



# Short-term central venous catheter: Production of educational videos for the Nursing team

*Cateter venoso central de curta permanência: produção de vídeos educativos para a equipe de enfermagem*

*Catéter venoso central de corta duración: producción de vídeos educativos para el equipo de enfermería*

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## ABSTRACT

**Objective:** to prepare and validate scripts and storyboards for the production of educational videos, in digital format, about the care and maintenance of the central venous catheters in adult patients. **Method:** a methodological and descriptive study about the elaboration and validation of scripts and storyboards for the production of educational videos that was conducted in two methodological stages: pre-production and production. The pre-production stage was based on three phases: preparation of the video scripts, elaboration of the storyboards, and validation by experts. Validation of the scripts and storyboards was in charge of 9 specialist judges in the subject matter and 2 technical experts in video; the Content Validation Index (CVI) was calculated considering as acceptable a minimum index of 0.80 for each item of the instruments. **Results:** three educational videos were created with the following themes: dressing, maintenance and exchange and removal of the central venous catheter. Concerning the validation by expert judges in the subject matter and expert video technicians, all items evaluated resulted in agreement with a CVI of 100.0. **Conclusion and implications for the practice:** the educational videos were elaborated, validated and suitable to be made available; the judges' participation in the validation of this material was essential to ensure the theoretical and practical relevance of the result.

**Keywords:** Catheterization, Central Venous; Educational Technology; Health Education; Instructional Film and Video Descriptor; Nursing Care.

## RESUMO

**Objetivo:** construir e validar roteiros e *storyboards* para a produção de vídeos educativos, em formato digital, sobre os cuidados e manutenção do cateter venoso central em pacientes adultos. **Método:** estudo metodológico, descritivo, sobre construção e validação dos roteiros e *storyboards* para a produção de vídeos educativos, ocorrido em duas etapas metodológicas: de pré-produção e de produção. A etapa de pré-produção baseou-se em três fases: construção dos roteiros dos vídeos, elaboração dos *storyboards* e validação por peritos. A validação dos roteiros e *storyboards* foi realizada por nove juízes especialistas na temática e dois técnicos especialistas em vídeo. Calculou-se o Índice de Validação de Conteúdo (IVC), considerando-se como aceitável o índice mínimo de 0,80 para cada item dos instrumentos. **Resultados:** produziram-se três vídeos educativos com as seguintes temáticas: cobertura, manutenção e troca e remoção do cateter venoso central. A respeito da validação pelos juízes especialistas na temática e pelos técnicos especialistas em vídeo, todos os itens avaliados resultaram na concordância em IVC de 100,0. **Conclusão e implicações para a prática:** os vídeos educativos foram produzidos, validados e adequados para serem disponibilizados. A participação dos juízes na validação desse material foi fundamental para garantir a relevância teórica e prática do resultado.

**Palavras-chave:** Cateterismo Venoso Central; Cuidados de Enfermagem; Educação em Saúde; Filme e Vídeo Educativo; Tecnologia Educacional.

## RESUMEN

**Objetivo:** construir y validar guiones y *storyboards* para la producción de vídeos educativos, en formato digital, sobre el cuidado y mantenimiento del catéter venoso central en pacientes adultos. **Método:** estudio metodológico y descriptivo sobre la construcción y validación de guiones y *storyboards* para la producción de vídeos educativos que se produjo en dos etapas metodológicas: preproducción y producción. La etapa de preproducción se basó en tres fases: construcción de los guiones de los vídeos, elaboración de *storyboards* y validación por parte de expertos. La validación de los guiones y *storyboards* fue realizada por 9 jueces especialistas en el tema y 2 técnicos expertos en vídeo. Se calculó el Índice de Validación de Contenido (IVC), considerando como aceptable el índice mínimo de 0,80 para cada ítem de los instrumentos. **Resultados:** se crearon tres vídeos educativos con los siguientes temas: cobertura, mantenimiento e intercambio y retirada del catéter venoso central. A partir de la valoración por parte de los jueces especialistas en el tema y de los técnicos especialistas en vídeo, todos los elementos evaluados resultaron en una concordancia en el IVC de 100,0. **Conclusión e implicaciones para la práctica:** los vídeos educativos fueron construidos, validados y adecuados para ser puestos a disposición. La participación de los jueces en la validación de este material fue esencial para asegurar la relevancia teórica y práctica del resultado.

**Palabras clave:** Atención de Enfermería; Cateterismo Venoso Central; Educación en Salud; Película y Vídeo Educativos; Tecnología Educacional.

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## INTRODUCTION

Patients in critical conditions are constantly undergoing invasive procedures during hospitalization, requiring the use of central venous catheterization for continuous monitoring, infusion of medications, parenteral nutrition and periodic collection of laboratory tests.<sup>1-3</sup> Excessive handling of the catheter, the amount of lumens, contamination of the connections and in the professionals' hands, and the infusion of contaminated solutions characterize risks for bloodstream infection (BSI).<sup>4-6</sup>

A number of studies indicate that it is possible to reduce the numbers of Catheter-Related Bloodstream Infections (CRBSIs) to rates close to zero through efficient, low-cost and simple measures, including multifactorial approaches with actions aimed at education and appropriate behavior of the entire team involved.<sup>7-9</sup>

In this health training process, actions or information resources can improve communication and understanding of team members. Health technologies present evident advances and improvements in the provision of Nursing care, being useful, among other purposes, to facilitate the understanding of certain events and quickly promote changes in the care practices.<sup>10</sup>

Among the Information and Communication Technologies, educational videos are recognized as a didactic and technological tool that combines several elements – images, text and sound – in a single object of knowledge promotion. Currently, this resource has been used in several health education experiences; for example, in the identification of participants' perceptions about the use of an educational video in teaching a support group for people with colostomy<sup>10</sup> and as an educational strategy on chemotherapy treatment for cancer patients,<sup>11</sup> showing potential to be applied in this scenario.<sup>10-12</sup>

Considering that the reduction of infection rates must be aligned with the global care context (including behavioral and educational interventions by professionals,<sup>8,9,13</sup> as well as the relevance of the Nursing team's participation in the care process for patients with CVC), this study aimed at elaborating and validating scripts and storyboards for the production of educational videos, in digital format, on the care and maintenance of central venous catheters in adult patients.

## METHOD

A methodological and descriptive study, carried out at a public university located in the inland of the state of São Paulo, with experts in the fields of Nursing (n=9) and Informatics (n=2).

Elaboration and validation of the scripts and storyboards for the production of educational videos took place in two methodological stages: pre-production and production. The project was approved by the Institution's Research Ethics Committee, under CAAE 39708820.0.0000.5504, on December 19<sup>th</sup>, 2020.

### STAGE 1 - Pre-production

The pre-production stage was based on three phases: preparation of the video scripts, elaboration of the storyboards, and validation by experts.

Preparation of scripts took place from bundles based on evidence defined by the National Health Surveillance Agency<sup>14</sup> and the Centers for Disease Control and Prevention.<sup>15</sup> Subsequently, based on the content of the scripts, three storyboards were created, one for each video. Each storyboard consisted of three columns: audio/narration, with the entire content of the script inserted; images/scenes, with a description of the scenes, filming locations and images used; and, in the last column, the information/captions.

Validation of the scripts and storyboards was carried out by expert judges on the subject matter and by expert video technicians. For selection of the expert judges, a search was carried out on the Lattes Platform of the National Council for Scientific and Methodological Development (CNPq), using the "curriculum search" tool in "advanced search", with the following specifiers: central venous catheter, Nursing, bloodstream infection, critical patient. The selection criteria to be characterized as judges were adapted.<sup>16</sup> The expert video technicians were selected for convenience.

Invitations were sent to 23 expert judges on the subject matter and 2 professionals linked to the communication service, with experience in videos, through an electronic address, clarifying the research purpose to each of them. Nine expert judges on the subject matter and two expert video technicians agreed to participate in the study. All answered the informed consent and the biographical and professional characterization questionnaire.

For this stage, two adapted instruments were used, one for each professional area.<sup>17-19</sup> The evaluation instrument sent to the expert judges on the subject matter was structured in 4 categories (objective, content, relevance and environment), totaling 14 assertions, represented in Table 1. The instrument referring to the expert video technicians approached three categories, with ten assertions divided into functionality, usability and efficiency, presented in Table 2.

The expert judges on the subject matter and the expert video technicians evaluated the videos' scripts and storyboards, and marked in the instrument the items on the established agreement levels, as follows: "disagree", "partially disagree", "partially agree" and "agree", on a Likert scale from 1 to 4. Each item presented an area for comments and reasons – if they answered "disagree", "partially disagree" and "partially agree" – and also to include descriptive contributions.

The estimated time for filling out the instruments was approximately 30 minutes, with expected return to the responsible researcher within 15 days.

### STAGE 2 - Production

After the evaluations carried out by the expert judges on the subject matter and the expert video technicians, the video production stage was initiated. Rehearsal and recording of the scenes took place in a Health Simulation Unit environment, at a Public Federal University, during edition of the scenes. In order to ensure accessibility, subtitles were inserted in all speeches, thus contemplating individuals with hearing difficulties. This entire process was supported by an audiovisual operator.

**Table 1.** Absolute frequency distribution of the agreement level of the expert judges in the subject matter (n=9) and Content Validation Index (CVI) of each item of the validation instrument of the educational videos scripts/storyboards. São Carlos, Brazil, 2021.

Variables	"Evidence-Based Good Practices for Central Venous Catheter Dressing"					"Evidence-Based Good Practices for Central Venous Catheter Maintenance"					"Evidence-Based Good Practices for Central Venous Catheter Exchange and Removal"				
	D	PD	PA	A	CVI %	D	PD	PA	A	CVI %	D	PD	PA	A	CVI %
<b>Objective</b>															
1) The objectives are consistent with the Nursing practice.	0	0	0	9	100.0	0	0	0	9	100.0	0	0	0	9	100.0
2) The objectives are suitable to be achieved.	0	0	0	9	100.0	0	0	1	8	100.0	0	0	0	9	100.0
<b>Content</b>															
1) The script content responds to the objectives proposed.	0	0	0	9	100.0	0	0	0	9	100.0	0	0	1	8	100.0
2) The script content facilitates the teaching-learning process on the good practices for dressing/ maintenance/exchange and removal of the CVC.	0	0	0	9	100.0	0	0	0	9	100.0	0	0	0	9	100.0
3) The content allows understanding the good practices for dressing/maintenance/exchange and removal of the central venous catheter.	0	0	1	8	100.0	0	0	1	8	100.0	0	0	1	8	100.0
4) The content follows a logical sequence of interventions according to the bundle.	0	0	2	7	100.0	0	0	0	9	100.0	0	0	0	9	100.0
5) The content incorporates all the necessary steps to carry out good practices in dressing/ maintenance/ exchange and removal of the CVC.	0	0	1	8	100.0	0	0	1	8	100.0	0	0	1	8	100.0
6) The content has all the materials needed to demonstrate the good practices in dressing/ maintenance/exchange and removal of the CVC.	0	0	3	6	100.0	0	0	0	9	100.0	0	0	1	8	100.0
7) All the information contained in the script is correct.	0	0	3	6	100.0	0	0	3	6	100.0	0	0	0	9	100.0
<b>Relevance</b>															
1) The images and scenes illustrate important aspects of the good practices for dressing/ maintenance/ exchange and removal of the CVC.	0	0	0	9	100.0	0	0	0	9	100.0	0	0	0	9	100.0
2) The images and scenes are relevant so that the Nursing team can understand the good practices in dressing/maintenance/exchange and removal of the CVC.	0	0	0	9	100.0	0	0	0	9	100.0	0	0	0	9	100.0
3) The images and scenes allow transferring and using theoretical/practical knowledge in different contexts by the Nursing team.	0	0	0	9	100.0	0	0	0	9	100.0	0	0	0	9	100.0
<b>Environment</b>															
1) The setting is suitable for video production.	0	0	1	8	100.0	0	0	1	8	100.0	0	0	1	8	100.0
2) The setting is suitable for teaching and learning the good practices in dressing/maintenance/ exchange and removal of the CVC.	0	0	1	8	100.0	0	0	1	8	100.0	0	0	1	8	100.0

D = Disagree, PD = Partially Disagree, PA = Partially Agree, A = Agree, CVI = Content Validity Index.

Source: Prepared by the author

The scenario had the simulated participation of an actress, in the role of a nurse, and a medium-fidelity simulator representing the patient, in addition to a narrator. Any and all

disclosures and uses of the video will be free of commercial purposes, being specifically intended for educational and scientific use.

**Table 2.** Absolute frequency distribution of the agreement level of expert video technicians (n=2) and Content Validation Index (CVI) of each item of the scripts/storyboards validation instrument of the three educational videos. São Carlos, Brazil, 2021.

VARIABLE	D	PD	PA	A	CVI %
<b>Functionality</b>					
1) The video script proposes understandable Nursing interventions of the good practices for dressing/maintenance/exchange and removal of the CVC.	0	0	0	2	100.0
2) The video script has the potential to generate positive results.	0	0	0	2	100.0
<b>Usability</b>					
1) The concepts that will be used in the video and its applications are easy to learn.	0	0	0	2	100.0
2) The video will allow the Nursing team to develop the good practices for dressing/maintenance/exchange and removal of the CVC, being easy to apply.	0	0	0	2	100.0
3) The video will assist the Nursing team in a clear and efficient way, not being tiring.	0	0	0	2	100.0
<b>Efficiency</b>					
1) The time proposed is adequate for the Nursing team to learn the content.	0	0	0	2	100.0
2) The number of scenes is consistent with the time proposed for the video.	0	0	0	2	100.0
3) The number and characterization of the characters meet the objective proposed.	0	0	0	2	100.0
4) Communications between the characters occur efficiently and understandably.	0	0	0	2	100.0
5) The description of the materials that will be used is clear.	0	0	0	2	100.0

D = Disagree, PD = Partially Disagree, PA = Partially Agree, A = Agree, CVI = Content Validity Index.

Source: Prepared by the author.

Regarding the descriptive analysis, a careful investigation of the judges' and technicians' considerations and suggestions was carried out and, when relevant, the scripts and storyboards were changed. Afterwards, the Content Validation Index (CVI) was calculated in order to assess its agreement regarding representativeness of each item. For this study, a minimum index of 0.80 for each item was considered acceptable.<sup>7,20</sup>

## RESULTS

In this study, three scripts and storyboards were developed to produce three educational videos with the following themes: dressing, maintenance and exchange and removal of the central venous catheter.

The three scripts and storyboards were based on bundles entitled as follows: 1. Central venous catheter dressing with subtitles: Dressing; 2. Central venous catheter maintenance with subtitles: Handling and Exchange of the materials and complementary devices (extender, perfuser, among others); and 3. Central venous catheter exchange and removal with subtitles: Exchange and Removal.

After preparation of the scripts, the storyboards were elaborated using the same contents, characterized as organizers that detail

the scenes, whose objective is to preview the videos. They were structured into three columns: audio/narration, grouping all the script content; images/scenes, with a detailed description of the scenes, filming locations and images used; and, in the last column, information/captions.

Nine (100%) expert judges on the subject matter and 2 (100%) video experts participated in the validation process. Referring to age, the subject matter experts presented a mean of 38.9 years old; with regard to the highest academic degree, the majority (44.5%) had PhD degrees, followed by master's degrees (33.3%), specializations (11.1%) and Post-PhDs (11.1%).

In addition to the results presented above, three additional questions were proposed to the expert judges on the subject matter. Regarding managerial and/or care experience with CVCs in critically-ill adult patients, all judges (100%) answered positively. In relation to having previous experience in the development and evaluation of educational materials for the Nursing team, 8 (88.9%) of the judges answered "yes", and only 1 (11.1%), "no". Regarding publication of scientific research on the validation of educational materials related to short-term CVCs in critically-ill adult patients and/or infection prevention and control, only 3 (33.3%) judges reported having publications in the area. All mentioned



participation in scientific events related to their professional area in the last two years.

In relation to the video technicians, a mean age of 45.5 years old was found; and, regarding the highest academic degree, 1 (50.0%) had a master's degree and 1 (50.0%) had a specialization. However, the 2 (100%) expert video technicians reported not having participated in events related to their professional area in the last two years.

Table 1 presents the absolute frequencies of answers and CVI values of each item of the validation instrument, referring to the expert judges on the subject matter, for the three educational videos.

In relation to the validation of the three educational videos by the two expert video technicians, regarding functionality, usability and efficiency, in all items evaluated the experts considered agreement, resulting in a CVI of 100.0.

The absolute frequencies of answers given by the video experts and CVI of each item of the validation instrument are shown in Table 2.

After the results of the validation process, the educational videos were recorded, with production of the following: the first video entitled "Good Evidence-Based Practices for Central Venous Catheter Dressing" lasting 6 minutes and 53 seconds; the second video, "Evidence-Based Good Practices for Central Venous Catheter Maintenance", lasting 3 minutes and 49 seconds;

and, finally, the third video, "Evidence-Based Good Practices for Central Venous Catheter Exchange and Removal", with 2 minutes and 59 seconds.

Figure 1 presents some scenes referring to the three educational videos.

**DISCUSSION**

The Nursing work process involves a search for resources that support the practice of education in health. Technology and information resources contribute to the health professionals' personal demands, learning and autonomy during the work activities.<sup>10</sup>

In this aspect, video presents itself as an appealing educational technology that holds the attention and favors the spectator's learning. The literature presents studies with the purpose of training individuals with neurogenic bowel;<sup>19</sup> about central venous catheter dressing;<sup>17</sup> guidelines for parents and children who use clean intermittent catheterization;<sup>21</sup> Nursing care on syphilis prevention and management;<sup>18</sup> and foot reflexology.<sup>22</sup> Such papers produced educational videos in the health area, in addition to using the elaboration of scripts and storyboards similar to those developed for this study.

The videos produced were based on bundles built from available evidence on the theme. It is noteworthy that Evidence-

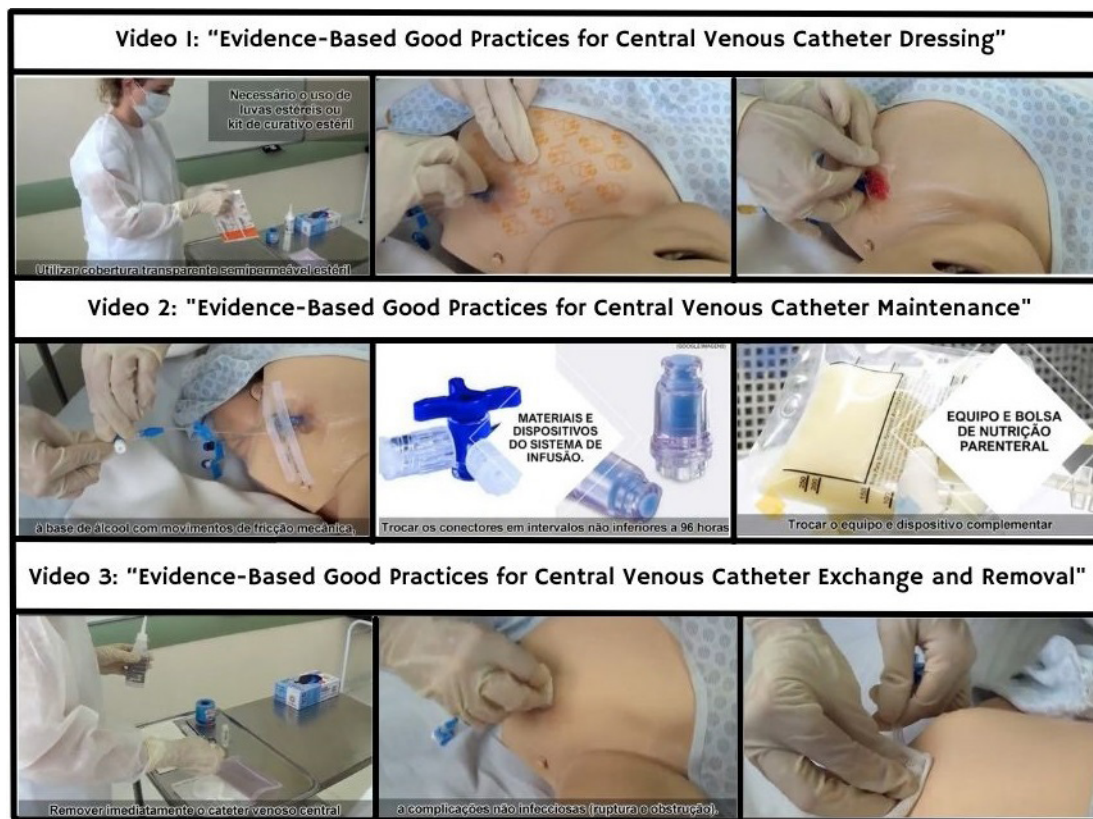


Figure 1. Images of the scenes from the three educational videos. São Carlos, Brazil, 2021. Source: Prepared by the author.

Based Practice (EBP) aims at research based on the search and critical evaluation of the best evidence for clinical care and teaching, thus promoting better quality of the care provided and establishing the professional behavior in a safe and organized way.<sup>23,24</sup>

According to a study developed for the teaching of Nursing procedures,<sup>25</sup> educational films and videos can in fact contribute to the teaching-learning process, as long as their elaboration follows careful planning, in order to take full advantage of its potential.

The evaluation by judges from the Nursing and Informatics areas allowed detecting errors and improvements in the educational material. According to a study designed to build and validate a virtual learning object for teaching peripheral vascular semiology,<sup>26</sup> if the material is offered to the target audience without the appreciation of subject matter experts, content or design errors can discourage the users or provide access to inappropriate content.

Studies that elaborated and validated educational videos emphasize that this type of didactic tool should not exceed 15 minutes in length, with 10 minutes being ideal to more easily hold the viewer's attention.<sup>17,19,22</sup> The results revealed the expert technicians' agreement in relation to the videos having an adequate duration for the Nursing team to learn the content.

The literature that deals with the assessment of the accessibility of assistive technology for the hearing impaired<sup>27</sup> states that educational materials should use simple language, with little reading and objective information, in addition to breaking down barriers to accessing audio information, including subtitles or translation into sign language. In this sense, in order to guarantee accessibility, the material produced in this study presented subtitles for all verbal communication, thus contemplating individuals with hearing difficulties.

The results of the evaluation on the content and recording environment showed a high agreement level among the experts in the field. The scenes were produced in a simulated environment in order to minimize the need for real patients, a procedure recommended in other studies that evaluate clinical simulation in Nursing education<sup>28,29</sup> to guarantee protected, safe and ethical spaces, avoiding patients' exposure to errors, in addition to constituting a scenario with properties close to reality. The similarity with reality contributes to the learning process, as the video can be played several times, allowing for discussion, review, understanding of the technique and resolution of doubts.<sup>30</sup>

In recent years, several scientific publications have presented proposals similar to this study, that is, for training the Nursing team. Recent findings involve professional training on blood pressure measurements,<sup>31</sup> adherence to the Standard Precautions by Nursing workers<sup>32</sup> and the technique for performing the physical examination in prenatal care by the Nursing team,<sup>33</sup> among other productions.

In the current study, the need for hand hygiene before the procedures was observed by the judges, including it in the final content of all three videos. Thus, in the first scene, the professional sanitizing her hands and the image of the five moments of this

procedure were inserted. The importance of heeding this suggestion is strengthened, as Hand Hygiene (HH) is the main and most effective measure to prevent and control infections in health care environments, including Bloodstream Infections (BSIs).<sup>34</sup>

Several factors extrinsic to the patient (non-standardization of interventions, incorrect performance of the techniques and of the patient protection rules, and especially lack of permanent education of the team) compromise care quality.<sup>30</sup> Using a video as an educational tool is a health education strategy that is easy to understand and visualize. Therefore, it is noted that, through the Internet, it democratizes knowledge, increases the target audience reach and provides opportunities for care improvements, in addition to collaborating methodologically for the development of other educational videos in the health area.

## CONCLUSION AND IMPLICATIONS FOR THE PRACTICE

Through the objectives proposed, it is concluded that the educational videos were elaborated and validated, and that are ready to be made available. The judges' participation in the validation of this material was fundamental to guarantee the theoretical and practical relevance of the result. The study has limitations regarding non-validation of the material with the target audience, that is, the Nursing team.

Availability of the videos will certainly contribute to educational processes in health, as well as to the improvement of cognitive knowledge, technical skills, clinical reasoning and decision-making by the team, enabling improvements in care quality.

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Study design. Bruna Caroline Gorla. Fernanda Berchelli Girão. Data collection or production. Bruna Caroline Gorla.

Data analysis. Bruna Caroline Gorla. Fernanda Berchelli Girão. Beatriz Maria Jorge. Ana Carolina Belmonte Assalin.

Interpretation of the results. Bruna Caroline Gorla. Fernanda Berchelli Girão. Andressa Rueda de Oliveira. Liandra Aparecida Cezario Rocha. Beatriz Maria Jorge. Ana Carolina Belmonte Assalin.

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