, attributed to cost and accessibility barriers, poses a substantial challenge to the program's effectiveness.

Ross et al.[2] conducted an investigation into tourniquet application by laypersons further underscoring the complexity of usability. Despite assessing different tourniquet types, the study reveals alarmingly high failure rates in the correct application of tourniquets. This discrepancy between intended use and actual application emphasizes the necessity for enhanced user-friendly designs or more intuitive training methodologies.

The examination of post-training efficacy and retention of skills emerges as a recurring theme across multiple studies. Goolsby et al.[3] emphasize the impact of just-in-time instructions, showing a significant increase in successful tourniquet placement among laypersons. Conversely, Goralnick et al.[8] identify the superiority of specific instructional interventions in enabling effective hemorrhage control. However, Weinman[9] reports a decline in skill retention after six months, signaling the need for consistent refresher training to maintain proficiency.

Furthermore, Schroll et al.[10] and Zwislewski et al.[11] delve into the impact of hands-on training methods. Their findings highlight the substantial contribution of practical, hands-on practice in enhancing the knowledge and skills of laypersons in managing severe bleeding. Additionally, Goolsby et al.[3] explore the potential of web-based training alongside just-in-time instructions, providing promising insights into scalable educational strategies. However, these approaches also pose challenges, such as limited practical application and potential participant dropout, requiring further refinement.

Collectively, these studies underscore critical areas necessitating improvement in Stop the Bleed programs. These include enhanced accessibility to materials, sustained skill retention strategies, and the importance of incorporating hands-on training approaches. The findings collectively emphasize the imperative need for ongoing evaluation and tailored enhancements in training methodologies. Such improvements are essential to equip individuals, especially laypersons, with the requisite skills to respond effectively to life-threatening emergencies characterized by severe bleeding incidents.

VI. Significance:

The Senior Project Committee's support in allowing me to conduct this research is crucial due to its direct relevance to our local community. Focusing on the efficacy of Stop the Bleed programs in Flagstaff and the surrounding areas, I aim to unearth insights that can immensely benefit emergency preparedness. My hope is to uncover practical improvements to these programs, making them more tailored and effective for our region's unique needs.

Through this research, I aspire to contribute a localized perspective, enriching the existing knowledge base on bleeding control programs. This study will offer nuanced insights into teaching and applying these critical skills specifically within the context of Flagstaff. The intent is to enhance the understanding of what works best in our community, offering a fresh angle to the broader conversation about emergency response.

The new knowledge derived from my research will be a valuable addition to the existing field, providing specific and targeted strategies for improving bleeding control training. My findings aim to empower local healthcare providers and hospitals in Arizona, equipping them with refined methodologies to implement more impactful programs. Moreover, this research seeks to elevate public awareness about the importance of these initiatives, arming individuals with life-saving knowledge during critical situations.

My final presentation will serve as a practical resource for hospitals, medical institutions, and emergency responders in Arizona. I aim to collaborate with these entities to implement the enhanced training programs suggested by my findings. Additionally, I plan to share my research outcomes with the broader public, intending to raise awareness and empower individuals to act effectively during emergencies. Some ways I could share outcomes with the public are public talks coordinated with the hospital, as well as through online platforms where I could share infographics or videos on my findings.

VII. Description:

I plan to use a multifaceted research approach that involves both existing literature analysis and direct empirical studies. To begin, I will extensively review academic databases and scholarly journals, performing internet research to gather data from prior surveys, experiments, and studies related to the efficacy of Stop the Bleed programs. This will provide a comprehensive understanding of the existing knowledge, including the successes and challenges faced in implementing these programs.

In addition to this literature review, I will be working with a peer, Sarah W. She'll handle survey design and distribution as an intern, while I focus on analysis and research. She intends to carry out both a pre-training survey as well as a post-training survey, specifically targeting trainees in Flagstaff. These surveys will aim to gauge their understanding, preparedness, and retention of skills gained from existing training

programs. These surveys can also serve as a reusable tool for continuous assessment of program efficacy.

My primary focus for this research project will center on evaluating bleeding control training programs, by testing the retention of skills over different time intervals pre and post-training. aiming to create a reusable tool for continuous assessment. I will do this using the data that Sarah is able to receive through her surveys. I will look at various variables to see which areas within the programs could change with a different approach to teaching.

Should time permit, I aspire to develop supplementary educational materials, like an updated slide show and video tutorial, based on the insights gained from our research findings. While existing resources exist, incorporating our survey input will enhance the relevance and effectiveness of these materials, contributing to better accessibility for those unable to attend in-person sessions. Ultimately, my aim is to refine existing programs through survey data, ensuring their ongoing improvement and wider accessibility within our community.

VIII. Methodology:

Three-Month Research Period:

Training Program Implementation (Weeks 1-2):

- Conduct Stop the Bleed training programs at selected schools.
- Ensure proper scheduling and resources for effective training.

Post-Training Survey Collaboration (Weeks 3-4):

- Collaborate with Sarah W. in reviewing and understanding post-training survey layout.
- Use this insight to inform data analysis planning.

Data Analysis Planning and Execution (Weeks 5-6):

- Devote time to designing detailed statistical analysis methodologies based off of the survey layout.

PowerPoint and Video Creation (Weeks 7-8):

- Allocate time to create a revised PowerPoint presentation.
- Develop a video summarizing key research findings and methodologies.

Report Compilation and Presentation (Weeks 9-10):

- Compile research findings into a report or presentation.
- Incorporate detailed statistical analysis into the presentation, using various visual aids.

IX. Problems:

Difficulties in scheduling training programs at the school might arise due to administrative constraints and teacher availability. Engaging school administrators and ensuring the alignment of their schedules with the proposed training sessions can be challenging. Additionally, teacher availability for these sessions could pose obstacles. Moreover, there might be reluctance among some participants to engage in the pre/post surveys, impacting the data collection process. Transforming survey insights into actionable changes for the existing training programs might also present challenges as it requires a nuanced understanding of the specific needs and improvements sought. To address these issues, I plan to maintain open communication with school administrators to align schedules effectively, possibly offering flexible training times. Addressing teacher concerns and providing incentives or alternate timings could enhance participation rates. To mitigate survey reluctance, I aim to emphasize the importance of their contribution and ensure anonymity in responses. Regarding translating survey insights, I'll collaborate with stakeholders and experts to decode findings into tangible improvements for the training programs, fostering a clearer direction for enhancement.

X. Budget:

The projected expenses for this project primarily revolve around surveying materials, potentially incurring costs for using Survey Monkey for data collection. However, these resources could be sourced from the hospital, potentially minimizing this expense. Additionally, if we decide to create our training video or presentation, there might be costs associated with acquiring PowerPoint or video equipment. Another possible expense could be related to obtaining CPR certification, which might involve certification fees depending on the chosen method. To offset these expenses, seeking support from the hospital for surveying materials and exploring free software alternatives, will be necessary.

XI. Bibliography:

(1) Dhillon NK, Dodd BA, Hotz H, et al. What Happens After a Stop the Bleed Class? The Contrast Between Theory and Practice. Journal of Surgical Education. 2019;76(2):446-452. doi:https://doi.org/10.1016/j.jsurg.2018.08.014

Summary:
This study examines participants' actions post-Stop the Bleed training, focusing on material acquisition. Despite expressing intent, a disparity exists between participants' reported likelihood to obtain necessary materials (like tourniquets) and actual acquisition rates post-training. Cost and accessibility are cited as barriers.

Evaluation:

The study uses a standardized survey to highlight discrepancies in material acquisition post-training. It acknowledges potential limitations like follow-up loss and response bias but emphasizes the need for strategies to bridge the gap between intent and action for effective program implementation.

(2) Ross EM, Mapp JG, Redman TT, Brown DJ, Kharod CU, Wampler DA. The Tourniquet Gap: A Pilot Study of the Intuitive Placement of Three Tourniquet Types by Laypersons. The Journal of Emergency Medicine. 2018;54(3):307-314. doi:https://doi.org/10.1016/j.jemermed.2017.09.011

Summary:
This pilot study investigates the effectiveness of different tourniquet types for layperson use within the "Stop the Bleed" campaign. The study aims to identify the most intuitive tourniquet for correct application by laypersons. Participants, novice in tourniquet use and excluded based on prior medical certification or training, were randomly assigned one of three commercially available tourniquets. The primary outcome measured was successful tourniquet placement, revealing high failure rates.

Evaluation:
The study conducts a randomized controlled trial, demonstrating the disparity between intended and successful tourniquet application by laypersons. While the study provides valuable insights into tourniquet usability, it acknowledges potential limitations in sample size and exclusion criteria. The findings underscore the need for widespread education and improvements in tourniquet design for layperson use, emphasizing the necessity for impactful public health interventions.

(3) Goolsby C, Branting A, Chen E, Mack E, Olsen C. Just-in-Time to Save Lives: A Pilot Study of Layperson Tourniquet Application. Cone DC, ed. Academic Emergency Medicine. 2015;22(9):1113-1117. doi:https://doi.org/10.1111/acem.12742

Summary:
This pilot study aimed to assess the impact of just-in-time (JiT) instructions on the successful application of Combat Application Tourniquets (C-A-T) by laypersons. Conducted in August 2014 at the Uniformed Services University campus, the randomized study involved 194 volunteers without prior military or medical training. Participants, faced with a simulated mass casualty event, were tasked with applying a tourniquet to a mannequin's leg. The primary outcome measured the proportion of successfully applied tourniquets among those who received JiT instructions versus controls without instructions.

Evaluation:

Employing a randomized controlled trial, the study demonstrates that JiT instructions significantly increased successful tourniquet placement among laypersons. Participants provided with JiT instructions exhibited over twice the success rate in tourniquet application compared to those without instructions. The study's findings suggest that JiT instructions can substantially assist the lay public in effectively applying point-of-injury hemorrhage control, emphasizing their potential in enhancing public response during mass casualty incidents.

(4) Melmer P, Carlin M, Castater CA, et al. Mass Casualty Shootings and Emergency Preparedness: A Multidisciplinary Approach for an Unpredictable Event. Journal of Multidisciplinary Healthcare. 2019;Volume 12:1013-1021. doi:https://doi.org/10.2147/jmdh.s219021

Summary:
This comprehensive review examines the clinical significance of interdisciplinary team collaborations and extrapolates lessons learned from past Mass Casualty Events (MCEs). The manuscript highlights the critical importance of effective hospital disaster preparedness, emphasizing the need for coordinated responses involving healthcare personnel, emergency services, law enforcement, government agencies, and community leaders. The review underscores the necessity of scheduled training for healthcare professionals to ensure accurate triage and immediate emergency care during MCEs, primarily focusing on incidents such as mass shootings.

Evaluation:
The review extensively discusses the multifaceted elements crucial for effective response and preparedness during MCEs. It identifies the significance of multidisciplinary teamwork in managing and optimizing care delivery for a surge of critically injured patients. Additionally, it delves into the specifics of hospital operations, communication strategies, and the coordination required among various healthcare sectors and external agencies during and after MCEs. The manuscript draws upon historical events, global case studies, and specific incidents, providing a detailed overview of the challenges faced, strategies adopted, and lessons learned in the aftermath of these critical incidents.

(5) Timbie JW, Ringel JS, Fox DS, et al. Systematic Review of Strategies to Manage and Allocate Scarce Resources During Mass Casualty Events. Annals of Emergency Medicine. 2013;61(6):677-689.e101. doi:https://doi.org/10.1016/j.annemergmed.2013.02.005

Summary:
This review analyzes evidence on strategies for efficiently managing limited medical resources during mass casualty events (MCEs) by examining 74 studies from various

databases and gray literature sources. It explores strategies like reducing healthcare demand, optimizing existing resources, augmenting resources, and crisis care standards. However, due to diverse study contexts and outcome measures, conclusive findings are limited. Only two strategies—efficient distribution of countermeasures through dispensing points and inconsistencies in field triage system performance—offer enough evidence for tentative conclusions.

Evaluation:
This systematic review comprehensively assessed strategies for MCE resource management, but its findings were constrained by diverse study designs and outcomes. While it highlighted key limitations in available evidence, the review stressed the need for standardized methodologies and further research to establish robust conclusions in this critical area.

(6) Kim J, Lee O. Effects of a simulation-based education program for nursing students responding to mass casualty incidents: A pre-post intervention study. Nurse Education Today. 2020;85:104297. doi:https://doi.org/10.1016/j.nedt.2019.104297

Summary:
Kim and Lee conducted a pre-post intervention study to evaluate a simulation-based education program's effectiveness on nursing students' responses to mass casualty incidents (MCI). Thirty-four graduating nursing students participated in lectures, practical sessions, and tests, showing increased positive attitudes post-intervention. While indicating a tendency for undertriage, the participants reported high satisfaction with the program, emphasizing its value in preparing for real-life scenarios. However, the absence of a control group limits comparative analysis and underscores the need for future studies to explore diverse instructional methods and tailored resources for disaster preparedness education.

Evaluation:
The study by Kim and Lee effectively assesses the impact of a simulation-based program on nursing students' preparedness for mass casualty incidents. By focusing on crucial elements like attitude, teamwork, and satisfaction, it highlights the program's positive influence. However, the lack of a control group restricts the ability to compare the program's efficacy against other educational approaches. The study's recommendation for future research to explore varied instructional methods and customized resources acknowledges the necessity for a broader perspective in disaster preparedness education, enhancing its relevance across diverse contexts.

(7) Khajehaminian MR, Ardalan A, Keshtkar A, et al. A systematic literature review of criteria and models for casualty distribution in trauma related mass casualty incidents. Injury. 2018;49(11):1959-1968. doi:https://doi.org/10.1016/j.injury.2018.09.005

Summary:
This review examines models and criteria influencing casualty distribution in trauma-related mass casualty incidents. The study evaluated 4540 documents, identifying 491 criteria affecting casualty distribution across pre-hospital and hospital settings, encompassing triage, treatment, and incident-related factors. These criteria, categorized as "model extracted" and "author suggested," offer a comprehensive view of the elements shaping casualty management. Notably, it is the first systematic review in this domain, emphasizing key factors in mass casualty incident management based on pre-hospital and hospital capacities.

Evaluation:
This review fills a crucial gap by analyzing criteria impacting casualty distribution in mass casualty incidents. The systematic search and quality assessment enhance the study's credibility, offering a structured understanding of influential factors. However, it primarily focuses on identified criteria without exploring their practical application. Future studies could validate these criteria in real scenarios, assessing their effectiveness in optimizing casualty distribution during such incidents.

(8) Goralnick E, Chaudhary MA, McCarty JC, et al. Effectiveness of Instructional Interventions for Hemorrhage Control Readiness for Laypersons in the Public Access and Tourniquet Training Study (PATTS). JAMA Surgery. 2018;153(9):791. doi:https://doi.org/10.1001/jamasurg.2018.1099

Summary:
This randomized clinical trial assessed the effectiveness of different instructional interventions and in-person training for hemorrhage control among laypersons compared to no intervention. The study, conducted with 465 participants, found that the Bleeding Control Basic (B-Con) course was notably superior to other interventions and control groups in facilitating correct tourniquet application. However, retention of this skill after 3 to 9 months was observed in only 54.5% of participants who received B-Con training, emphasizing the need to explore refresher training or improved point-of-care instructions to enhance skill retention.

Evaluation:
This clinical trial offers valuable insights into the efficacy of hemorrhage control training among laypersons. It highlights the superiority of in-person training (B-Con course) over other instructional interventions, emphasizing its efficacy in enabling bystanders to effectively manage hemorrhage incidents. However, the study also underscores a significant retention challenge, with only around half of the participants maintaining the tourniquet application skill over several months. This prompts the need for further

investigations into strategies like refresher courses or enhanced point-of-care instructions to sustain these critical life-saving skills among laypersons.

(9) Weinman S. Retention of Tourniquet Application Skills Following Participation in a Bleeding Control Course. Journal of Emergency Nursing. 2020;46(2):154-162. doi:https://doi.org/10.1016/j.jen.2019.10.020

Summary:
This study delves into the retention of tourniquet application skills acquired through the American College of Surgeons' Stop the Bleed (STB) program among laypersons. It involved 46 participants returning after 6 months, demonstrating a decline in skill retention, with mean scores dropping from 100% initially to 69% at the 6-month mark. While 30% attained perfect scores, 26% could not control life-threatening bleeding. The study emphasizes the necessity for refresher training within six months of the initial course, indicating that skill degradation can impact efficient hemorrhage control.

Evaluation:
This study significantly contributes to understanding the retention of tourniquet application skills among individuals who completed the STB program. It highlights a notable decrease in skill retention after 6 months, indicating a necessity for regular refresher training to maintain proficiency in controlling life-threatening bleeding. However, limitations, such as a small sample size and single follow-up point, suggest the need for broader studies to evaluate skill degradation over various intervals. The study also has implications for emergency nurses involved in teaching bleeding control courses, emphasizing the importance of arranging refresher training to ensure ongoing competence among participants.

(10) Schroll R, Smith A, Martin MS, et al. Stop the Bleed Training: Rescuer Skills, Knowledge, and Attitudes of Hemorrhage Control Techniques. Journal of Surgical Research. 2020;245:636-642. doi:https://doi.org/10.1016/j.jss.2019.08.011

Summary:
This study assesses the effectiveness of the Stop the Bleed (STB) program in enhancing skills and knowledge related to bleeding control among lay rescuers (LRs) and medical rescuers (MRs). The participants' confidence in managing severe bleeding and packing bleeding wounds significantly improved post-course for both groups. The most notable increases in confidence were observed in these two areas where participants had the lowest confidence levels before the training. Objective assessment of LR skills demonstrated a high proficiency rate of 99.3% after completing the course. The study concludes that STB training, conducted within a 1-hour session, effectively enhances both confidence and skill proficiency in bleeding control for LRs and MRs.

Evaluation:
This study effectively evaluates the impact of the STB program on lay rescuers and medical rescuers, showcasing its efficacy in improving confidence and skill levels related to bleeding control. The use of quantitative measures, such as a Likert scale for self-reported confidence and an internally validated objective assessment tool, adds credibility to the findings. The high proficiency rate of 99.3% among lay rescuers on post-course objective assessments emphasizes the effectiveness of the training. However, while the study shows immediate improvements post-training, it lacks long-term follow-up to assess skill retention over time. The study's conclusion suggests the need for further investigation into instructor training, continued education for lay rescuers, and optimal recertification intervals for sustained skill proficiency.

(11) Zwislewski A, Nanassy AD, Meyer LK, et al. Practice makes perfect: The impact of Stop the Bleed training on hemorrhage control knowledge, wound packing, and tourniquet application in the workplace. Injury. 2019;50(4):864-868. doi:https://doi.org/10.1016/j.injury.2019.03.025

Summary:
This study evaluates the effectiveness of Stop the Bleed (STB) training among non-medical potential first responders (PFRs) in workplace settings. The training consisted of lectures and hands-on components focusing on bleeding control techniques. Pre- and post-assessments showed a significant increase in bleeding control knowledge among participants after the STB course. Additionally, the study divided participants into experimental and control groups to assess the impact of guided hands-on practice on wound packing and tourniquet application. Results indicated that PFRs who engaged in hands-on practice scored notably higher in both wound packing and tourniquet application compared to those who received only lectures. This study concludes that hands-on training significantly contributes to the success of lay STB training programs.

Evaluation:
The study effectively assesses the impact of STB training on non-medical potential first responders' knowledge and skill-based abilities in managing hemorrhage. The use of pre- and post-assessments for knowledge, along with practical evaluations for wound packing and tourniquet application, provides a comprehensive understanding of the training's impact. The division of participants into experimental and control groups helps isolate the influence of hands-on practice, highlighting its significant contribution to proficiency in bleeding control techniques. However, the study could benefit from additional insights into the long-term retention of skills acquired through this training. Nonetheless, the findings underscore the importance of hands-on, in-person training in enhancing the effectiveness of STB programs among laypersons in workplace settings.

(12) Goolsby CA, Strauss-Riggs K, Klimczak V, et al. Brief, Web-based Education Improves Lay Rescuer Application of a Tourniquet to Control Life-threatening Bleeding. Khandelwal S, ed. AEM Education and Training. 2018;2(2):154-161. doi:https://doi.org/10.1002/aet2.10093

Summary:
The research investigates the efficacy of incorporating brief web-based training alongside just-in-time (JiT) instructions for laypersons in the context of tourniquet application. The study employs a prospective, non-blinded, randomized design involving lay participants. It aims to determine whether preexposure to web-based training improves success rates in applying tourniquets compared to relying solely on JiT instructions. The outcomes assessed include successful tourniquet application, application time, placement accuracy, and participants' ability to identify situations requiring a tourniquet.

Evaluation:
This study's innovative approach of combining web-based education with JiT instructions presents promising results for empowering laypeople in managing life-threatening hemorrhage. The methodology, employing randomized prospective design, strengthens the reliability of the findings. However, limitations exist, such as the static model used for assessment, potential selection bias due to participant dropout, and lack of blinding for observers. Despite these limitations, the research offers valuable insights into a potentially scalable and cost-effective educational strategy to equip the public with life-saving skills. The study's focus on critical bleeding control techniques aligns with the broader objectives of Stop the Bleed campaigns and could significantly impact public health initiatives aimed at reducing mortality due to uncontrolled hemorrhage.