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Translating Violence Prevention Programs from Research to Practice: SafERteens Implementation In an Urban Emergency Department

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Abstract

Background: Youth violence is a leading cause of adolescent mortality, underscoring the need to integrate evidence-based violence prevention programs into routine Emergency Department (ED) care.

Objectives: To examine the translation of the SafERteens program into clinical care.

Methods: Hospital staff provided input on implementation facilitators/barriers to inform toolkit development. Implementation was piloted in a 4-arm effectiveness-implementation trial, with youth (age: 14-18) screening positive for past 3-month aggression randomized to either SafERteens (delivered remotely or in-person) or enhanced usual care (EUC; remote or in-person), with follow-up at post-test and 3-months. During maintenance, ED staff continued in-person SafERteens delivery and external facilitation was provided. Outcomes were measured using the RE-AIM implementation framework.

Results: SafERteens completion rates were 77.6% (52/67) for remote and 49.1% (27/55) for in-person delivery. In addition to high acceptability ratings (*e.g.*, helpfulness), post-test data demonstrated increased self-efficacy to avoid fighting among patients receiving remote (IRR=1.22; 95% CI=1.09-1.36) and in-person (IRR=1.23; 95% CI=1.12-1.36) SafERteens, as well as decreased pro-violence attitudes among patients receiving remote (IRR=0.83; 95% CI=0.75-0.91) and in-person (IRR=0.87; 95% CI=0.77-0.99) SafERteens when compared to their respective EUC groups. At 3-months, youth receiving remote SafERteens reported less non-partner aggression (IRR=0.52; 95% CI=0.31-0.87; Cohen's $d=-0.39$) and violence consequences (IRR=0.47; 95% CI=0.22-1.00; Cohen's $d=-0.49$) compared to remote-EUC; no differences were noted for in-person SafERteens delivery. Barriers to implementation maintenance included limited staff availability and a lack of reimbursement codes.

Conclusions: Implementing behavioral interventions such as SafERteens into routine ED care is feasible using remote delivery. Policymakers should consider reimbursement for violence prevention services to sustain long-term implementation.

Keywords

Youth Violence; Translation; Emergency Departments; Implementation

INTRODUCTION

Youth violence is a significant U.S. public health problem.¹ Homicide is the third leading cause of death for adolescents (ages 14-18); 90% occurring as a result of firearm-related violence.² Interpersonal violence also results in 200,000 adolescent emergency department (ED) visits annually for non-fatal assault injuries.² Nationally, nearly a quarter of high-school youth have been in a fight during the past year and 1 in 6 report weapon (*e.g.*, firearm) carriage in the past 30-days.³ Youth experiencing violent injuries are at elevated risk for developing substance use disorders and mental health issues (*e.g.*, PTSD), as well as experiencing physical disabilities, arrest/incarceration, violent injuries, and death.⁴⁻¹³ Disparities exist in these outcomes, with homicide and incarceration rates significantly higher for African American youth,¹ especially youth residing in disadvantaged

communities without access to adequate prevention services.^{14–17} Societal costs for youth violence are estimated at ~\$36 billion annually.¹⁸ Given data showing negative outcomes for youth treated in the ED for violence,^{4,19} ED-based violence prevention efforts are warranted.²⁰

While EDs are recognized as an important setting for violence prevention,^{20–25} few evidence-based programs exist. SafERteens²⁶ is a theory-based violence intervention integrating elements of motivational interviewing to enhance problem recognition (i.e., why behaviors negatively influence goals) with cognitive behavioral skills training (i.e., how to change behaviors). Delivered by a therapist during the ED visit, SafERteens has demonstrated efficacy in prior clinical trials reducing multiple forms of violence, including non-partner (e.g., peer) aggression, non-partner/partner victimization, and violence consequences (e.g., school suspension) among at-risk adolescents (i.e., those with recent alcohol use/fighting).^{26–28} SafERteens was also found to reduce alcohol-related consequences (e.g., driving under the influence) and depression symptoms.^{26,29} The number needed to treat, or number of youth that need to receive SafERteens to prevent one violent encounter or consequence in the subsequent 12-months, was eight.^{26,27} Findings for violence reduction were replicated in a universal sample of youth seeking ED treatment from high-risk neighborhoods.³⁰ Post-hoc cost analyses indicate that SafERteens costs ~\$17.06 per violence event/consequence averted, considerably less than the costs of providing trauma care (e.g., firearm assaults average acute care cost = \$20,989; \$389 million annually nationwide).^{31,32}

Research studies to date have disproportionately focused on establishing program efficacy and less on how such programs function in real-world clinical settings.³³ This widely acknowledged research-to-practice gap delays program dissemination and reduces public health impact for efficacious programs.³⁴ The CDC's research-to-practice framework,³⁵ entitled Replicating Effective Programs (REP), is a theoretically-informed³⁶ strategy³⁷ for implementing evidence-based interventions in routine clinical practice.³⁶ This framework combines pre-implementation program packaging to translate intervention materials into a user-friendly format with the provision of technical assistance during implementation.^{38,39} Prior studies have demonstrated that REP can also be enhanced by adding external facilitation (EF), including regularly scheduled support (e.g., mentoring, feedback, strategies to address barriers) for on-site staff implementing the intervention.^{40,41} Guided by these strategies, we obtained funding to pilot a small hybrid effectiveness-implementation study examining the translation of SafERteens into clinical care in a low-resourced Level-1 trauma center. Outcomes were examined using the RE-AIM framework to assess reach (e.g., ED screening / intervention delivery rates), effectiveness (e.g., participant self-report outcomes), adoption (e.g., staff/provider trainings), implementation (e.g., fidelity ratings of implementation delivery), and maintenance (e.g., continued SafERteens delivery overtime).^{42,43} Given that SafERteens efficacy has been established in prior research, this study focuses on implementation data that serves to bridge the research to practice gap noted above.

METHODS

This study (Figure 1) was conducted in three phases (Pre-implementation; Hybrid Effectiveness-Implementation; Maintenance). In the pre-implementation phase, minor program adaptations were made based on hospital staff feedback and a SafERteens technical package (www.SafERteens.org) to support implementation was created. In the hybrid effectiveness-implementation phase (2/2017-11/2017), we examined RE-AIM outcomes, including effectiveness (“E”), by conducting a randomized control trial (RCT) comparing SafERteens to an enhanced usual care condition (*i.e.*, resource brochure). In the maintenance phase (3/2018-9/2018), we observed program continuation following the initial implementation to identify additional barriers that would inform future implementation within other EDs. Study procedures were approved by the University of Michigan (UM) and Hurley Medical Center (HMC) Institutional Review Boards (IRBs), and a Certificate of Confidentiality was obtained.

Setting/Population

This study was conducted at Hurley Medical Center (HMC; Level 1 trauma center), a 443-bed, teaching hospital in Flint, Michigan. Flint violent crime and poverty rates are comparable to other urban centers (*e.g.*, Detroit).⁴⁴ The ED patient population reflects Flint, which is 50-60% African American.⁴⁵ ED patients (ages: 14-18) presenting for any reason (*e.g.*, abdominal pain, ankle sprain) and reporting past 3 month aggression on a screening survey were eligible for study enrollment.

Pre-Implementation Procedures: SafERteens Adaptation & Program Packaging.

Semi-structured interviews were conducted at the outset of the study to identify key implementation facilitators and barriers.^{37,43,46,47} Despite strong support for addressing youth violence in the ED setting and support for the SafERteens program, hospital staff identified several potential implementation barriers, including eligibility screen length, time/staff availability for screening/intervention delivery, technical expertise required to deliver specific intervention components, and a lack of re-imburement for the clinical service. To address these, we made minor adaptations to the SafERteens program (see Figure 1 for detailed description and phases of this translation study). In addition, recognizing that intervention effects diminish outside of tightly controlled research settings,⁴⁸ a tailored automated text message booster program was developed to augment the therapist-delivered content, as tailored text messaging shows promise for other health behaviors.⁴⁹⁻⁵¹ Final training and intervention elements were combined into a web-based technical program package (www.safERteens.org).

Hybrid Effectiveness-Implementation Study Procedures

Overview.—We conducted a small randomized controlled trial (RCT) to examine effectiveness of SafERteens, including two delivery modalities (*i.e.*, in-person delivery by trained on-site hospital staff; telehealth delivery by remote study therapists), with enhanced usual care (EUC; *e.g.*, review of a resource brochure with mental health, substance use, and violence prevention resources).

Recruitment.—Participants were recruited (2/2017-11/2017) by trained research assistants (RAs), Sunday through Friday, during high-volume hours (3-11 p.m.). RAs approached youth in the ED to obtain study assent/consent (ages 14-17: child assent with parental consent; age 18: consent); participants self-administered a screening survey on an iPad to determine eligibility.

Eligibility.—Patients were screened using 3 questions assessing frequency of past 3-month aggression toward partners (*e.g.*, girlfriend/boyfriend) or non-partners (*e.g.*, friends). Questions consisted of collapsed items from the Conflicts Tactics Scale used in prior work with ED youth^{52,53} to assess frequency of moderate (*e.g.*, pushed, shoved), severe (*e.g.*, hit, punched), and weapon-related aggression (*e.g.*, knife, firearm).²⁶ Participants indicating any aggression in the past 3-months were eligible. Participants were excluded if they were non-English speaking, active prisoners, presenting for sexual assault, suicide attempt, or child abuse, or if they were unable to provide informed assent/consent (*e.g.*, medically unstable).

Procedures.—Eligible youth completed a second consent/assent for the study, followed by a self-administered baseline survey (~10-15 min). Enrolled participants were randomized (through a web-based computer program) to either SafERteens or EUC, stratified by sex given differences in rates/context of violence.^{20,54,55} Due to availability constraints of HMC personnel, randomization varied by day-of-week. Patients presenting Sunday, Monday or Tuesday were randomized to either remotely-delivered SafERteens by a study therapist (remote SafERteens) or the corresponding EUC (remote EUC) group. Patients presenting Wednesday, Thursday, or Friday were randomized to either in-person SafERteens delivery by on-site ED staff (In-Person SafERteens) or the corresponding EUC group (In-Person EUC). Given the implementation focus, participants were randomized 2:1 to intervention conditions as compared to EUC conditions, regardless of day of week. Participants self-administered an immediate post-test (~5 minutes; \$20 remuneration for baseline and post-test) in the ED and then later completed a 3-month follow-up survey (\$25 remuneration).

SafERteens.—Youth in active intervention groups received SafERteens, a 30-45 minute brief evidence-based behavioral intervention.^{26,27,30} To ensure privacy, individuals accompanying the participant were asked to wait outside treatment rooms. The intervention integrates motivational interviewing (MI)^{56,57} to enhance problem recognition and cognitive behavioral strategies for skill development. The intervention is structured, proceeding through five modules: 1) personal goals & strengths; 2) prior violence and substance use experiences; 3) benefits of avoiding risky behaviors (*e.g.*, fighting; injury); 4) five role play scenarios to develop cognitive/behavioral skills for anger management, conflict resolution, refusal skills for weapon carriage/substance use, and skills for avoiding/reducing involvement in violent situations; and, 5) summary of session content and relevant community resources.^{26,27,30} The intervention is delivered in parallel with ED care (delivery paused as needed for clinical care) using the web-based clinical decision tool. In the remote group, participants received the intervention from a remotely located study therapist via a HIPPA compliant telehealth program.

Participants were also enrolled in an two-month tailored text messaging program. Daily messages were delivered for the first month (Days 1-30) and reduced to every 3 days for the second month (Days 31-63; resulting in 42 total text message days). The program included: a) a question about their self-efficacy (scale 1-5) to avoid fighting; b) a tailored therapeutic response; c) a reminder about their self-identified goals (*e.g.*, college), strengths (*e.g.*, independent), benefits of avoiding fights (*e.g.*, avoiding injury), and/or tools to avoid violence (*e.g.*, anger management) identified during the ED SafERteens session; and, d) a general affirmation (*i.e.*, “thought of the day”). Youth could also “pull” on-demand messages by texting “CHILL” to receive tips for bad days (*e.g.*, coping skills) or “PLAN” for tips to avoid fighting (*e.g.*, anger management). Consistent with an MI framework, the text messaging was optional and participants could turn off messages at any time by texting STOP.

Enhanced Usual Care (EUC) Conditions.—Research staff reviewed (~2 minute) an informational brochure listing available community resources (*e.g.*, violence prevention, mental health, substance use) to participants randomized to either EUC condition (Remote; In-Person).

Training Protocol.—Remote and ED therapists completed a two-day training in MI and SafERteens. Prior to study initiation, therapists completed mock patient scenarios and were required to demonstrate proficiency with MI and intervention components using a standardized instrument (Motivational Interviewing Treatment Integrity Scale-3; version 3.0; MITI-3).⁵⁸ During the study, external facilitation^{40,59,60} was provided to support delivery. This included skills-based coaching, assistance coordinating on-site staffing coverage, and booster training sessions. Research staff were available for elbow-level clinician support full-time (*i.e.*, 8 hours/day) for 3 weeks, then 2-3 days/week for 6-months, then 1-2 days/week.

Maintenance Procedures (after completion of the Hybrid Effectiveness-Implementation Study).

Finally, SafERteens was fully integrated at HMC, with screening and intervention procedures performed by on-site ED staff. Based on the stakeholder interviews, triage nurses were trained (*e.g.* staff meetings; boosters at shift turnover) to conduct violence screening as a part of ED triage for any youth (age 14-18) seeking treatment. To facilitate screening, a passive electronic medical record (EMR) best practice alert (BPA) was added to the computerized workflow as a reminder to conduct screening. For the first 3 months, eligibility screens were administered via iPad; however, due to triage staff preference, pencil/paper screening procedures were implemented for the remaining 4 months. Screening outcome (positive/negative) was entered into the EMR, alerting the on-site treatment team to conduct the intervention. This workflow mirrored other clinical procedures (*e.g.*, social worker contact for suicidal ideation) at the site. Following retraining of clinical staff (given staff turnover), SafERteens was delivered in-person by staff (*e.g.*, child life) using the web-based toolkit and consenting youth were enrolled in the optional text messaging program. External facilitation was provided for technical assistance, as well as to boost screening/

intervention compliance. For the first 3 months, on-site external facilitation was provided once a week. This was reduced to every other week for the final 4 months.

Measures

Outcomes were measured using the RE-AIM^{42,43} implementation framework.

Reach.—Screening rates were calculated as the proportion of youth (ages 14-18) seeking ED treatment who were screened for eligibility. Intervention delivery rates were determined as the proportion of eligible youth that received their assigned condition.

Effectiveness.—Participant level data was collected to characterize the sample, including background characteristics (age, race/ethnicity, sex, receipt of public assistance via Add Health items⁶¹) and past 3-month alcohol and marijuana use (via Add Health, ASSIST [Alcohol, Smoking, and Substance Involvement Screening Test], and SAOM [Substance Abuse Outcomes Module] items).^{61–65} Immediate post-test outcome measures included: a) self-efficacy to avoid fighting using the Teen Conflict Scale^{26,66} (sum of 5 items; 0-4 responses ranged from not at all to extremely; Chronbach's $\alpha=0.80$); b) pro-violence attitudes using the Attitudes Towards Violence Scale⁶⁷ (sum of 7 items; 1-5 responses ranged from strongly disagree to strongly agree; Chronbach's $\alpha=0.71$); c) behavioral intention to avoid fighting in the next 3-months using a single ruler item^{26,27,30} (10-point ruler; responses ranged from not at all likely to very likely). Among intervention participants, intervention acceptability (i.e., helpfulness/likability) was measured using 8 items assessing whether: a) it was helpful to talk to a health counselor about fighting/staying safe; b) therapists were supportive/caring; c) therapists understood them and the issues they were struggling with in life; d) therapists treated them with respect; e) they enjoyed video-chat delivery (if applicable); e) they would recommend SafERteens to other youth; f) text messages were helpful; and g) text messages were easy to understand. Items were assessed using a 5 point likert scale ranging from not at all (0) to extremely(4).

At the 3-month follow-up, behavioral outcomes included: a) frequency of moderate (*e.g.*, pushed) and severe (*e.g.*, hit, used a knife/gun) aggression (*i.e.*, you did to someone else) in non-partner relationships (*e.g.*, friends, strangers) using a 15-item adapted version of the Conflict Tactics Scale (CTS)^{52,53} (0-6 scale; responses ranged from never to more than 20 times; Chronbach's $\alpha=0.90$); b) frequency of victimization (*i.e.*, someone did to you) using parallel CTS items (Chronbach's $\alpha=0.92$; see prior work^{26,27,30}); and, c) violence consequences (*e.g.*, trouble at school/work related to fighting) using 7-items from prior work²⁶ (sum of responses coded never or one or more times; Chronbach's $\alpha =.78$).

Adoption.—Hospital/staff adoption of SafERteens was measured by the number of trainings provided, staff trained, intervention adopters (on-site staff implementing SafERteens per protocol), and non-adopters (staff not implementing SafERteens per protocol). Reasons for adoption/non-adoption (*e.g.* individual/organizational barriers) were explored through key informant interviews (n=6 nurses and n=3 Child Life Specialists) conducted during maintenance.

Implementation.—Fidelity was determined through mock patient sessions. Sessions were audio-taped and coded using the MITI-3⁵⁸ scale. Prior to study initiation, in-person and remote therapists (n=19) were required to demonstrate proficiency (*i.e.*, mean of global subscales ≥ 4), with retraining provided as necessary. Post-implementation, adopters (n=2) repeated the fidelity assessment to examine changes in fidelity over time by staff delivering SafERteens.

Maintenance.—Using EMR queries, maintenance was assessed as the number of screens administered, percentage of patients screening positive, and percentage of eligible youth receiving SafERteens.

Analysis

For RE-AIM outcomes, descriptive data is presented. In addition, for effectiveness, percent change from baseline to post-test, and baseline to 3-month follow-up was examined, with group comparisons tested (Wilcoxon rank sum; Chi-Square). Next, regression analyses (Poisson, negative binomial, or normal distribution as appropriate) were used to predict outcomes controlling for baseline values: a) post-test outcomes in self-efficacy to avoid fights, pro-violence attitudes, and intention to avoid fights based on condition assignment (remote SafERteens vs. remote EUC, or in-person SafERteens vs. in-person EUC) when controlling for respective baseline values; and, b) 3-month behavioral outcomes in non-partner aggression, non-partner victimization, and violence consequences based on condition assignment (remote SafERteens vs. remote EUC, or in-person SafERteens vs. in-person EUC). Consistent with implementation studies,^{33,68–70} effectiveness data is presented only on the sample that completed SafERteens (whereas original RCT efficacy trial used intent to treat analysis).

RESULTS

Reach.

A total of 1,038 youth presented during recruitment (Figure 2). Of 648 youth eligible for screening, RAs approached 76.7% (497/648), with 75.5% (375/497) completing the screen. Of these, 54.1% (203/375) met eligibility. No socio-demographic differences were observed between youth screened/not screened. Individuals that refused participation were not significantly different from the final analytical sample based on sex, age, and race. Comparing eligible and ineligible youth, the ineligible sample were younger (ineligible, M=15.9, SD=1.4 vs. eligible, M=16.3, SD=1.5; $p<0.0001$); no other differences (*i.e.*, race, sex) were observed.

Among eligible youth, 91.1% (185/203) were consented and randomized to either SafERteens or EUC. In total, 67 youth were randomized to remote SafERteens, 55 in-person SafERteens, 38 remote EUC, and 25 to in-person EUC. SafERteens completion varied by group, with 77.6% (52/67) receiving remote SafERteens and 49.1% (27/55) receiving in-person SafERteens. Consistent with the efficacy trial,²⁶ completion was defined as finishing more than half of the intervention screens (*e.g.*, before ED discharge). Participants, who completed their assigned condition, ranged from age 14 to 18 (M=16.2, SD=1.6), 44.4%

(63/142) were African American, 58.5% (83/142) were female, and 64.1% (91/142) received public assistance (Table 1). Regarding recent substance use, 26.1% (37/142) reported alcohol and 30.3% (43/142) reported marijuana use.

Among youth that completed the intervention (in-person/remote) and had the opportunity to enroll in text messages, 78.7% (59/75) enrolled in the post-ED text message program. Of these, 20.3% (12/59) received between 1-10 days of messages, 3.4% (2/59) received 11-20 days, and 76.3% (45/59) received 31-42 days (max potential days = 42 days; participants could opt out) of scheduled text messages. More than half (55.9%; 33/59) of youth responded at least once to the daily self-efficacy question (with no financial compensation), with answers on 11% (216/1965) of possible days. In addition, 16.9% (10/59) “pulled” help messages (13.6% [8/59] CHILL; 5.1% [3/59] PLAN). Overall, 3-month follow-up was 80% (148/185); follow-up completion did not differ by condition ($p=0.29$).

Effectiveness.

In terms of acceptability, among youth receiving SafERteens and completing the post-test survey, 84.9% (62/73) reported that it was very/extremely helpful to talk to a health counselor about fighting/staying safe. Youth in both groups also overwhelmingly reported that therapists were supportive/caring (remote=93.8% [45/48]; in-person=100.0% [25/25]), understood them and the issues they were struggling with in life (remote=91.7% [44/48]; in-person=100.0% [25/25]), and treated them with respect (remote=100.0% [48/48]; in-person=100.0% [25/25]). Among youth receiving remote SafERteens, 78.3% (36/46) reported that they enjoyed video-chat delivery. Most indicated they would recommend SafERteens to other youth (remote=83.3% [40/48]; in-person=88.0% [22/25]). Among youth agreeing to receive text messages, 81.3% (39/48) indicated the messages were useful and 87.5% (42/48) found them easy to understand. Participant feedback included: “very helpful throughout the days/they were uplifting. They really helped me understand how to change my point of view on everything. And I’ve been able to go on without all the drama”; and, “I wish that I could continue getting them. I feel like sometimes I have bad day and they were a wonderful thing to have on those days.” One person felt there were too many messages and one felt they were too generic (wanted more tailoring).

At post-test, between group comparisons (Table 2) of mean pre-post differences showed that both SafERteens groups, relative to their respective EUC conditions, demonstrated greater increases in mean self-efficacy to avoid fighting (both $p<0.001$) and decreases in mean pro-violence attitudes ($p<0.001$ remote SafERteens; $p<.05$ for in-person SafERteens). No significant differences were noted from baseline to post-test for behavioral intention to avoid fighting for either the remote or in-person SafERteens groups when compared to their respective EUC conditions. Data on 3-month behavioral outcomes are presented in Table 3. Between-group comparisons showed significant decreases for remote SafERteens relative to remote EUC for non-partner aggression (IRR=0.52 [95% CI=0.31-0.87]; Cohen’s $d=-0.39$) and violence consequences (IRR=0.47 [95% CI=0.22-1.00]; Cohen’s $d=-0.49$), but reductions in victimization did not reach significance for the remote SafERteens group compared to remote EUC (RR=0.64 [95% CI=0.39-1.05]). For the in-person SafERteens

group, no significant differences were observed for non-partner aggression, victimization, or violence consequences when compared to the in-person EUC condition.

Adoption.

Research staff conducted three on-site trainings; continuing education credits were offered as an incentive. In total, 24 ED staff completed the training, including 8 child-life, 4 nursing, and 12 social workers. Of trained staff, 2 child life specialists (8.3%; 2/24) became intervention adopters, delivering in-person interventions. Non-adopters, while supportive of the program, reported organizational- and individual-level barriers, including lack of time availability due to large caseloads, and lack of reimbursement for staff time to conduct intervention delivery.

Implementation.

Implementation was assessed using fidelity checks. Among 19 hospital staff trained prior to the study, 100% (19/19) met recognized competency thresholds (MITI-3 mean of global scores >4). Among intervention adopters (n=2), mock patients sessions were repeated following the effectiveness study and prior to maintenance, with no loss of fidelity (mean of global scores = 4.40). Adopters reported several factors enhancing fidelity, including high levels of comfort delivering the intervention without assistance, the accessibility/design of the web-based implementation toolkit, and dedicated time to deliver the intervention.

Maintenance.

During maintenance, screening RAs/remote therapists were removed and on-site ED staff conducted all procedures. Specifically, 12 ED triage nurses were trained on screening procedures and a BPA was added to the EMR to remind staff to conduct screens and record results in the patient's chart. Additional clinical staff were also trained to deliver SafERteens (n=2). During maintenance (3/2018-9/2018), 587 youth were screened, with 22.7% (133/587) screening positive, and 35.3% (47/133) youth receiving SafERteens. External facilitation focused on strategies for increasing screening and intervention rates, including booster trainings, change of shift reminders about completing screening during triage, and regular monthly feedback at staff meetings on screening/intervention rates with positive reinforcement (*e.g.*,snacks, verbal feedback from patients on their experience). In addition, screening procedures were shifted from iPad administration to paper/pencil delivery, given staff preference during the latter half of maintenance. In addition, to improve intervention delivery rates, a dedicated child life interventionist was hired mid-way during maintenance to focus on SafERteens administration. External facilitation supported an increase in screening rates from ~5% (83/1829) during the first half of maintenance to ~34% (492/1476) during the final 3-months. Intervention delivery was also noted to be highest in the 3-months following availability of a dedicated staff member to deliver SafERteens.

DISCUSSION

This study demonstrates that implementing SafERteens, currently the only evidence-based youth violence intervention available for ED settings, was well-received by patients, as well as clinical staff, when combined with theoretically informed implementation strategies

such as replicating effective programs (REP) and external facilitation (EF). Barriers remain, however, including challenges for in-person delivery due to competing clinical demands and lack of available staff for delivery. This study also demonstrates that remote delivery of SafERteens via a telehealth hub model may be a promising modality for overcoming existing resource limitations in many hospital settings. Importantly, the web-based implementation toolkit was well received by clinical staff for training and delivery support, with the intervention and text messaging program also well-received by enrolled youth. The addition of the text messaging program is a promising strategy for extending the reach of prevention programs for youth as they are rolled out into the community, particularly for low-resource EDs that are unable to extend in-person contact beyond the initial ED visit.

This study sheds light on challenges and potential solutions of implementing evidence-based violence prevention efforts in routine emergency care. The web-based toolkit, which contained the screening, training, and intervention components, provided a single platform for EDs interested in implementing SafERteens. Further, the toolkit enhanced fidelity of intervention delivery (in-person/remote), reduced provider-level barriers for the delivery of session components (via the user-friendly design and on-demand help screens), and provided real-time clinical decision making support. Such elements are supported by prior studies^{36,71} documenting the efficacy of toolkits to increase provider capacity to deliver evidence-based interventions within routine clinical practice. Finally, this online toolkit utilized sustainable web-based technology, ensuring long-term program availability at low annual costs, and enables broader dissemination throughout low-resourced healthcare settings.

While this implementation pilot was underpowered to detect behavioral outcomes, findings were consistent with prior efficacy trials^{26–30} and support the concept that SafERteens can be integrated into routine ED delivery. For example, self-efficacy to avoid fighting improved from baseline to post-test, regardless of delivery method. Similarly, remote telehealth delivery decreased non-partner aggression at the 3-month follow-up. This is particularly promising in terms of reach, as most participants (nearly 80%) in the remote group received the SafERteens intervention during their ED visit. In contrast, in-person completion was less than 50%, with clinician availability prior to patient discharge the primary barrier. Further, effectiveness data for in-person behavioral outcomes was not significant, which given high fidelity ratings in mock patient sessions among on-site therapists may reflect a greater baseline severity in the in-person SafERteens group or the small sample size. Alternatively, on-site therapists may have delivered the intervention differently in the clinical space as compared to mock fidelity sessions given time constraints during their clinical practice. Given the COVID-19 pandemic has increased the need and ability for providers to deliver behavioral health interventions remotely,^{72–74} our findings regarding high acceptability, higher completion rates than the in-person cohort, and positive effectiveness findings, suggests that telehealth delivery for violence prevention services is a potential solution to many of these on-site barriers in low-resource settings.⁷⁵ Further, this modality may be an option to extend the availability of such interventions to clinical sites with lower clinical volumes that don't support on-site staff delivery (e.g., rural EDs). Healthcare systems are increasingly moving toward e-visits⁷⁶ including for telehealth delivery of behavioral therapies. Regardless, results show that SafERteens can be integrated with

fidelity and effectiveness within routine ED care using a remote behavioral telemedicine hub model, which is consistent with prior evidence on the efficacy of remote behavioral health interventions.^{34,76} Future implementation studies are needed to enhance reach and effectiveness when delivered in-person, which may be a preferred model in some EDs that have on-site behavioral health specialists.

The tailored text messaging program demonstrated high acceptability and feasibility. More than 80% of youth reported the text messages were helpful, with qualitative feedback highlighting an appreciation for the personalized content. Such findings are consistent with other healthcare text messaging interventions.^{34,50,51,77,78} This additional component extended the intervention's reach, providing a low-cost method for continued support and skills development (*e.g.*, conflict resolution; anger management) without requiring additional hospital staff resources or training. Such methods may also increase access to prevention services for lower-risk youth that do not require more intensive wrap-around violence prevention programs.⁵¹ Of note, text messaging was optional (*i.e.*, could be turned on/off). This is an important consideration for long-term sustainability as 10% of youth did not have texting plans and hospital systems may not be able to incur messaging costs (~\$2/patient) given that text messaging interventions are not yet reimbursable.

During maintenance, screening/intervention rates decreased substantially, reflecting competing clinical demands and lack of institutional capacity to support prevention programs in the absence of a mandate or reimbursement. External facilitation was successful improving low screening/intervention rates, however, the site's reliance on external facilitation highlights the need for additional technical assistance and infrastructure development (*e.g.*, identifying internal champions to manage implementation) to support long-term sustainability. While adjusting screening procedures to paper/pencil based on staff preference increased the number of screens conducted, it may have had a paradoxical effect on participants comfort answering sensitive questions given our finding that fewer youth screened positive for aggression over time. This is consistent with prior research supporting use of computerized screening for sensitive risk behaviors (*e.g.*, intimate partner violence)⁷⁹ because it enhances privacy/self-report validity.⁸⁰ Alternatively, this may reflect seasonal variations in violence levels. Regardless, embedding screening procedures in the EMR is a useful direction for future implementation, especially given research demonstrating higher provider compliance with screening procedures, especially when paired with a "hard stop" best-practice alert.⁸¹

Although^{82,83} in-person SafERteens completion increased during maintenance by obtaining additional programmatic funding for a dedicated Child Life specialist, lower overall rates reflect challenges in not having multiple staff dedicated to delivering SafERteens (*e.g.*, evenings, weekends) and a lack of reimbursement codes for screening/intervention delivery for youth violence prevention. A key component of sustaining implementation of violence prevention services in low resource health settings, regardless of delivery mechanism, is the development of reimbursement codes for violence prevention interventions by public and private insurance.⁸⁴⁻⁸⁶ Given these codes do exist for other behavioral health screening and interventions (*e.g.*, substance use screening and intervention services⁸⁴⁻⁸⁶), and are mandated for patients admitted to in-patient trauma units for alcohol-related

injuries,^{87,88} expanding existing reimbursement mechanisms to also address youth violence prevention is an important future policy direction to enhance sustainability. Finally, further implementation research is needed to iteratively develop a SafERteens technical assistance package, which could support intervention scale up and sustainment in a variety of ED settings. This package should include the identification of supplemental resources for under-resourced sites, including methods/processes for developing internal infrastructure to deliver the intervention (or establish a telemedicine hub) and engage internal champions as well as optimal external facilitation methods to enhance consistent implementation of screening and intervention delivery.

Limitations

Findings should be considered in context of limitations. First, the study occurred at a single clinical site. Second, outcome measures relied on retrospective self-report about potentially sensitive subject matters, and are thus subject to recall and social desirability bias;⁸⁹ however, prior research shows youth are likely to share this information when self-administered and confidentiality and lack of penalty can assured.^{40,80,90,91} Third, due to practical limitations of staff availability, randomization to in-person and remote delivery of the intervention was restricted to certain days of the week in this pilot implementation trial, underscoring the need for future implementation studies. Fourth, given the study's scope, intervention completion by on-site clinical staff was a limitation, reflecting practical barriers in low-resource settings.⁹² Fifth, effectiveness data should be considered exploratory in nature given that the study was underpowered; thus, findings warrant replication in future implementation studies.⁹³ Future studies should test strategies to optimize implementation across a variety of ED settings to enhance wide-spread dissemination, given that organizational needs, staffing, and implementation supports vary greatly based on setting.³⁶

Conclusion

This study demonstrates that integrating violence screening and the evidenced-based SafERteens intervention into routine emergency care is challenging given competing demands of on-site staff, with remote staff providing a potential solution for intervention delivery, which is particularly promising given current challenges due to the COVID-19 pandemic. Nonetheless, given high acceptability among patients and providers, violence interventions could have high public health impact, potentially interrupting violence trajectories before escalation to more severe types of violence (e.g., firearm violence). Given established efficacy in prior trials, future studies should test implementation strategies to enhance standard reach of youth violence screening and intervention delivery to at-risk patients in low-resource EDs. Policymakers should continue to expand reimbursement mechanisms in health care settings for violence screening and interventions for youth at-risk for negative violence outcomes.

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Article Summary

1. Why is this topic important?

Youth violence is a leading cause of adolescent mortality in the United States, and while EDs are recognized as an important setting for violence prevention, few evidence-based programs exist. Additionally, research studies disproportionately focus on establishing efficacy and less on how interventions function in real-world clinical settings.

2. What does this study attempt to show?

Guided by the REP strategies, this study aims to examine the translation of an evidence-based violence prevention program into clinical care in a low-resourced Level-1 trauma center.

3. What are the key findings?

Effectiveness data included high acceptability, and post-test data showing that the SafERteens intervention (remote and in-person) significantly increased self-efficacy to avoid fighting and decreased pro-violence attitudes as compared to EUC conditions. At the 3-month follow-up, the remotely delivered SafERteens condition had significantly less non-partner aggression and violence consequences relative to the EUC; however, no significant differences were found between the in-person delivery of SafERteens and the EUC. Barriers to maintenance included limited staff availability and lack of reimbursement codes.

4. How is patient care impacted?

Given high acceptability among patients and providers, violence interventions such as SafERteens could have high public health impact, potentially interrupting violence trajectories before escalation to more severe types of violence (*e.g.*, firearm violence).

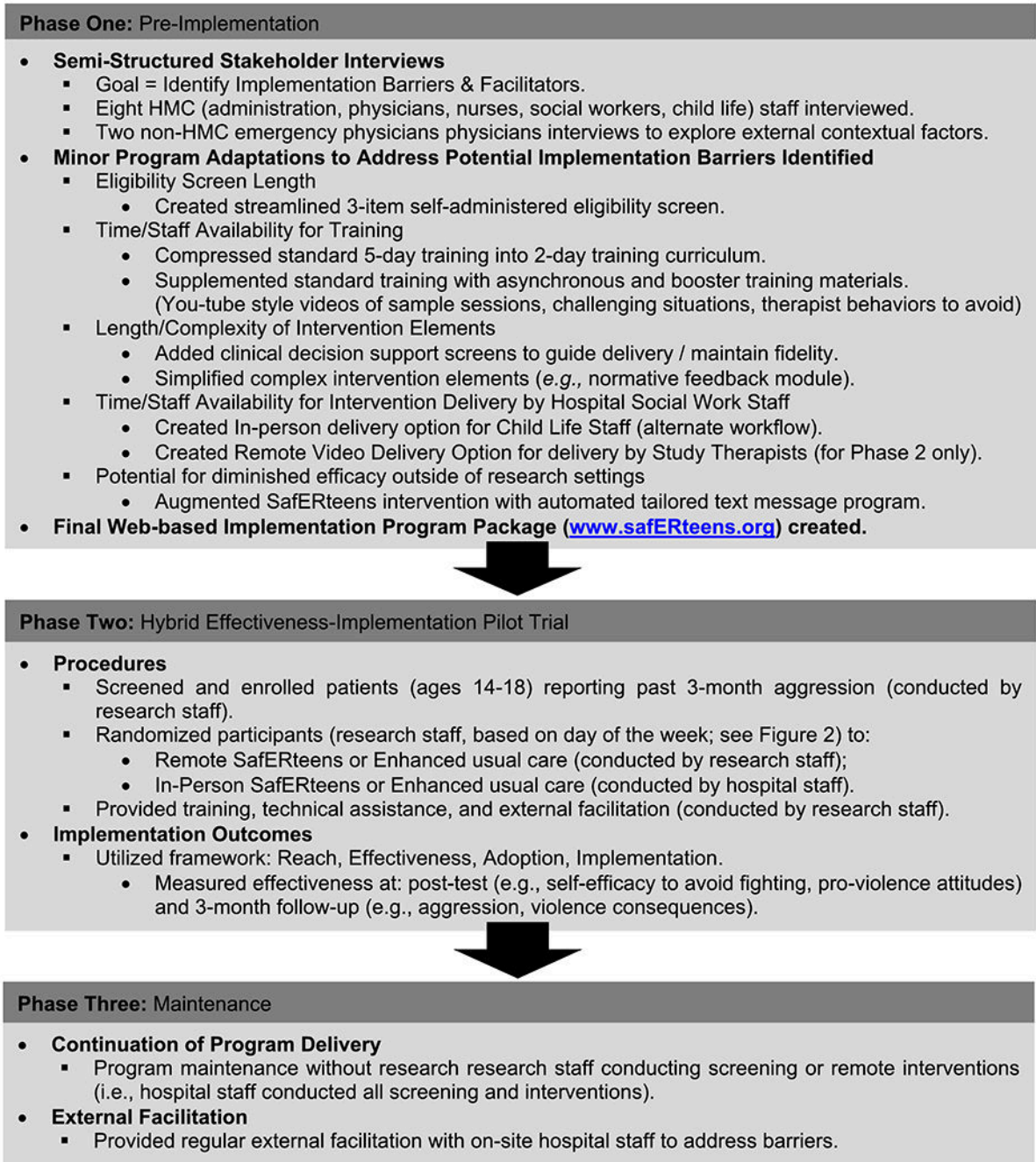


Figure 1.
Description of the three phases conducted in this translation study.

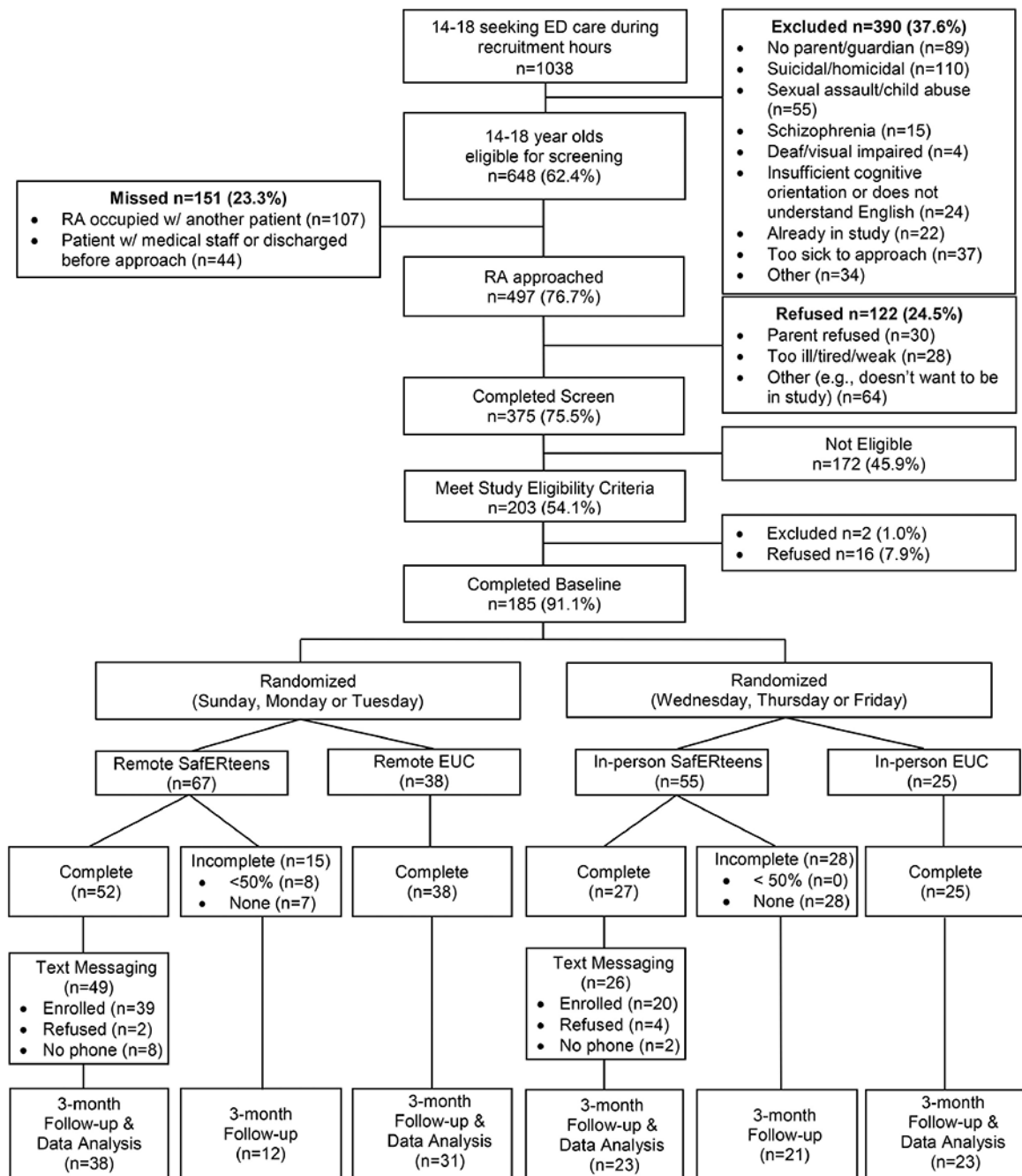


Figure 2. Flowchart for the SafERteens Effectiveness-Implementation Pilot (Feb-Nov 2017) Phase detailing participant enrollment, randomization, group assignment, treatment adherence (*i.e.*, completion of assigned study condition), text messaging enrollment, and follow-up rates.

Table 1.

Baseline Sample Characteristics for the Overall Sample and by Assigned Study Condition for the Hybrid Effectiveness-Implementation Pilot (n = 142) Phase of the Study

	Remote SafERteens (n = 52)	Remote EUC (n = 38)	In-Person SafERteens (n = 27)	In-Person EUC (n = 25)	Total Sample (n = 142)
Age, mean (SD) ^{*, †}	16.0 (1.6)	16.2 (1.5)	16.3 (1.5)	16.8 (1.5)	16.2 (1.6)
Gender, n (% female)	30 (57.7%)	24 (63.2%)	17 (63.0%)	12 (48.0%)	83 (58.5%)
Race, n (%)					
African American	19 (36.5%)	16 (42.1%)	12 (44.4%)	16 (64.0%)	63 (44.4%)
White/Caucasian	26 (50.0%)	13 (34.2%)	12 (44.4%)	5 (20.0%)	56 (39.4%)
Other	7 (13.5%)	9 (23.7%)	3 (11.1%)	4 (16.0%)	23 (16.2%)
Ethnicity, n (% Hispanic)	4 (7.7%)	3 (7.9%)	0 (0.0%)	3 (12.0%)	10 (7.0%)
Public assistance, n (%) ^{*, †, §}	37 (71.2%)	23 (60.5%)	21 (77.8%)	10 (40.0%)	91 (64.1%)
Alcohol use, n (%)	14 (26.9%)	8 (21.1%)	7 (25.9%)	8 (32.0%)	37 (26.1%)
Marijuana use, n (%)	16 (30.8%)	10 (26.3%)	9 (33.3%)	10 (40.0%)	43 (30.3%)
Self-efficacy to avoid fighting, mean (SD) ^{*, †, §}	12.1 (4.6)	12.4 (4.7)	12.4 (3.7)	14.7 (3.5)	12.7 (4.3)
Pro-violence attitudes, mean (SD)	18.4 (5.3)	17.6 (5.3)	17.8 (4.9)	17.0 (5.3)	17.8 (5.2)
Behavioral intention to avoid fighting, mean (SD)	7.1 (2.8)	8.2 (2.5)	8.3 (2.6)	7.8 (2.7)	7.7 (2.7)
Non-partner aggression, mean (SD)	6.4 (7.5)	7.2 (6.7)	8.1 (9.6)	4.2 (4.6)	6.6 (7.4)
Non-partner victimization, mean (SD) ^{*, †}	3.1 (4.6)	2.9 (3.4)	4.4 (4.7)	1.8 (3.8)	3.0 (4.3)
Violence consequences, mean (SD)	2.1 (2.3)	1.5 (1.8)	2.0 (2.3)	1.4 (2.0)	1.8 (2.1)

Note: Results are presented only on those youth that completed their assigned condition.

*
 $p < 0.05$;

**
 $p < 0.01$;

 $p < 0.001$.

Comparisons:

[†] Remote SafERteens vs. In-Person EUC;

[‡] In-person SafERteens vs. In-Person EUC;

[§] Remote EUC vs In-person EUC.

EUC = enhanced usual care; SD = standard deviation.

Table 2.

Baseline to Post-Test Changes in Self-Efficacy to Avoid Fighting, Pro-Violence Attitudes, and Behavioral Intention to Avoid Fights between the SafERteens Intervention (Remote SafERteens; In-Person SafERteens) and their Respective EUC (Remote EUC; In-Person EUC) Conditions for the Hybrid Effectiveness-Implementation Pilot Phase of the Study

Variable by Condition	Baseline Mean (SD)	Post-Test Mean (SD)	% Change	Regression IRR (95% CI)	<i>p</i> -Value
Self-efficacy to avoid fighting					
Remote EUC	12.4 (4.7)	13.3 (4.3)	+7.3%	1.22 (1.09–1.36)	0.0005
Remote SafERteens	12.1 (4.6)	16.0 (4.1)	+32.2%		
In-person EUC	14.7 (3.5)	14.5 (3.6)	–1.4%	1.23 (1.12–1.36)	< 0.0001
In-person SafERteens	12.4 (3.7)	15.7 (3.6)	+26.6%		
Pro-violence attitudes					
Remote EUC	17.6 (5.3)	16.1 (5.1)	–8.5%	0.83 (0.75–0.91)	0.0001
Remote SafERteens	18.4 (5.3)	14.1 (4.9)	–23.4%		
In-person EUC	17.0 (5.3)	15.6 (4.9)	–8.2%	0.87 (0.77–0.99)	0.0287
In-person SafERteens	17.8 (4.9)	15.0 (5.0)	–15.7%		
Behavioral intention to avoid fights					
Remote EUC	8.2 (2.5)	7.9 (2.9)	–3.7%	2.04 (0.89–4.70)	0.0937
Remote SafERteens	7.1 (2.8)	7.8 (2.9)	+9.9%		
In-person EUC	7.8 (2.7)	7.8 (3.1)	0.0%	1.82 (0.97–3.41)	0.0621
In-person SafERteens	8.3 (2.6)	8.5 (2.1)	+2.4%		

Note: Results are presented only on those participants that completed their assigned study condition and were available to complete the post-test survey (n = 132 of the 142 participants completing their assigned condition).

IRR values > 1.0 indicate variables positively associated with the outcome variable, and values < 1.0 indicate variables negatively associated with the outcome variable.

IRR = incident rate ratio; CI = confidence interval; EUC = enhanced usual care condition.

Table 3.

Baseline to 3-Month Follow-Up Changes in Non-Partner Aggression, Non-Partner Victimization and Violence Consequences between the SafERteens intervention and their respective EUC conditions (N=142).

Variable by condition	Baseline (N=142) Mean (SD)	3-Month (N=115) Mean (SD)	% Change	Regression IRR (95% CI)	P-value
<u>Non-Partner Aggression</u>					
Remote EUC	7.2 (6.7)	5.7 (7.9)	-20.8%	0.52 (0.31-0.87)	0.0132
Remote SafERteens	6.4 (7.5)	3.6 (6.9)	-43.8%		
In-person EUC	4.2 (4.6)	1.7 (2.8)	-59.5%	1.82 (0.82-4.03)	0.1412
In-person SafERteens	8.1 (9.6)	5.1(6.6)	-37.0%		
<u>Non-Partner Victimization</u>					
Remote-control	2.9 (3.4)	2.1 (2.9)	-27.6%	0.64 (0.39-1.05)	0.0746
Remote SafERteens	3.1 (4.6)	1.8 (3.1)	-41.9%		
In-person –control	1.8 (3.8)	0.7 (1.3)	-61.1%	1.69 (0.66-4.36)	0.2769
In-person SafERteens	4.4 (4.7)	1.5 (2.4)	-65.9%		
<u>Violence Consequences</u>					
Remote-control	1.5 (1.8)	1.5 (2.2)	-0.0%	0.47 (0.22-1.00)	0.0491
Remote SafERteens	2.1 (2.3)	0.9 (1.7)	-57.1%		
In-person –control	1.4 (2.0)	0.4 (0.9)	-71.4%	1.87 (0.99-3.50)	0.0525
In-person SafERteens	2.0 (2.3)	1.2 (1.7)	-40.0%		

Note: IRR= Incident Rate Ratio; CI=Confidence Interval. IRR values >1.0 indicate variables positively associated with the outcome variable and values <1.0 indicate variables negatively associated with the outcome variable.