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Strangulation Assessment, Evidence Collection, and Documentation Guidelines for Forensic Nurse Examiners: A Pilot Project

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Background/Significance

Intimate partner violence (IPV) is a widespread public health issue in the United States (US) affecting millions of Americans. According to Center for Disease Control and Prevention (CDC), IPV is defined as psychological harm, sexual harm, or physical harm of a person inflicted by a current or former intimate partner or spouse of the victim (CDC, 2012). In 2010, the CDC estimated 24 Americans suffered from one or a combination of these forms of IPV every minute, approximately 12 million victims annually.

In the early 1990's San Diego district attorney Gael Strack and emergency physician George McClane began to characterize strangulation as a form of IPV. In their work with IPV, Strack, McClane, and Hawley (2001) identified that victims survived strangulation more often than previously realized. Before, experts believed that strangulation victims sustained immediate fatal injury and were only examined by forensic pathologists after their death (Hawley, McClane, & Strack, 2001).

Based on their work, Strack and McClane, along with other IPV professionals, developed the National Strangulation Training Institute. The Institute provides training and technical assistance to health care providers, law enforcement officers, prosecuting attorneys, and family violence professionals. To date, more than 5,000 professionals are trained each year at the Institute. In addition to providing training on strangulation, the Institute also conducts research. Strack, McClane, and Hawley (2001) conducted a retrospective case review with the objectives of enhancing victim safety to ensure offender accountability. Three-hundred strangulation

victims were selected from 14,000 case files at the San Diego City Attorney's office dated from 1990 through 1997. Ninety-nine percent of the victims were female, 89% reported a prior history of IPV, and the average length of the relationship with the abuser was 4.3 years. Only 5% victims sought medical care within 48 hours of the strangulation event. Ninety-nine percent of the abusers were male, with an average age of 31.9, and 59% were employed. Ninety-seven percent of victims reported being strangled by their partner's hands and 41% reported children being present and witnessing the strangulation.

Additional research conducted by Strack, McClane, and Hawley (2001) found that police officers lacked the appropriate training to adequately identify and assess victims of strangulation. Lack of training led police officers to minimizing the effects of strangulation and the resultant health consequences, as well as allowing further violence, and victim death to occur (Strack, McClane & Hawley, 2001). Police officers and medical staff that identify and assess victims of IPV must be adequately trained on the various signs, symptoms, effects, pathophysiology, documentation, and expert testimony of strangulation (Strack & Gwinn, 2011). Forensic Nurse Examiners (FNE) are the medical professionals that can fill this role.

Forensic Nurse Examiners have specialized training to be experts in evidence collection and legal testimony. In addition, FNEs provide focused care for victims of crime. Forensic Nurse Examiners collaborate with medical staff and law enforcement to provide forensic documentation, interpretation of injuries, and provide expert testimony on the aspects of forensics as it relates to: (a) adult and adolescent sexual assault, (b) suspect examinations, (c) domestic violence including strangulation, (d) elder abuse, (e) felonious assaults, (f) gunshot wounds, (g) stabbings and sharp force injuries, (h) and motor vehicle crashes for the determination of the occupant role driver or passenger. Forensic examinations are performed at

the request of local law enforcement and with victim's consent, implied consent, or through a court order.

Forensic Nurse Examiners have the ability to improve the quality of the criminal investigation through accurate and complete strangulation documentation. Completion of the physical assessment documentation and photographic documentation are essential for the prosecution of the perpetrator and to corroborate the victim's account of the strangulation event. To determine if the strangulation is a felonious assault, documentation of the degree of injury assists in determining the level of violence.

Purpose Statement

The purpose of this pilot project was to develop and implement a strangulation assessment, evidence collection, and documentation protocol for FNEs. Implementation of the protocol was at the Louisville Metro Police Department's Clinical Forensic Medicine Program in Louisville, KY and included the following:

- Protocol checklist
- Victim description of strangulation(s) event
- Questions for strangulation victim
- Physical assessment
- Biological evidence collection
- Photo-documentation

Literature Review

The neck is easily accessible and susceptible to life-threatening injuries. The neck's small diameter, lack of bony shielding, and close association of the airway, major blood vessels, and spinal cord enhances vulnerability (Emoehazy, 2011). Strangulation is a form of asphyxia produced by a constant application of pressure to the neck (Mitchell & Anglin, 2009). Pressure applied to the neck results in the closure of the blood vessels and/or air passages. Injuries occur through one or a combination of the following factors: (a) respiratory, (b) circulatory, or (c) neurological (Di Paolo, Guidi, Bruschini, Vessio, Domenici, and Ambrosino, 2009).With continuous pressure and closure of either vascular or respiratory structures, victims rapidly progress to unconsciousness due to the decrease flow of oxygen to the brain. The deprivation of oxygen to the brain results in an anoxic injury and ultimately death (Funk & Schuppel, 2003; Clarot, Vas, Papin & Proust, 2005).

Glass et al. (2008) performed a study to determine if non-fatal strangulation was a risk factor for attempted and completed homicide in abused women. The authors examined 310 cases of completed IPV female homicides. Homicide records from the medical examiner and police department between the years of 1994-2000 were reviewed to identify proxy informants. There were 194 attempted homicide cases identified. Results indicated that women who had experienced strangulation by their intimate partner had a 6.7 (95% CI = 3.91-11.49) increased odds of becoming an attempted homicide victim. The odds of becoming a victim of completed homicide when previously strangled by intimate partners were 7.48 (95% CI= 4.53-12.35).

Victim Description of Strangulation Event

It is important to document the mental and emotional state of strangulation victims (McClane, Strack, & Hawley, 2001). If the case goes to trial, accurate documentation of the victim's description of events will allow the judge and jury to understand what the victim actually experienced. This section included detailed documentation of each strangulation event in the victim's own words.

Questions for Strangulation Victim

Accurate and complete documentation are essential components for appropriate legal intervention for victims in all strangulation cases (Funk & Schuppel, 2003). Signs and symptoms of strangulation that should be included in documentation are complaints of difficulty breathing, a hoarse voice, difficulty and painful swallowing, complaints of pain in the neck region, hearing changes, reported loss of consciousness, and involuntary loss of urine and stool during the attack (Mitchell & Anglin, 2009; Christe et al., 2009).

Victims should also be questioned if they experienced any changes in vision (Wilber et, al., 2001; Smith, Mills & Taliaferro, 2001; Christie et, al., 2009; Gwinn & Strack, 2012). Changes in vision are a response from a lack of blood flow and oxygenation to the brain. Additional questions to ask the victim include whether or not they vomited (Strack & McClane, 1999; Gwinn & Strack, 2012; Paluch, 2013) and if they experienced coughing as a result of being strangled (Strack & McClane, 1999; Ernoehazy, 2011). Both of these questions will inform the FNE that the victim has additional signs and symptoms of strangulation.

Victims should be questioned regarding how many times they were strangled (Strack & McClane, 1999; Gwinn & Strack, 2012; Paluch, 2013) as well as how much pressure was applied

to their neck (Strack & McClane, 1999; Gwinn & Strack, 2012; Paluch, 2013). It needs to be determined if the victim's head was pounded while they were being strangled (Strack & McClane, 1999; Paluch, 2013). In addition, whether or not the victim was smothered needs to be determined (Gwinn & Strack, 2012; Paluch, 2013). Asking these questions assists the FNE in determining the severity of the strangulation event.

The victim should be asked what they thought was going to happen during the strangulation event (Strack & McClane, 1999; Gwinn & Strack, 2012; Paluch, 2013). What the perpetrator said to the victim before, during, and after they were strangled should also be questioned (Strack & McClane, 1999; Gwinn & Strack, 2012; Paluch, 2013). By documenting what the victim thought and what the perpetrator said to the victim while being strangled allows the judge and jury to understand what the victim was actually experiencing. The reason the perpetrator stopped strangling the victim needs to also be asked (Gwinn & Strack, 2012; Paluch, 2013).

Physical Assessment

A forensic examination includes a head to toe physical assessment to evaluate for injuries (Strack & McClane, 1999). Injuries may include edema, erythema, petechiae, abrasions, and contusions (Strack & McClane, 1999; Hawley, McClane & Strack, 2001; Wilber et. al, 2001; Funk & Schuppel, 2003; Mitchell & Anglin, 2009; Shields, Corey, Weakley-Jones & Stewart, 2010; Emozehazy, 2011). Fingernail marks are abrasions often associated with the victim's own nails as the victim struggles to release pressure from their neck (Line, Stanley, & Choi, 1985). Contusions can result from the perpetrator's grasp around the victim's neck and are called finger-pad or finger-tip contusions (Hawley, McClane, & Strack, 2001).

According to Wilber et al. (2001) some of the most common assessment findings seen in strangulation victims include the signs and symptoms of odynophagia, neck pain, dyspnea, petechiae on the skin, and linear red marks on the skin. Shields, Corey, Weakley-Jones, and Stewart (2010) found some of the same in their study, identifying the most common injuries suffered by strangulation victims were erythema, abrasions, contusions, edema, and petechial hemorrhage on the face and neck. Additional assessment findings are mental status changes which includes restlessness, combativeness, and amnesia (Ernoehazy 2011; Paluch 2013). Lung injuries such as aspiration pneumonia or pulmonary edema can result from strangulation (Funk & Schuppel, 2003). The absence or presence of these findings should be included in the documentation of strangulation victims.

Photo-documentation

Photography often captures minute details that the eye does not see until the photograph is processed (Paluch, 2013). Photo-documentation in the clinical setting should be used to depict both the presence and the absence of injuries (Paluch, 2013). The entire set of photographs should describe the event which cannot be portrayed with just the written word (Pasqualone, 2006).

Distant full-body photographs are initially taken and are termed as orientation photos, to identify the victim. Mid-distance photos are next and identify particular parts of the body where injuries are noted. At least two photographs should be taken of the anterior, lateral, and posterior aspects of the face, neck, upper chest, and shoulders (Strack & McClane, 1999). The FNE should carefully assess around the eyes, ears, nose, mouth, including the conjunctiva of the lower eyelids and the soft and hard palates of the mouth to identify swelling, erythema, abrasions,

contusions, and petechiae. When possible, and the victims are available, follow-up photographs of all visible injuries should be taken at 24, 48, and 72 hours after the assault (Strack & McClane, 1999). Taking photographs of injuries at different time intervals is necessary to accurately document the evolution of injuries (Funk & Schuppel, 2003). Once injuries are identified, close-up photographs are taken with a ruler for accurate measurement.

Biological Evidence Collection

According to Hawley, McClane, and Strack (2001), skin cells from the perpetrator may be recovered from the victim's injured neck. Deoxyribonucleic acid is extracted from these skin cells and can prove the identity of the perpetrator. Dried evidence and skin cells are collected using four moistened sterile cotton swabs. Sterile water or sterile saline are placed on these swabs. The moistened swabs are then rolled over the area where the perpetrator came in contact with the victim's neck (Hawley, McClane, & Strack, 2001). Secretions that are already wet such as blood, saliva, and semen are collected using four dry sterile cotton swabs. Swabs are allowed to air dry before packing them. Each package is labeled with the contents, victim name, collector name, and the date and time of collection.

Theoretical Framework

Evidence-Based Practice Conceptual Framework

The Evidence-Based Practice Conceptual Framework is a guide for healthcare professionals that provides a systematic process to implement practice change (Rosswurm and Larrabee, 1999) (see Appendix A). According to Rosswurm and Larrabee the framework is based on research and literature related to evidence-based practice, research utilization, standardization of language, and change theory.

Framework	Capstone Project
Step 1-Assess: The professional collects internal and external data about current practice and identifies a need for a change in practice	• A retrospective review of patient charts identified the assessment, evidence collection, and documentation of strangulation victims was conducted differently by all FNEs
Step 2 –Link: Identify potential interventions and select outcome indicators for the problem identified	• Three databases were searched: MEDLINE, CINAHL, EBSCO Host. • Multiple research articles were identified that addressed strangulation.
Step 3 -Synthesize: Evidence is critiqued and weighed, best evidenced is identified, and there is an assessment of the feasibility, risk, and benefits of a change in practice	• Articles were evaluated for current evidence on strangulation assessment, documentation, and evidence collection. • Stakeholders identified. • IRB approval was obtained.
Step 4 –Design: The proposed change is defined, resources are identified, and the implementation process is planned	• A formal protocol was developed for assessing, documenting and collecting evidence from victims of strangulation*: Sturgeon's Strangulation Assessment for Victims with Evidence collection and Documentation (SAVEcD) Tool* • Resources identified • Face and content validity established • Training on the use of the tool for the FNEs and forensic physician employed by Louisville Metro Police Department's Clinical Forensic Medicine Program. • Tool piloted at the Louisville Metro Police Department's Clinical Forensic Medicine Program in Louisville, Kentucky.
Step 5 –Implement and evaluate: A pilot study is performed, the process and outcomes are evaluated, and the decision is made to adapt or reject the practice change	• Protocol was implemented at the Louisville Metro Police Department's Clinical Forensic Medicine Program in Louisville, Kentucky. • There were 22 strangulation cases between March 20, 2014 and October 20, 2014 in which the new tool was

	used.
Step 6 – Integrate and maintain: The practice change is integrated into practice as a standard of care, stakeholders are made aware of change and the process and outcomes are continually monitored	• The goal is to revise the SAVEcD strangulation tool and disseminate it to other FNE programs in the nation. • Another goal is to continue to use the tool with all strangulation cases at the Louisville Metro Police Department's Clinical Forensic Medicine Program in Louisville, KY. • Stakeholders updated with results. • Outcomes continually monitored.

The Evidence-Based Practice Conceptual Framework guided the development and implementation of this capstone. The framework directed the use of the systemic process to assist in identifying the problem that the assessment, evidence collection, and documentation of strangulation victims were being done differently by all FNEs working with the Louisville Metro Police Department's Clinical Forensic Medicine Program in Louisville, KY. The framework as guided the development and implementation of the proposed change, titled Sturgeon's Strangulation Assessment for Victims with Evidence collection and Documentation (SAVEcD) tool, to ensure the completeness in the assessment, evidence collection, and documentation of all strangulation cases.

Methods/Procedures

Participants/Population

The forensic physician and FNEs employed by the Louisville Metro Police Department's Clinical Forensic Medicine Program were the target audience for this project, while strangulation victims also benefited from the outcomes of this project. Other participants included Louisville Metro Police Department's police officers which were the first responders, divisional detectives, and the Special Victims Unit detectives.

Settings

Physician Bill Smock, the LMPD Police Surgeon, is notified by regional detectives or by detectives in the Domestic Violence and Sex Crimes Units when a forensic examination is needed on a strangulation victim. Once Dr. Smock is notified, he sends out text-messages and makes phone calls to determine which FNE is available for the consult. The forensic physician and FNEs employed by the Louisville Metro Police Department's Clinical Forensic Medicine Program examine strangulation victims at numerous locations, including hospitals, police headquarters, courthouse, forensic office, and/or victim's home.

Stakeholders

The stakeholders are many. There are the obvious victims of strangulation. Additional stakeholders include law enforcement officers and detectives, commonwealth prosecuting and defense attorneys, forensic physician and nurses, and the community of taxpayers.

Protocol Checklist

The protocol checklist was developed so that each victim referral was managed identically. The checklist (see Appendix B) was used by the FNEs to assure the strangulation assessment, evidence collection, and documentation protocol is completed thoroughly and accurately. The completed checklist accompanies all Louisville Metro Police Department victim case records.

Strangulation Assessment, Evidence Collection, and Documentation Tool

The 5-page instrument developed for this protocol is titled Sturgeon's *S*trangulation *A*ssessment for *V*ictims with *E*vidence collection and *D*ocumentation (SAVEcD) Tool and is

used by FNEs when consulting on a strangulation victim. The instructions on the use of SAVEcD tool (Appendix C) are a guide for FNEs and provide detailed instructions on how to complete each component of the tool. The tool is divided into sections for the FNE to document the victim's description of the event, questions to ask the victim, physical assessment findings, photo-documentation and collection of evidence (Appendix D). The SAVEcD Tool was evaluated for face and content validity by three forensic professional experts including the LMPD Police Surgeon, a Domestic Violence Unit investigating detective, and an FNE employed by the Louisville Metro Police Department's Clinical Forensic Medicine Program.

Victim description of strangulation event and questions for strangulation victim. The narrative portion of the protocol is the first page of Appendix D. Next, there are twenty-five questions related to the victim's physical and psychological state before, during, and after the strangulation event. The victim's answers to these questions are documented in quotation marks. Some of this information may not initially assist in the clinical evaluation, but may be important later if the case goes to trial (McClane, Strack, & Hawley, 2001).

Physical assessment and photo-documentation. The forensic examination entails a 13 item physical assessment to evaluate for injuries on the head, face, neck, chest, lungs, and neurological system (Appendix D). Anatomical body diagrams and photographs are used by the FNE to document injuries of the anterior, posterior, and lateral aspects of the face, chin and neck where pain, erythema, petechiae, contusions, abrasions, and bite-marks are present. Petechiae, pinpoint hemorrhages on the skin and mucous membranes of the sclera, conjunctiva, lips, palate, ears, and scalp are also assessed, diagramed and photographed when noted on the physical assessment. In addition, fingernail marks present as linear or curvilinear abrasions are also documented.

Biological evidence collection. To collect skin cells and dried evidence the FNE uses four sterile cotton swabs moistened with sterile water or saline rolled over the area where the perpetrator came in contact with the victim's neck. The FNE should also collect moist secretions such as blood, saliva, and semen, if present. To collect moist evidence, the FNE uses four dry sterile cotton swabs rolling over the area of biological evidence. All swabs are allowed to air dry before being packaged. Each package is then be labeled with the contents, victim's name, collector's name, and the date and time of collection.

Data Collection & Analysis

A retrospective, pre-protocol review of all non-lethal strangulation cases from January 2013 to December 2013 were conducted for completeness, including the victim's narrative of events, pertinent questions, physical assessment, photographic and biological evidence collection. Once the new protocol was implemented another retrospective chart review was performed collecting identical data. A total of 19 pre-protocol and 22 post-protocol strangulation cases were reviewed and results compared.

Results

Education of Forensic Nurses and Physician

Training on the use of the protocol for the FNEs and forensic physician took place at the forensic physician's office at the Louisville Metro Police Department's Clinical Forensic Medicine Program in February of 2014. An email was sent and follow-up phone calls were made to each FNE (n = 3) and the forensic physician to determine availability for this training. Each examiner was given a hard copy and an electronic copy of the tool. The instructions as well as

the Sturgeon's SAVEcD Tool were reviewed in depth. Each section of the tool was reviewed individually and questions were answered as they arose.

Demographics

In the pre-protocol cases the age range was 16-61 (X = 32.21; SD = 12.118) years old, while post-protocol ages ranged from 21-74 years old (X = 35.45; SD = 12.192) (p> .05). Additional demographic information examined included the victims' gender, history of being strangled, and the victims' relationship to the perpetrator (see Table 1).

Table 1

Demographic Information	**Pre-protocol cases *n*=19**	**Post-protocol cases *n*=22**
Gender of victim	Female 19 (100%)	Female 21(95.5%)
	Male 0 (0%)	Male 1(4.5%)
Victim history of being strangled	8 (42.1%) Not assessed	0 (0%) Not assessed
	11 (57.9%) Present	15 (68.2%) Present
	0 (0%) Absent	7 (31.8%) Absent
Victim relationship to perpetrator	2 (10.5%) = Spouse	4(18.2%) = Spouse
	13 (68.4%) = Significant Other	17 (77.3%) = Significant Other
	3 (15.8%) = Ex-spouse or ex-significant other	1 (4.5%) = Ex-spouse or ex-significant other
	1(5.3%) = Father	0(0%) = Father

Instrument Completeness of Introductory Page

The introductory page of the instrument was evaluated for completeness and included the victim's past medical history, current medications, affect/demeanor during the forensic examination, and the description of the strangulation event. Significant differences in completion rates were found between past medical history, medication documentation, and victims' affect/demeanor pre and post protocol (see Table 2).

Table 2

Introduction	**Pre-protocol %**	**Post-protocol %**	χ^2	***p***
Past medical history	0%	91%	33.72	.0001
Medications	0%	91%	33.72	.0001
Affect/demeanor	5.3%	91%	29.93	.0001
Victim description of strangulation event		19 (100%) assessed	22 (100%) assessed	>.05

Instrument Completeness of Victim Description of Strangulation Event

The victims' description of the strangulation event section had 25 questions for the FNE to ask. This section of the instrument had a 52% completion rate pre-protocol and a 97% completion post-protocol rate (see Table 3).

Table 3

Victim Description of:	**Pre-protocol**	**Post-protocol**
How strangled	100%	100%
How many times strangled during event	100%	100%
Being shaken while strangled	0%	95.5%
Head being pounded while strangled	21%	95.5%
Feet leaving the ground while being strangled	16%	95.5%
How long the strangulation lasted	73.7%	95.5%
How much pressure was applied on the neck when strangled	57.9%	100%
Thoughts of what was going to happen while strangled	26%	95.5%
What perpetrator said before, during, and after strangled	78.9%	100%
What made perpetrator stop strangling	26%	95.5%
Being smothered	10.5%	95.5%
Difficulty breathing	21%	100%
Cough	16%	95.5%
Trouble swallowing	73.7%	95.5%
Hoarse, raspy, or complete loss of voice	57.9%	95.5%
Changes in vision	78.9%	100%
Changes in hearing	47%	100%
Dizziness and lightheadedness	47%	95.5%
Loss of consciousness	89.5%	100%
Vomiting	47%	95.5%
Losing control of urine or stool	73.7%	100%
Being sexually assaulted	47%	95.5%
Being slapped, punched, or kicked somewhere on body	78.9%	100%
Being bitten somewhere on body	5%	91%
Being strangled prior to this event and number of times	57.9%	100%
Completion	52%	97%

Instrument Completeness of Documentation of Physical Findings

The documentation of physical findings had a total of 13 items for the FNE to assess. This section of the instrument had a pre-protocol completion rate of 32% and a post-protocol completion rate of 90% (see Table 4).

Table 4

Documentation of:	**Pre-protocol**	**Post-protocol**
Visible injuries on the neck and mastoid	100%	100%
Petechiae on eyelids, face, scalp, neck, ears, soft palate	89.5%	100%
Subconjunctival/sclera hemorrhage	37%	100%
Mental status changes	21%	100%
Neurological findings	26%	95.5%
Neck measurement/swelling	0%	27%
Miscarriage	10%	91%
Lung Injuries	0%	95.5%
Other Symptoms	26%	95.5%
Pain, erythema, contusions, abrasions, edema	100%	100%
Photographs	100%	100%
Completion	32%	90%

Instrument Completeness of X-ray Reports Reviewed and DNA Collected

X-ray reports were reviewed in 58% of the pre-protocol cases and in 100% of the post-protocol cases (see Table 5). DNA was collected when appropriate in 79% of the pre-protocol cases and in 100% of all post-protocol cases.

Table 5

	Pre-protocol	Post-protocol
X-ray reported reviewed	58%	100%
DNA collected	79%	100%

Discussion

The victims evaluated with this protocol were similar to those of previous studies regarding strangulation. The majority of victims were female, in their thirties, and the non-lethal strangulation was done by a male.

Overall, the tool was found to be useful and improved documentation by the FNEs in the Louisville Metro Police Department's Clinical Forensic Medicine Program. The pre-protocol completion rates for the introductory components of the Sturgeon's SAVEcD Tool were low. The victims past medical history and medication history were each 0%, with the post-protocol completion rates increased to 91%. The pre-protocol completion rates were low for the introductory questions because these were not questions Dr. Bill Smock trained FNEs to ask. However, these are important questions to include on the tool because certain medical conditions and medications can alter a victim's assessment results. An example includes an acute asthma attack, which increases intracranial pressure and can produce petechiae. Given that petechiae is also found with strangulation it is important for the FNE to identify if the victim did not experienced an acute asthma attack and can rule out that as a cause for petechial findings.

Pre-protocol completion rates for the victims' description of the strangulation event, how they were strangled, and how many times they were strangled during the event, were each at 100%. These rates were high because these are the original questions that Dr. Bill Smock trained the FNEs with the Louisville Metro Police Department's Clinical Forensic Medicine Program to ask. These were the questions the FNEs have been asking and documenting on strangulation victims for six years before Sturgeon's SAVEcD Tool was developed.

However, the victim's description of their thoughts of what was going to happen while they were being strangled, were low at 26% pre-protocol. The post-protocol completion rate increased to 95.5%. It is important to assess and document the victim's thoughts about the strangulation event because this will allow the judge and jury, if the case goes to trial, to understand what the victim actually experienced. The completion rate pre-protocol was low because this is not an original question that FNEs were taught to ask while assessing victims of strangulation.

Strengths

A strength of this newly developed protocol is that it is evidence based. The best scientific evidence regarding the accurate assessment and documentation of strangulation victims' injuries was identified. However, most of the literature was older than 5-10 years. Forensic journals and articles from the National Strangulation Training Institute need to be monitored to identify newly published literature on strangulation. Future research can assist in the further development of the strangulation tool.

In addition, the protocol has led to a significant improvement in the completeness in assessing, documenting, and collecting evidence of strangulation victims evaluated by the FNEs

at the Louisville Metro Police Department's Clinical Forensic Medicine Program. The retrospective chart review pre-protocol completeness was 46%. Once the FNEs were trained on the use of a standardized tool the post-protocol completeness improved to 95%. These results indicate that the tool assists the completeness in assessing, documenting and collecting evidence of strangulation victims evaluated by the FNEs at the Louisville Metro Police Department's Clinical Forensic Medicine Program. Once the tool is disseminated and used by other FNE programs, there is the potential for the tool to do the same for them.

Limitations

The largest limitation was so few health care providers using the tool. To address this limitation, the tool should be sent to other FNE programs and data gathered regarding the demographics, introductory page, and instrument completeness of the victim description of the strangulation event, documentation of physical findings, x-ray reports reviewed, and DNA collection.

Another limitation was the lack of establishing validity and reliability of the tool. The tool was examined for content validity by one of the Domestic Violence Unit Detectives, the forensic physician, and one forensic nurse. A larger number of peers that work with strangulation victims are needed to accurately determine the construct validity the tool. Inter-rater reliability should also be determined by the agreement between the findings by multiple FNEs on the same victim of strangulation.

The small sample size was a third limitation. Since this was a pilot project, and the sample size was so small, it was difficult to generalize these results to the larger population of strangulation victims. A much larger sample size is needed. Disseminating the tool to other FNE

programs and allowing more data collection and analyses will also assist in ultimately refining the tool.

SAVEcD Tool Revisions

The portion of the tool that had the lowest completion rate post-protocol was documentation of physical findings due to assessment and documentation of neck swelling at 27%. The low completion rate may be due to the fact that neck edema is determined when there are a minimum of two measurements at two different points in time. Repeated neck measurements occur with a follow-up assessment at 48 hours to 72 hours after the initial assessment. A follow-up assessment was performed only in 27% cases. The 27% completion rate will rise if the FNE and Detective work collaboratively in getting the victim to return for at least one follow-up examination when the victim's neck measurement can be reassessed.

Anecdotally, FNEs and the forensic physician identified important information that needed collecting was not found on the instrument. Therefore, changes to the instrument are necessary to assure a complete and thorough examination of the strangulation victim's assessment. For the victim description of strangulation events section, there is a need to include the amount of time from the strangulation event to the forensic examination. The amount of time can change the physical characteristics of the findings, and this time frame needs to be documented (National Strangulation Training Institute, 2013).

Secondly, there were two strangulation victims that were also shot and stabbed during their assault. There was no place on instrument to document these findings. A future recommendation would be to add gunshot wounds and stabbings to the questions for strangulation victim portion of the instrument.

Thirdly, there is limited space available on the instrument to document the strangulation victims' past medical history and medications. A future recommendation would be to add more space for this documentation.

Lastly, in the assessment of physical findings section, a check-box needs to be added to each assessment so there is a place to document negative findings. This check-box assures there will be no blanks on the assessment tool. This could further improve the completion rates on this section of the tool.

Alternate Light Source

In the future, when funding is available, Louisville Metro Police Department's Clinical Forensic Medicine Program plans to purchase an alternate light source. Forensic light sources are powerful lamps that contain ultraviolet and infrared components of light. Alternate light sources filter down light into individual color bands called wavelengths. Multiple wavelengths are necessary because different colors penetrate at different depths of the wound on the skin. Forensic lights may reveal contusions that are not visible under normal white light (Limmen, Ceelen, Reijnders, Stomp, Keijzer, & Das 2013). Contusions, once visualized with the forensic light, can be added to the diagram and description of injuries section of the instrument.

Fiberoptic Laryngoscopy and Kentucky Board of Nursing Position Statement

The use of a fiberoptic laryngoscope to allow for internal visualization of the larynx and other internal structures is not currently listed as a scope of practice for the Registered Nurse in Kentucky. The Louisville Metro Police Department's Clinical Forensic Medicine Program plans to request an advisory opinion statement from the Kentucky Board of Nursing's Practice Committee regarding the RN's ability to perform this procedure. If observed, laryngeal injuries

visualized with the laryngoscope, can be added to the diagram and description of injuries section of the instrument. According to McClane, Strack, and Hawley (2001) and Funk and Schuppel (2003) strangulation victims with symptoms of dyspnea, dysphonia, aphonia, or odynophagia should undergo fiberoptic laryngoscopy as a means of visualizing the vocal cords and trachea to evaluate for injury.

Application to Practice

After revisions to the SAVEcD strangulation tool, the plan is to disseminate it to other FNEs programs nationwide. Interest has been expressed for the use of the tool by the Past-President of the International Association of Forensic Nurses (IAFN) in her forensic program in Maine and by another FNE to use in Washington. The plan is to publish the strangulation instrument and the results of this pilot project in the Journal of Forensic Nursing, a publication sponsored by the IAFN. In October of 2014 the strangulation instrument and the preliminary results of this pilot project were present at the IAFN's Annual Conference in Phoenix, AZ.

Conclusions

Accurate and thorough physical assessment, with accompanying documentation, are essential components for appropriate legal intervention for victims in all strangulation cases. There is a need for this strangulation assessment, evidence collection, and documentation protocol. Forensic nurse examiners who work with strangulation victims need to be sure that their assessment, evidence collection, and documentation are complete, accurate, and consistent to help ensure perpetrator accountability.

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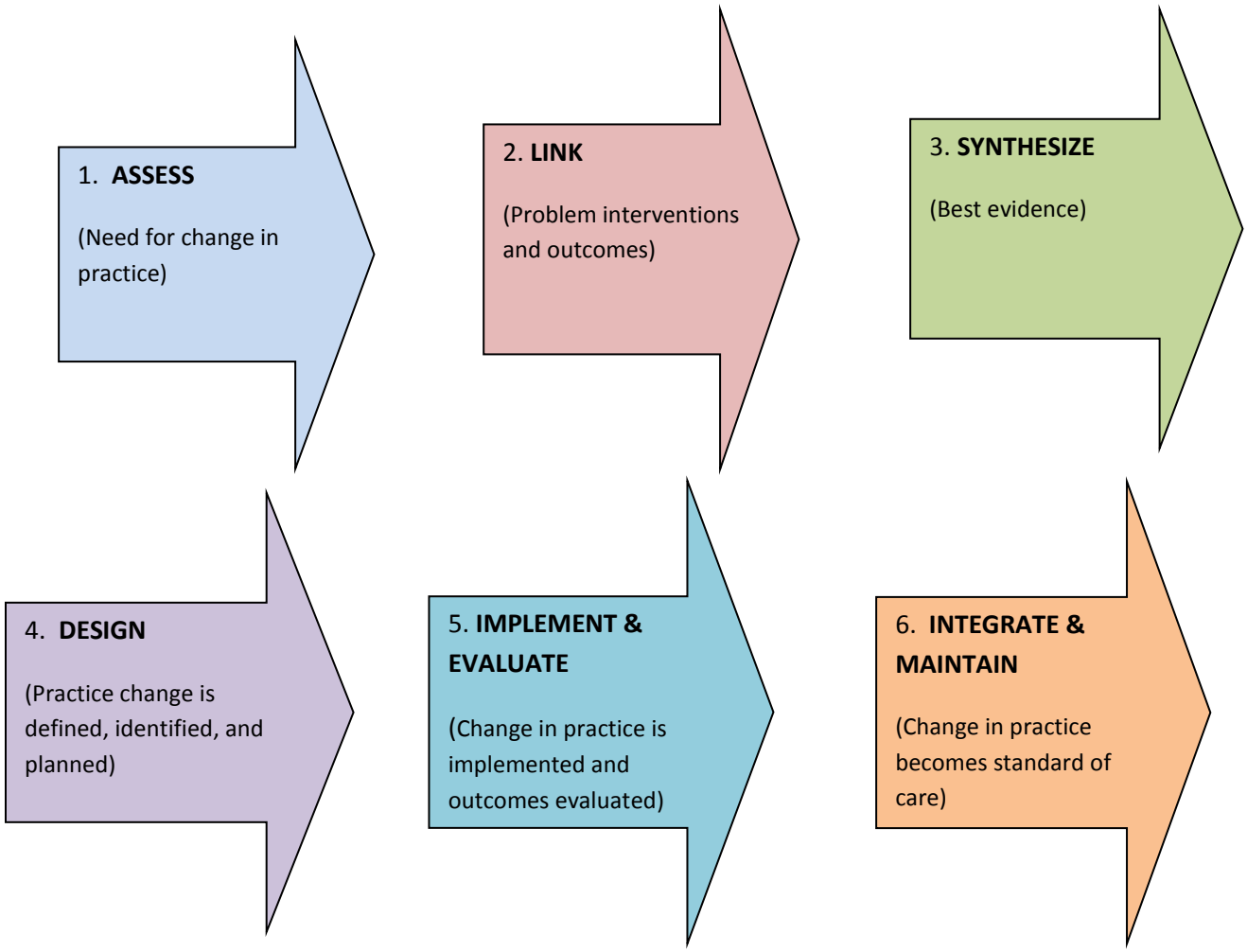
Appendix A

Evidence-Based Practice Conceptual Framework (Rosswurm, M.A. & Larrabee, J.H. 1999)



Appendix B

Strangulation Assessment, Evidence Collection, and Documentation Protocol -- Checklist

_____STEP 1: Notified by forensic physician of consult needed by text-message or phone call.

_____STEP 2: Contact regional detectives or detective in the Domestic Violence Unit to determine specifics about the case.

_____STEP 3: Arrive at location of forensic examination within one-hour of contact of consult needed. Work with detectives, officers, and crime technicians at the scene.

_____STEP 4: Obtain consent from victim.

_____STEP 5: Complete the 5-page Strangulation Assessment for Victims with Evidence collection and Documentation tool (Sturgeon's SAVEcD tool). Follow instruction page carefully. Document general information, the victim's description of strangulation event, diagrams and descriptions of injuries, collection of evidence, and photo-documentation.

_____STEP 6: Follow-up photo-documentation of all visible injuries at 24 hours, 48 hours, and/or 72 hours after the assault whenever possible. The photography from each case is reviewed by a clinical forensic expert for compliance and accuracy.

_____STEP 7: Formal report completed with 5-page tool attached and sent to detective within one week from date of consultation.

Appendix C

Sturgeon's SAVEcD Tool

Strangulation Assessment, Evidence Collection, and Documentation Tool Instructions

STEP 1: GENERAL INFORMATION

Include the name and date of birth of the victim, the Louisville Metro Police Department's Clinical Forensic Medicine Program case number, the Louisville Metro Police Department report number, the date and time of the examination, and the date and time of the strangulation event.

STEP 2: VICTIM DESCRIPTION OF STRANGULATION EVENT

Describe what happened using the victim's own words. Place quotation marks around the victim's comments. Also describe the victim's general demeanor/affect using terms such as flat, sad, labile, crying, tearful, or withdrawn. Include the perpetrators name, date of birth, and his or her relationship to the victim. Attach additional pages if needed.

STEP 3: COLLECTION OF EVIDENCE

Collect dried and moist secretions (i.e. blood stains, saliva, etc.) from the face, head, neck, and mouth. Use four sterile cotton tipped swabs for each specimen. Swab moist secretions with dry swabs. Swab dry secretions with swabs moistened with sterile saline or sterile water. Air dry the swabs before packaging in an envelope or a swab box. Label each envelope or swab box with the contents, victim name, collector name, the date and time of collection, seal the envelope with tape, and then initial. Make a control swabs by moistening swabs with the sterile saline or the sterile water used. Label, air dry, and package the control swabs separately from the evidence samples. Collect fingernail scrapings or cuttings, if indicated per history. Use the stick portion of the cotton tipped swabs to scrap under fingernails. Place scrapings from each hand into a separate labeled envelop. Clean nail clippers could also be used to cut fingernails from each hand. Place cuttings from each hand into separate envelopes. Make certain each envelope or swab box is label with the contents, victim name, collector name, the date and time of collection; seal the envelope with tape, and then initial. Document location and potential secretion identified.

STEP 4: DIAGRAMS OF INJURIES

Examine the head, face, neck, and chest. Closely examine the sclera, conjunctiva, lips, palate ears, and scalp. Observe for areas of erythema, abrasion, contusion, swelling, laceration, fracture, bite mark, burn, or tenderness. Record each injury by drawing on the diagram. Label each injury drawn on the diagram by using the consecutive alphabetical system (A, B, C, etc.) to describe each one separately. Attach additional pages if needed.

STEP 5: DESCRIPTION OF INJURIES

Document the shape, color, and size of all injuries. Use centimeters as the unit of measure. Note length, wide, and depth (if possible) of each injury.

STEP 6: PHOTO-DOCUMENTATION

First, take distant full-body photographs (called orientation photos). Next, take mid-distance photographs. Take at least two photographs each of the front, sides, and back of the face, neck, upper chest, and shoulders. Carefully assess and photograph the eyes and mouth. Take five photographs of the left eye and five photographs of the right eye. With the victim looking straight ahead while gently pulling down on the right lower lid with gloved hands, expose the lower conjunctival sac. Take a least one photograph. More if injuries are identified. Take other photographs of the victim looking up, looking to the left, looking to the right, and looking down. Repeat on the left eye. With the victims mouth open take photographs of the upper and lower lips and frenulums, under the tongue and on the soft palate. Take at least one photograph with the flash on and the camera in the upright position. Take other photographs with the camera rotated so the flash on the left, the right, and is upside down. More photographs should be taken if injuries are identified. Follow-up photographs of all visible injuries should be taken at 24, 48, and 72 hours post-assault. Take close-up photographs of all injuries with and without a measurement ruler in place. Equipment needed: SLR camera in aperture mode with the f-stop at 18-22 with a Macro lens and an ABFO No.2 L-Ruler for measurement of injuries. Ensure that the plane of the object is at 90 degrees.

Appendix D– Sturgeon's SAVEcD Tool

Victim Name_____ Date of Birth _____ Case # _____ Report #_____

Date & Time of Assessment _____ Date & Time of Strangulations _____

PMH:---Respiratory (asthma, etc.) _____ ---Neurological (stroke, seizures, Parkinson, etc.) _____

Medications:_____

Affect/Demeanor: ____sad ___crying ___tearful ___labile ___flat ___ anxious ___withdrawn

Victim Description of Strangulation(s) Event

_____

_____

_____

_____

_____

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_____

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_____

_____

Forensic Nurse Examiner Name/Signature _____

Victim Name_____ Date of Birth _____ Case # _____ Report #_____

Questions for Strangulation Victim

1. Describe and demonstrate on the model how you were strangled? one hand? two hands? arm? leg? or other object?

_____

2. How many times were you strangled? / What period of time?

_____

3. Were you shaken while you were being strangled?

_____

4. Was your head pounded on the ground or wall while you were being strangled?

_____

5. Did your feet leave the ground while you were being strangled?

_____

6. How long did the strangulation(s) last? #1) #2) #3)

_____

7. How much pressure was applied to your neck during strangulation on a scale of 1-10? #1) #2) #3)

_____

8. What did you think was going to happen?

_____

9. What did the perpetrator say to you before, during, and after you were strangled?

_____

10. What made the perpetrator stop strangling you?

_____

11. Were you smothered? (suffocation refers to obstruction of the airway at the nose or mouth)

_____

12. Did you or do you currently have any difficulty breathing?

_____

13. Did you or do you currently have a cough?

_____

14. Did you or do you currently have trouble swallowing?

_____

15. Did you or do you currently have a hoarse, raspy, or complete loss of voice?

_____

16. Did you or do you currently have any changes in your vision? (seeing spots, tunnel vision, blurry vision, everything went black, etc.)

_____

17. Did you or do you currently have any changes in your hearing? (roaring, ringing, etc.)

_____

18. Did you get dizzy or become lightheaded?

_____

19. Did you lose consciousness? (passed out, blacked out, etc.)

_____

20. Did you vomit as a result of being strangled?

_____

21. Did you lose control of urine or stool while you were being strangled?

_____

22. Were you sexually assaulted?

_____

23. Were you slapped, punched, or kicked anywhere on your body?

_____

24. Were you bitten anywhere on your body?

_____

25. Have you been strangled prior to this event? / How many times?

_____

Forensic Nurse Examiner Name/Signature _____

Victim Name_____ Date of Birth _____ Case # _____ Report #_____

Assessment of Physical Finding* *(further narrative documentation required for positive findings)*

1. Voice Changes: dysphonia (defined as hoarseness) /aphonia (defined as severe or complete loss of voice)
_____

2. Swallowing Changes and Tongue Swelling: dysphagia (defined as difficulty swallowing) /odynophagia (defined as painful swallowing)
_____

3. Breathing Changes: dyspnea (defined as difficulty breathing)
_____

4. Visible Injuries on the Neck and Mastoid: ligature marks/edema/ abrasions (scratches & scrapes)/erythema/contusion
_____

5. Petechiae: eyelids/peri-orbital region/face/scalp/neck/ears/soft palate/under tongue
_____

6. Subconjunctival/Scleral Hemorrhage (eyes)
_____

7. Mental Status Changes: restlessness/combativeness/amnesia/psychosis
_____

8. Neurological Findings: ptosis/facial droop/unilateral weakness/loss of sensation/paralysis/seizure
_____

9. Neck swelling: measurement for size
_____

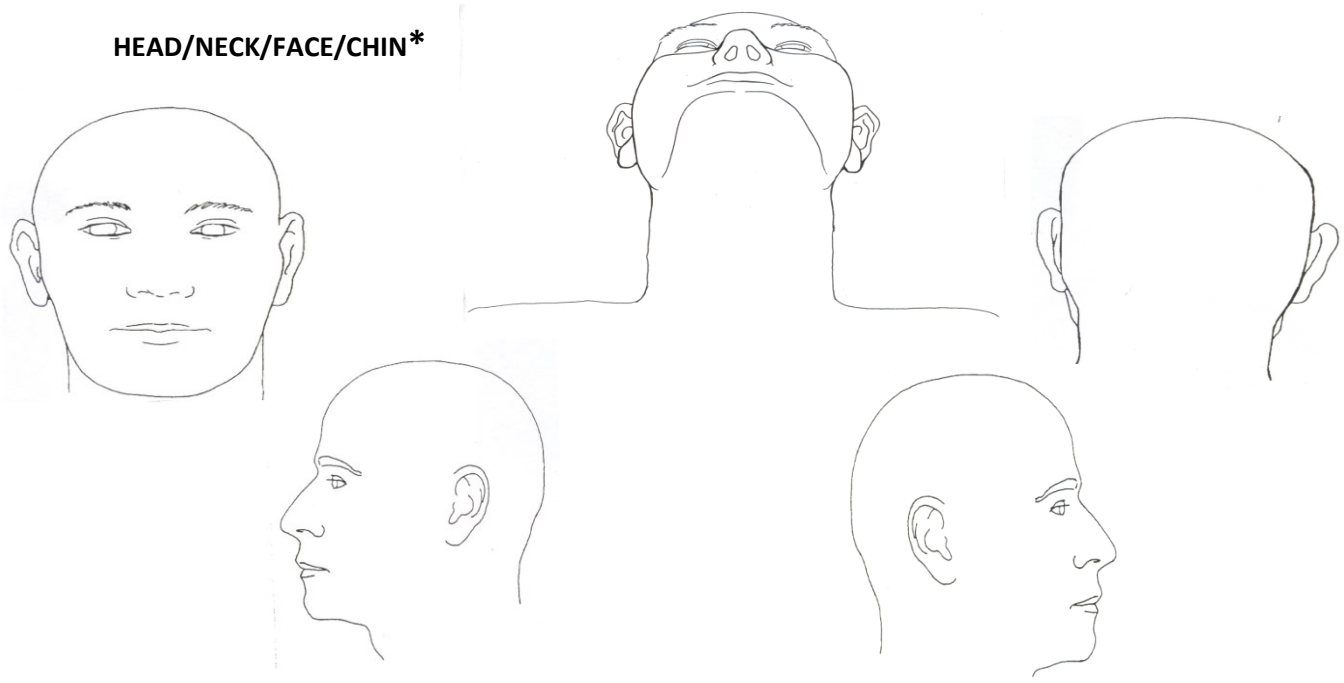
10. Miscarriage/Pregnancy/LMP_____
_____

11. Lung Injuries: aspiration pneumonia/pulmonary edema
_____

12. Other Symptoms: dizziness/tinnitus/acid reflux
_____

13. Pain, erythema, contusion, abrasion, edema, petechiae, or bite marks on any other area of the body (i.e. chest, back, upper extremities, lower extremities)
_____

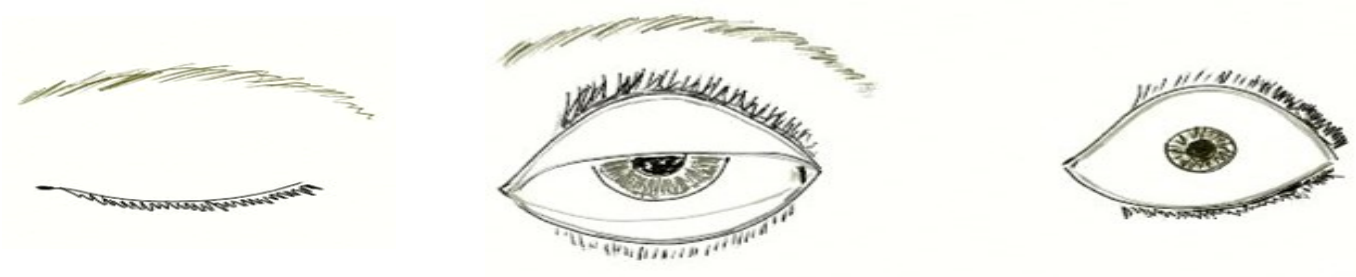
HEAD/NECK/FACE/CHIN*



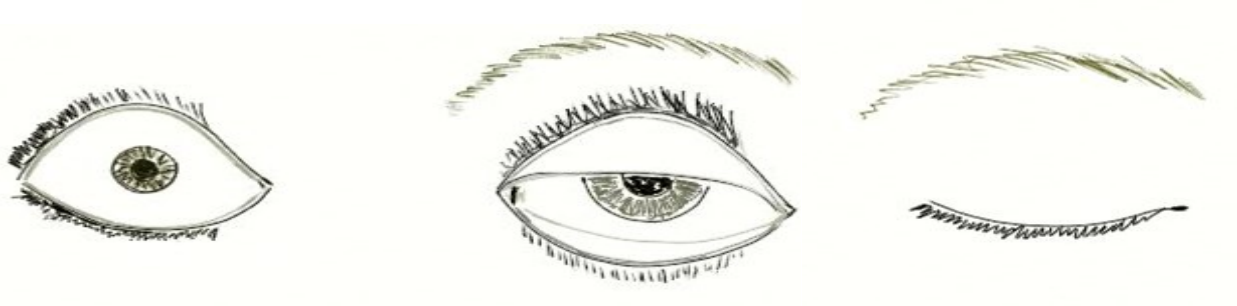
Forensic Nurse Examiner Name/Signature _____

Victim Name_____ Date of Birth _____ Case # _____ Report #_____

LEFT EYE – OUTER EYELID/UPPER AND LOWER CONJUNCTIVA/SCLERA*



RIGHT EYE – SCLERA/UPPER & LOWER CONJUNCTIVA/OUTER LID*



MOUTH – PALATE/TONGUE/FRENULUMS/INNER &OUTER LIPS*

Forensic Nurse Examiner Name/Signature _____

Victim Name_____ Date of Birth _____ Case # _____ Report #_____

***DESCRIPTION OF INJURIES/(EVIDENCE COLLECTION)**

Label (A,B…)	*Description*

Forensic Nurse Examiner Name/Signature _____