Protocol validation for the preservation of forensic traces in health services

Validação de protocolo para a preservação de vestígios forenses em serviços de saúde

DOI: 10.55905/revconv.16n.12-093

Recebimento dos originais: 03/11/2023
Aceitação para publicação: 11/12/2023

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ABSTRACT
Care protocols integrate norms, routines and procedures related to a particular health problem/condition. This study proposed the elaboration and validation of a protocol on the preservation of forensic traces in urgent/emergency health services. Methodological study with a quantitative approach. The protocol content validation was performed by 16 judges with expertise in the area of forensic sciences. The measures used to assess the degree of agreement were Percentage of Agreement, Content Validity Index (CVI) and Cronbach's Alpha. A rate of agreement with values above 80% was considered acceptable in the study; a value higher than 78% was considered for CVI calculated per item, and the minimum acceptable value for Cronbach's Alpha was 0.70. The average agreement rate of the instrument was 89.9% (±14.0), varying between the blocks of questions. Of all the items evaluated, 97.4% had an average CVI above 0.78 (78%). The sum of the items considered relevant by each evaluator resulted in an average score of 0.992 (99.2%) for the CVI of the entire protocol. In the evaluation of the degree of reliability, general Cronbach's Alpha showed a high level of internal consistency of the protocol, equivalent to 0.864. The protocol had acceptable psychometric measures of content validity, being valid for use in the preservation of forensic traces by health professionals in urgent/emergency health services.

Keywords: validation studies, forensic sciences, health services, health professionals, clinical practice guidelines, violence.
avaliar o grau de concordância foram a Porcentagem de Concordância, o Índice de Validade de Conteúdo (IVC) e o Alfa de Cronbach. Uma taxa de concordância com valores acima de 80% foi considerada aceitável no estudo; um valor superior a 78% foi considerado para o IVC calculado por item, e o valor mínimo aceitável para o Alfa de Cronbach foi de 0,70. A taxa média de concordância do instrumento foi de 89,9% (±14,0), variando entre os blocos de questões. De todos os itens avaliados, 97,4% tiveram um IVC médio acima de 0,78 (78%). A soma dos itens considerados relevantes por cada avaliador resultou em uma pontuação média de 0,992 (99,2%) para o IVC de todo o protocolo. Na avaliação do grau de confiabilidade, o Alfa de Cronbach geral mostrou um alto nível de consistência interna do protocolo, equivalente a 0,864. O protocolo apresentou medidas psicométricas aceitáveis de validade de conteúdo, sendo válido para uso na preservação de vestígios forenses por profissionais de saúde em serviços de saúde de urgência/emergência.

Palavras-chave: estudos de validação, ciências forenses, serviços de saúde, profissionais de saúde, diretrizes de prática clínica, violência.

1 INTRODUCTION

Coordination of health care, social protection and justice networks services is necessary for proper care to victims of violence. However, situations of lack/failure of intersector communication are very frequent, contributing to the destruction, contamination or loss of important forensic traces for the elucidation of cases of violence, as well as to inflict new suffering to the victims who have to access various health services (PARANÁ, 2015).

Regardless of the fact that the health of individuals who have suffered violence is a priority, health institutions must follow pre-defined guidelines to ensure continuity of comprehensive care. Health professionals must include in the procedures to be adopted the activation and referral of patients to services that integrate the victim protection network, and also collaborate to ensure the integrity of possible material evidence of expert interest frequently found during care (TOZZO, 2018).

Many studies addressing the participation of health professionals in the preservation of forensic traces during the care of victims have been recently developed, and although scientific production is still restricted, some guidelines inherent to the process of maintaining the integrity of evidence and the collection of materials in the hospital and intra-hospital environment have been listed (TOZZO, 2018; HENDERSON, 2017).

Studies with health professionals from the intra and pre-hospital care sectors in Brazil revealed that these individuals are unaware of the existence of institutional protocols for the
management of traces (HENDERSON, 2012; MISHORI, 2017). Protocols are technical, organizational and political tools that help standardize practices and introduce new technologies into care settings. However, first, it is recommended that these protocols are based on the best scientific evidence and validated by a group of experts, to ensure the understanding of the items of the instrument (PARANÁ, 2015)

The present study aimed to develop and validate a protocol for the preservation of forensic traces by health professionals in an urgent and emergency hospital unit.

2 MATERIAL AND METHODS

This is a methodological study aimed to validate a protocol for the preservation of forensic traces in urgent and emergency health services with a quantitative approach. The development of a protocol for the preservation of forensic traces by health professionals in urgent/emergency services was proposed based on the results of a field research with the health team of a referral hospital for trauma in the state of Sergipe, Brazil [13]. In the investigation on the knowledge and activities performed by health professionals related to the preservation of these materials during the assistance of victims of violence, one of the weaknesses identified was precisely the lack of a protocol to guide these practices.

According to Werneck (2009), for the elaboration of the protocol, the difficulty in preserving forensic traces in the health services was analyzed, considering its magnitude, transcendence, vulnerability, effects and determinants (Chart 1).

After characterization of the problem, a systematic search was carried out in PubMed, Lilacs and Bireme databases for scientific evidence regarding the main procedures recommended for the preservation of forensic evidence in cases of sexual assault with firearms, bladed weapons, intoxication and asphyxia that supported the protocol’s actions. Moreover, the Brazilian legislation and the law of professional practice for occupations in the health segment (physicians, nurses and nursing technicians) were analyzed.

The protocol developed was divided into five main chapters. The first addresses conceptual aspects of forensic evidence, specific legislation and chain of custody; the second chapter addresses the main aspects related to registration in medical records containing information on the care provided to the victims; the main procedures related to the preservation of traces in cases of sexual assault with firearms and white arms (bladed weapons), by asphyxia
and exogenous intoxication are listed in the third chapter; the fourth chapter emphasizes the importance of intersector dialogue between health services and the police forensic investigation department, and a consistent flow of information, and finally the fifth chapter presents the flowcharts of the guidelines proposed for each specific type of violence.

After the construction of the protocol, a questionnaire for data collection was elaborated using Google Forms for the validation process. Information about the evaluator's educational level and length of professional experience was requested, and there were 76 questions related to the procedures contemplated in the protocol. These procedures were evaluated by the participants using a four-point Likert scale: 1 = not representative, 2 = item needs major revision to be representative, 3 = item needs minor revision to be representative, 4 = item is relevant or representative. At the end of the instrument, observed could also make descriptive considerations about the items judged and suggestions for improvements.

The evaluators were selected by snowball sampling, that is, the first subjects selected recommended the recruitment of other subjects who fulfilled the selection criteria for the study. The inclusion criteria were, as follows: being a specialist, master, doctor or researcher in a given area of forensic science or having professional experience in the area. A cover letter, the protocol, a link to access the online questionnaire and instructions for its completion were sent by email to 16 professionals in the forensic area, and a period of 15 days was established for completion of the evaluation.

The measures used to assess the degree of agreement in the content validation of the protocol developed were the percentage of agreement (% agreement = number of participants who fully agreed with the item/total number of participants x 100), the Content Validity Index (CVI) (number of responses 3 or 4/total number of responses) and Cronbach's Alpha.

A rate of agreement with values above 80% was considered acceptable in the study; a value higher than 78% was considered for CVI calculated per item, and for the CVI of the entire instrument, a rate greater than or equal to 90% was considered. Items that scored “2” were revised and those assigned “1” were eliminated (COLUCI et al, 2015)

The minimum acceptable value for Cronbach's Alpha was 0.70. Thus, the instrument’s internal consistency was considered low if Cronbach’s Alpha values were lower than 0.70. Alpha values ranging between 0.80 and 0.90 are generally preferred (QUAGLIO et al, 2019)
After analyzing the quantitative data, the experts were asked about the items that did not reach the acceptable rate of agreement, so that changes could be or items eliminated. At this stage, the specialists could make suggestions and pertinent observations for the improvement of the protocol.

Ethical principles stipulated by resolution 466/2012 that provides for guidelines and regulatory standards for research involving human beings, were observed, and the methodological steps were initiated only after the study’s approval by the Research Ethics Committee of Universidade Tiradentes (no 2.135.510, CAAE: 69059017.7.0000.5371).

3 RESULTS

The first version of the protocol was evaluated by 16 professionals, five coroners, five forensic experts and six forensic nurses. As for training, 37.5% had a lato sensu specialization, 50% stricto sensu (25% doctorate and 25% master's degree) and 12.5% had completed postdoctoral studies in the area of forensic sciences.

The average agreement rate of the instrument was 89.9% ±14.0, varying between the blocks of questions. Of the 76 items evaluated, 43.4% (33) obtained total agreement (all individuals reported a maximum score of 4 points, that is, the item was considered totally relevant or adequate), 52.6% (40) had at least one grade 3 (item suitable, but in need of minor revision), 7.9% (6) received at least a grade 2 (item needs major revision) and 1.3% (1) at least a grade of 1 (item inappropriate). The average agreement rate assigned to the topics evaluated in the protocol was 3.9 ± 0.365.

Of the total number of items evaluated, 97.4% had an average CVI above 0.78 (78%). The values ranged from 0.6875 (68.75%) to 1 (100%). The sum of the items considered relevant by each evaluator resulted in an average score of 0.992 (99.2%) for the CVI of the entire protocol.

The domains that showed an average percentage of agreement lower than 80% were Flowchart proposed for the intersector dialogue (Figure 1) and General Guidelines, with 68.75% and 77.1%, respectively.

The items that received the lowest score (Table 3) were the procedures related to the collection of traces on the patients’ bodies, forwarding of materials used by the health team during care, and preservation of patients’ hands after death.
In the assessment of the degree of reliability of the responses obtained after experts’ evaluation, general Cronbach's Alpha showed a high level of internal consistency of the protocol, equivalent to 0.864.

At the end of the protocol evaluation, the specialists suggested adjustments to the instrument (Figure 3). The suggestions included guidelines for the preservation of traces in situations of sexual violence, complete identification of the patient in the medical record; photographic documentation and identification of the collected evidence.

4 DISCUSSION

The protocol for the preservation of forensic traces in urgent and emergency services allows for a better operationalization of the work carried out by health teams, regarding the directing of flows, conducts and procedures for the identification, storage and forwarding of forensic materials during the care of patients who have been victims of violence, collaborating to guarantee the suitability and legitimacy of the referred materials, as well as their viability for analysis of criminal expertise (DE OLIVEIRA MUSSE, 2020).

This study aimed to validate a set of procedures proposed in a protocol for the preservation of forensic traces for health professionals during the care of victims of sexual violence, firearms, bladed weapons, exogenous intoxication and asphyxia. The elaboration of the items contemplated in the proposal of this protocol was based on the relevant literature and on the experience of the experts invited for analysis. The items were classified according to their clarity (TOZZO, 2018; SOUZA, 2017; EISERT, 2010; GOMES, 2017; SILVA, 2011; CODORMA, 2016; COLUCI, 2015; DE ANDRADE MARTINS, 2006; DE OLIVEIRA MUSE, 2020; GONÇALVES, 2022; GOMES, 2017).

One of the relevant aspects in the evaluation of an instrument is the number and expertise of judges. Therefore, the training and qualifications of these judges were taken into account. The selected judges had extensive experience in different areas of forensic science, and this is essential to ensure greater accuracy in the validation of the instrument (PEREIRA, 2017).

Most of the items included in the protocol and evaluated by the experts had an acceptable agreement rate (greater than 80%), as well as an average CVI above 0.78 (78%). Therefore, the protocol content was valid, with a percentage of agreement above that established in the literature.
Thus, the content of the instrument proposed in this study was considered a valid and accurate measure for the items evaluated.

The CVI is a method widely used in the health area, which measures the proportion or percentage of judges who agree on certain aspects of the instrument and its items. It allows to analyze at first each item individually and, later, the instrument as a whole (SILVA, 2010).

Cronbach's Alpha was used to verify the reliability of the instrument. It assesses how well a set of items measures in a one-dimensional way the construct proposed by the instrument. Values > 0.700 are considered acceptable for exploratory studies. In the context of this study, a satisfactory index (0.864) was obtained, thus guaranteeing the reliability of the validated instrument (SOUZA, 2017). The importance of the instrument developed is also highlighted, since it can be used in other studies. However, given its originality, comparison of its results with other studies on the same topic is difficult.

The use or implementation of a protocol validated with the final synthesis version with good agreement among experts favors the construction of an instrument consistent with reality. Therefore, the chances are greater that this protocol will be better accepted by health professionals, as well as by experts in forensic sciences, legitimizing a specialized and innovative care for health services.

Regarding the domains with lower percentage of agreement, the proposed flow for intersector communication (health and public safety institution) and the procedures related to the collection/preservation of traces and the forwarding of forensic materials were verified, contained in the domain "General Guidelines". It should be noted that in Brazil there is no regulation for the participation of health professionals in the chain of custody, except when it concerns traces in victims of sexual violence, and this is very recent. Thus, experts are expected to investigate the collection of these materials by professionals in health services, since it remains unclear how these materials should be packaged and sent to the competent bodies.

The situation in Brazil is quite different from that of other countries, such as the United States of America, Canada, the United Kingdom and Australia where in addition to their regular responsibilities, health professionals (including forensic nurses) are also supposed to perform these procedures when they assist victims of violence, using protocols, also called “guidelines” (COLUCI, 2015).
Agreement between the representative bodies of Health, Public Security and Justice is essential, so that the traces collected and/or preserved in the health services are included in the chain of custody and accepted as possible evidence to be analyzed by the police forensic investigation department. We also emphasize the role of the legislative body proposing laws to support the actions, and of the Councils of professional occupations recognizing the importance of the issue, encouraging participation and promoting the regulation of professional practice to support the activities performed by health professionals (DE OLIVEIRA MUSSE, 2020).

Regarding specialists' suggestions for improvements to the instrument, the inclusion of aspects related to the assistance to victims of sexual violence, analysis of bites, documentation and registration was highlighted.

In the case of victims of sexual violence that involves carnal intercourse or lewd acts, the presence of some types of biological traces, such as semen and blood, is very common. Underwear or sanitary pads in contact with the genital area often contain samples of these traces. Therefore, health professionals must collect these items so that they are submitted to forensic examination (SOUZA et al, 2017)

Amorim et al (2016) stress that “bites are frequent in cases of sexual assault, occurring on both the victim and the aggressor”. Analysis of bite marks can contribute to the investigation of the circumstances in which the crime was committed, and thus may provide significant medical-forensic evidence. The marks produced by the teeth can be used to identify the aggressor, as they have individual characteristics, and also as a potential source of genetic material.

Regarding the suggestions for procedures related to the records, focus should be given to the patient identification stage, which is emphasized in the guidelines of the National Patient Safety Program, as a way to avoid and/or minimize adverse events in health institutions, such as medication and medical procedure errors. The patient identification process requires at least two parameters among the following: full name, medical record identification number, date of birth and mother's name (BRASIL 2014) On the other hand, this identification is also crucial to guarantee the Chain of Custody.

In turn, the chain of custody will only be reliable if the labeling and storage of materials are adequate. Peel (2016) suggests that the traces be placed in an envelope, container or bag with identification: patient's full name, document number, date, time and place of collection, name of
the professional who performed the collection. Thus, adhesion of labels printed with this information is recommended, and staples should not be used to seal bags or envelopes to avoid tears when opening them.

The medical record is a document of great medical-legal relevance that may be requested by the court as indirect evidence during a criminal investigation. Therefore, healthcare professionals must ensure that the records are reliable and complete. Plain language should be used to describe the events witnessed by the professional and/or those reported by the victim (SOUZA, 2017; PEREIRA, 2017). It is suggested that photographic records of the lesions be attached to the patient’s chart, as they can help the experts to understand their pattern. Photographs can capture details of wound characteristics in an ephemeral moment, which will not be repeated PEREIRA, 2017).

5 FINAL CONSIDERATIONS

The present study is relevant and provides an unprecedented contribution as it reflects on and analyzes the construction and validation of a protocol for the preservation of forensic traces during the care of victims of violence, because this instrument will subsidize health professionals to adopt the necessary procedures for an effective participation in the preservation of materials of forensic interest, collaborating with forensic scientists in the effective investigation of the cases, in the integrality of the care and in the guarantee of the patients’ human rights

The protocol has psychometric indicators of acceptable content validity and, therefore, is an instrument that can be used as a set of guidelines for the preservation of forensic traces in urgent/emergency health services. A qualitative validation phase is suggested, characterized by interaction between the researcher and the invited examiners through interviews and discussions to review controversial aspects.
REFERENCES


SILVA, Cristina José Diogo Catanho da. “Os enfermeiros e a preservação de vestígios perante vítimas de agressão sexual, no serviço de urgência”. 2011.


ANNEXES

Chart 1. Aspects identified for the elaboration of the Protocol on Preservation of Forensic Traces in Urgent and Emergency Services. Aracaju, SE, Brazil, 2020

<table>
<thead>
<tr>
<th>THE PROBLEM: Non preservation of forensic traces by health professionals</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROBLEM CHARACTERIZATION:</td>
</tr>
<tr>
<td><strong>Magnitude</strong></td>
</tr>
<tr>
<td>Number of deaths from violence</td>
</tr>
<tr>
<td>No. of cases treated in health services</td>
</tr>
<tr>
<td>Number of unsolved cases of violence in Brazil</td>
</tr>
<tr>
<td><strong>Transcendence</strong></td>
</tr>
<tr>
<td>The health team recognizes the importance of preserving traces in the services. However, knowledge is deficient as to the procedures to be performed</td>
</tr>
<tr>
<td><strong>Vulnerability</strong></td>
</tr>
<tr>
<td>The team does not have access to a professional guidance instrument for the preservation, documentation and collection of forensic traces in the health service;</td>
</tr>
<tr>
<td>The team does not perform and does not know most procedures for documentation, collection and preservation of forensic traces.</td>
</tr>
<tr>
<td><strong>Effects</strong></td>
</tr>
<tr>
<td>Increase in the number of lost or contaminated forensic traces without validity for expert analysis;</td>
</tr>
<tr>
<td>Interference in the number of cases not resolved by the Judiciary due to lack of material evidence.</td>
</tr>
<tr>
<td><strong>Determinants</strong></td>
</tr>
<tr>
<td>Little or no approach on the subject in undergraduate courses of health professionals on the theme;</td>
</tr>
<tr>
<td>Little access to information on the subject in the continuing education process;</td>
</tr>
<tr>
<td>Huge demand for care and undersizing of professionals in the health service;</td>
</tr>
<tr>
<td>Lack of materials and supplies necessary for proper collection and preservation of materials.</td>
</tr>
</tbody>
</table>

PROTOCOL OBJECTIVES

Guide the practices of health teams in the preservation of forensic traces in victims of violence, avoiding contamination and disposal of materials of forensic interest;
Promote intersector coordination with the other responsible bodies, such as the technical and scientific police, to improve the preservation and forwarding of forensic traces.

Source: Authors

Table 1. Agreement rate and content validation index of the topics evaluated. Aracaju, SE, Brazil, 2020

<table>
<thead>
<tr>
<th>Domains</th>
<th>No of items</th>
<th>Average Percentage of Agreement± Standard deviation/%</th>
<th>Average CVI ± Standard deviation/%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction– Conceptual aspects</td>
<td>4</td>
<td>95.3 ± 3.125</td>
<td>100 (-)</td>
</tr>
<tr>
<td>Registration procedures</td>
<td>13</td>
<td>98.1 ± 3.940</td>
<td>100 (-)</td>
</tr>
<tr>
<td>General guidelines</td>
<td>9</td>
<td>77.1 ± 20,963</td>
<td>99.3 ± 2.166</td>
</tr>
<tr>
<td>Sexual violence</td>
<td>21</td>
<td>83.9 ± 17,740</td>
<td>98.2 ± 6.887</td>
</tr>
<tr>
<td>Firearm and bladed weapon</td>
<td>12</td>
<td>94.3 ± 8,618</td>
<td>99.5 ± 1.804</td>
</tr>
<tr>
<td>Asphyxia</td>
<td>5</td>
<td>97.5 ± 3,423</td>
<td>97.5 ± 3.423</td>
</tr>
<tr>
<td>Exogenous intoxication</td>
<td>5</td>
<td>93.75 (-)</td>
<td>100 (-)</td>
</tr>
<tr>
<td>Intersector Dialogue</td>
<td>1</td>
<td>68.75 (-)</td>
<td>100 (-)</td>
</tr>
<tr>
<td>Flowcharts in the Service</td>
<td>6</td>
<td>94.8 ± 7,306</td>
<td>100 (-)</td>
</tr>
<tr>
<td>GENERAL AVERAGE</td>
<td>76</td>
<td>89.9 ±14</td>
<td>99.2 ± 3.865</td>
</tr>
</tbody>
</table>

Source: Authors
Table 2. Topics in the “General Guidelines for Trace Collection and Preservation” domain with the lowest score. Aracaju, SE, Brazil, 2020.

<table>
<thead>
<tr>
<th>Topics of the Domain</th>
<th>Percentage of Agreement (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. In patients who are victims of violence, or under suspicion of violence, blood</td>
<td>56.25</td>
</tr>
<tr>
<td>samples, as well as vomit, or other body fluids, which can be submitted to laboratory</td>
<td></td>
</tr>
<tr>
<td>analysis, should be collected prior to drug administration.</td>
<td></td>
</tr>
<tr>
<td>3. Collect foreign bodies present in the patient's lesions, such as glass, soil,</td>
<td>68.75</td>
</tr>
<tr>
<td>plants, hair, clothing fibers, in sterile containers.</td>
<td></td>
</tr>
<tr>
<td>4. Collect, when possible, the materials used by the health team during the</td>
<td>56.25</td>
</tr>
<tr>
<td>treatment of injuries, such as gloves, gauze and medical devices that were in</td>
<td></td>
</tr>
<tr>
<td>contact with the patient, recording, identifying time, date, name of the patient</td>
<td></td>
</tr>
<tr>
<td>and health professionals.</td>
<td></td>
</tr>
<tr>
<td>8. When the patient dies, preserve hands and feet, covering them with paper bags</td>
<td>43.75</td>
</tr>
<tr>
<td>until referral to the IML (Institute of Forensic Medicine).</td>
<td></td>
</tr>
</tbody>
</table>

Source: Authors

Figure 1. Flowchart for communication between the Health Service and Public Security bodies. Aracaju, SE, Brazil, 2020.

Source: Authors