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☑ Implementation science in nursing, health, and education

Proposal for the implementation and monitoring of a health care nursing protocol for patients with external ventricular drains

Proposta de implementação e monitoramento: protocolo assistencial de enfermagem para pacientes com derivação ventricular externa

Propuesta de implementación y seguimiento: protocolo de atención de enfermería al paciente con derivación ventricular externa

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ABSTRACT

Objective: To structure a proposal for implementing and monitoring the nursing care protocol for the safety of adult patients with external ventricular drains.

Method: Descriptive exploratory research based on Implementation Science, with intentional sampling. Carried out in a hospital complex in southern Brazil, between May and December 2022, in four stages: online questionnaire on knowledge of care for patients with external ventricular shunt for nurses; matrix of proposed indicators with key actors; self-instructional online course for nurses; synthesis of the existing protocol. Contextualized instructional design was used to develop the course.

Results: Six nurses from the operating room and intensive care unit participated, identifying knowledge gaps, pointing out the need for specific training; four key actors in the neurosurgery service defined six indicators. An online course was created and made available on the platform of the institution with two modules, including eight videos. Protocol synthesis was adapted to the standards of the institution's quality sector.

Conclusion: A report regarding the implementation of the nursing care protocol for patients with external ventricular drains was delivered for the nurse who was the technical responsible. Future studies should evaluate the implementation and impacts it will generate. This model can be adapted by other institutions.

Descriptors: Implementation Science. Guidelines as Topic. Nursing. Education, Continuing. Cerebrospinal Fluid Shunts.

RESUMO

Objetivo: Estruturar uma proposta de implementação e de monitoramento do protocolo assistencial de enfermagem para a segurança de pacientes adultos submetidos à derivação ventricular externa.

Método: Pesquisa exploratória descritiva, fundamentada na Ciência da Implementação, com amostragem intencional. Realizada em um complexo hospitalar do sul do Brasil, entre maio e dezembro de 2022, em quatro etapas: questionário on-line sobre conhecimento de assistência a pacientes com derivação ventricular externa para enfermeiros; matriz de indicadores propostos com atores-chave; curso on-line autoinstrucional para enfermeiros; e síntese do protocolo existente. Utilizou-se design instrucional contextualizado para o desenvolvimento do curso.

Resultados: Participaram da pesquisa seis enfermeiros de centro cirúrgico e unidade de terapia intensiva, identificando-se conhecimento com lacunas, o que aponta para a necessidade de treinamento específico; quatro atores-chave do serviço de neurocirurgia definiram seis indicadores. Elaborou-se um curso on-line, disponibilizado na plataforma institucional, com dois módulos, incluindo oito vídeos. A síntese de protocolo foi adequada às normas do setor de qualidade da instituição.

Conclusão: Um relatório com a proposta de implementação do protocolo assistencial de enfermagem para pacientes com derivação ventricular externa foi entregue para a responsável técnica de enfermagem da instituição. Sugerem-se estudos futuros para avaliar a implementação do protocolo e seus impactos, havendo a possibilidade de adaptação para outras instituições, contribuindo para o monitoramento contínuo da prática e para a melhoria da assistência prestada.

Descritores: Ciência da Implementação. Protocolo. Enfermagem. Educação Continuada. Derivações do Líquido Cefalorraquidiano.

RESUMEN

Objetivo: Estructurar una propuesta para la implementación y seguimiento del protocolo de cuidados de enfermería para la seguridad de pacientes adultos sometidos al drenaje ventricular externo.

Método: Investigación exploratoria descriptiva basada en la Ciencia de la Implementación, con muestreo intencional. Realizada en un complejo hospitalario del sur de Brasil, entre mayo y diciembre de 2022, en cuatro etapas: cuestionario online sobre conocimientos acerca del cuidado de pacientes con drenaje ventricular externo para enfermeros; matriz de indicadores propuestos con actores clave; curso autoejecutado en línea para enfermeros; síntesis del protocolo existente. Para desarrollar el curso se utilizó un diseño instruccional contextualizado.

Resultados: Participaron seis enfermeros de quirófano y unidad de cuidados intensivos, identificando lagunas de su conocimiento, señalando la necesidad de capacitación específica; cuatro actores clave del servicio de neurocirugía definieron seis indicadores. Se creó un curso en línea disponible en la plataforma institucional con dos módulos, incluyendo ocho videos. La síntesis del protocolo se adaptó a los estándares del sector de calidad de la institución.

Conclusión: Presentar propuesta al técnico de enfermería de la institución responsable de implementar el protocolo de atención de enfermería a pacientes con derivación ventricular externa. Se sugieren estudios futuros para evaluar la implementación y los impactos que generará. Este modelo puede ser adaptado por otras instituciones.

Descriptores: Ciencia de la Implementación. Guías como Asunto. Enfermería. Educación Continua. Derivaciones del Líquido Cefalorraquídeo.

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INTRODUCTION

Monitoring intracranial pressure (ICP) and brain perfusion pressure is recommended for critical neurological patients who trigger intracranial hypertension, in cases such as traumatic brain injury, hydrocephaly, intracranial tumors, subarachnoid, ventricular, or intraparenchymal hemorrhage. External ventricular drains (EVD) are a closed system, formed by a catheter that is surgically inserted in a brain ventricle and connected to a reservoir and a collection bag, which allows continuous monitoring of ICP and helps the treatment of intracranial hypertension[1,2]. In neurology, EVD is seen as the gold standard in cases of hydrocephaly and intracranial hypertension (ICH)[1,3], as it drains cerebrospinal fluid, balancing intracranial pressure and enabling ICP monitoring, in addition to allowing the administration of medications[1,4]

Adult patients with EVD require specific and continuous Intensive Care Unit (ICU) attention, which requires a multidisciplinary approach from the team in order to prevent complications such as infections, excess drainage and accidental removal [1,2]. Considering this context, the knowledge of nursing workers about how to handle this system, prevent and identify potential complications, is essential in the care of neurocritical patients[1,12].

Handling the system and its connection with adverse events, often caused by failure in team training, is another important factor. Literature[5,6] suggests that educational interventions in health teams led to a 40 to 50% drop in infections linked to invasive devices. Thus, it is essential to adopt these measures and foster a culture of prevention in health care[5].

Adopting standardized health care practices to handle EVD based on specific guidelines and protocols and training professionals are effective strategies to prevent infections associated with this device, in addition to being essential to promote a culture of safety[5].

Although this is not directly related to improvements in neurological results, inserting EVDs reduces mortality in cases of intraventricular hemorrhage, implying that some interventions could save lives, despite the fact there are serious morbidities related to it, instead of a good recovery[7]. Another study found, similarly, that those with EVD showed lower mortality, but worse outcomes[8].

Due to the complexity of the patients with external ventricular drains (EVD), nursing care in managing EVD should be evidence-based, following the practices recommended in guidelines[9]. Evidence-based practice (EB) should be the base on which the nurse makes their decisions to provide care to patients, ensuring quality and safety in care[1]. Despite its importance, EBP is still not well disseminated in Brazilian nursing[10–12]. Its implementation requires collaboration between teams, researchers and facilitators, allowing nurses to explore solutions to clinical problems [10,11,13].

In Brazil, EBP is a part of instruments used in nursing, such as clinical guidelines, care protocols, standard operating procedures, and others[9]. Health care protocols are based on the fundamentals of guidelines, and seek to orient professional decisions about how to provide care to the patients using scientifically proven recommendations[9].

A literature review showed a gap in research about nursing care protocols for EVD patients, as few studies are available on the topic[1]. The institution where this study takes place has no specific protocol for EVD patients, nor institutional indicators to monitor infections and their associated complications. Since the researchers responsible for this article developed and validated a nursing care protocol for EVD patients[14], there was an opportunity to propose the implementation of this protocol in said institution, which is also a place for the practice of nursing undergraduate students.

This proposal is in accordance with implementation science, as it helps disseminate specific nursing knowledge using EBP, improving the quality of assistance, safety in the care of neurocritical patients, and owing to the need of further research on the topic. Therefore, we reiterate our commitment to improve the quality of care in order to promote more safety in the care of neurocritical patients.

In this context, the following research goal emerged: structuring a proposal to implement and monitor a nursing care protocol for the safety of adult patients with external ventricular drains.

METHOD

Descriptive, exploratory research, based on implementation science (IC). The IC was chosen as it allows understanding which factors are involved in nursing and the knowledge used for this end, enabling the inclusion of newfound knowledge more effectively[15]. To facilitate the successful adoption of EBP in clinical settings, such as the ICU, nurses should incorporate IC strategies[15].

EBP can be seen as a way to operationalize the translation of knowledge, also including implementation science[16]. Since it allows the scientific study of methods to promote the systematic acceptance of the results of the research and of other evidence-based practices in clinical practice, the IC can improve the quality and the effectiveness of health services [11,17]. This study had four stages, namely: 1) initial survey using a questionnaire about the practices conducted by nurses in adult patients with EVD; 2) elaboration of an indicator matrix by a team; 3) creation of a course for nursing workers; and

4) monitoring and synthesis of the health care protocol, in accordance with the norms of the institution. The Standards for Quality Improvement Reporting Excellence (SQUIRE 2.0) was adopted for the production of this manuscript.

The main setting of this study was a hospital specialized in neurosurgery, located in a large sized hospital complex in Porto Alegre, in the state of Rio Grande do Sul, Brazil. This hospital is a national reference when it comes to high-complexity procedures and high-quality neurology care. It is one of the most important neurology study centers in Latin America. It also is unique as it has a Surgical Center (SC) and an ICU that are exclusive for the care of neurosurgical patients. The SC has three operating rooms,10 ICU beds and 64 inpatient beds; in 2022, nearly 1,907 surgeries were performed there, in addition to 13,563 outpatient visits and 1,136 hospitalizations[18].

All stages of this research used an intentional sample. Different instruments were elaborated and chosen to be used in each of the four stages. The research was conducted from May to December 2022. Chart 1 shows the proposal of the authors regarding the stages of the research and its specification, describing the process of elaboration of the implementation proposal.

The instrument System Usability Scale, developed in 1986 by John Brooke, is considered to be a balanced and fast instrument to measure the usability of a system. It comprises ten objective questions that use a five-point Likert Scale, with zero corresponding to "strongly disagree" and five to "strongly agree"[20,21]. Its score can vary from 0 to 100 and is calculated by multiplying the sum of the scores relative to odd and even items[20,21]. In the fourth and last stage, the instrument elaborated for the evaluation of medical and nursing leadership in the ICU, for inclusion in the Tasy system, was the form called "Daily Evaluation of External Ventricular Drains", starting with the implementation of the protocol. This instrument will generate indicators for the institution.

Each stage had its own data collection phase, described below:

Stage 1: nursing leaders provided the institutional e-mail addresses of the nurses who worked in the institution's SC and ICU. These nurses were invited via e-mail to participate in the research, receiving an access link in case they wanted to participate. By clicking in the link, the nurse would access the informed consent register, which gave clarifications about the research. Only after accepting participation would the nurse receive a copy of the consent form via e-mail and could open the questionnaire, which was filling in in two parts: the first containing a survey to characterize the profile of the sample, with questions about their age, sex, academic degree, time of experience in the field, and experience regarding the use of educational technology. The second included an instrument formulated by researchers, with 22 closed questions and recommendations from the nursing health care protocol for adult patients submitted to EVD, in order to get to know the daily practices of nurses regarding the care provided to EVD patients.

Chart 1 – Stages of the research and its specifications for the elaboration of the proposal to implement the health care protocol for adult patients with external ventricular drains. Porto Alegre, Rio Grande do Sul, Brazil, 2022.

Stages	Stage 1 Initial survey of the practices performed by nurses in adult patients with LVD.	Stage 2 Elaboration of the matrix of indicators.	Stage 3 Elaboration of a course for the nursing team.	Stage 4 Monitoring of indicators and synthesis of the care protocol.
Objectives	To diagnose and identify the knowledge of nurses about EBP and the care provided to patients with EVD.	To evaluate, discuss, and define, together with the main actors in this regard, which indicators will be adopted after the protocol is implemented.	To elaborate an online course and evaluate its educational relevance.	To synthesize the protocol[18] (previously developed by the same research team), that is, adapt the protocol to the model standardized in the institution and elaborate a form to monitor patients with EVD, based on the indicators proposed.

Chart 1 – Cont.

Stages	Stage 1 Initial survey of the practices performed by nurses in adult patients with LVD.	Stage 2 Elaboration of the matrix of indicators.	Stage 3 Elaboration of a course for the nursing team.	Stage 4 Monitoring of indicators and synthesis of the care protocol.
Sample	Six nurses that were in accordance with inclusion (nurses who work in the SC or in the ICU of the hospital complex) and exclusion criteria (participants who did not fill the research survey in its entirety).	Four key-actors of the neurosurgery service, which is the field addressed by this research, two from the medical team, and two from nursing supervision. Inclusion criteria: participants in leadership roles in the field of medicine or nursing.	Six nurses, five from the ICU and one from the SC, were included, as they were enrolled and finished the online self-teaching course.	Three participants: the head of the neurosurgery service and their supervisor nurses, one from the SC and one from the ICU of the setting of the research.
Instruments	Questionnaire, elaborated by the authors using Google Forms®, including: field for the characterization of the participant's profile, and 22 multiple-choice questions addressing nursing care to patients with EVD, based on the protocol[18].	Indicator matrix is elaborated by the authors and based on literature[19].	Two electronic questionnaires in Google Forms®: (1) survey elaborated by the authors, filled in by nurses to evaluate the indicators used in the observation of th results after the implementation of the protocol; and (2) questionnaire adapted from the System Usability Scale to evaluate the usability of the course developed, since this is the most commonly used and recognized instrument for this end.	Institutional model for the elaboration of protocols, seeking to adapt the protocol to the context in which it will be implemented, and Daily Evaluation Chart for External Ventricular Drains, whose goal is creating daily electronic records of the care provided by the nursing team.

Source: Research data, 2022.

Stage 2: Members of the medical team and of the nursing supervision team in the neurosurgery field were invited in-person to participate in a workshop to reach a consensus about the proposed indicators. The professionals who accepted participating signed a consent form. Due to the unavailability of the professionals to participate all at the same time and to the pandemic, it was necessary to carry out individual meetings with each participant; In this meeting, the matrix of the indicators proposed was presented and each participant could agree or disagree, or make any suggestions or necessary changes. All their suggestions were recorded and considered in the reformulation of the indicators for the final matrix.

Stage 3: To prepare the course, the contextualized instructional design model (CID) was chosen. It comprises five stages: analysis, design, development, implementation, and evaluation[22] In the **analysis**, there was a survey of virtual media and environments, and the platform in which to make the course available was chosen. In the **design** the didactic, media, resources, content, and learning strategies were determined. The Pedagogical Action Plan of the Professional Training Course was developed in partnership with the educational sector of the institution, aimed at achieving the goals of the course and following institutional standards, since the course would be made available on the institution's platform. During **development**, the self-teaching online course was constructed using the video creation platform Renderforest®, which provides copyright-free resources for a monthly fee. During **implementation** the self-instructional online course was made available in the educational platform of the institution and offered to the nurses of the institution, and a pilot test was conducted. In the **evaluation**, nurses who had finished the course filled in two evaluative electronic forms: one about the indicators adopted after the implementation of the protocol, and the System Usability Scale, to evaluate the usability of the course developed.

Stage 4: to implement the protocol, it was essential to meet the requisites of the quality sector of the institution, which requires all protocols in the hospital complex to follow a document format standardized by the institution. Furthermore, to monitor indicators, it was necessary to develop a evaluation chart for EVD patients and to insert both documents in the Tasy® system of the institution.

Data analysis took place according to each stage. In stage 1, the results of the survey of the nurses were input in Microsoft Excel® tables and categorized using descriptive statistics (absolute and relative frequencies). Stage 2, regarding indicators, was analyzed using in-person individual conversations in which considerations, reflections, and perceptions of participants were carefully noted; the final version of the indicator matrix was presented to the participants so they could review it and express whether they agreed. In stage 3, the course was evaluated by the participants, using a 5-point Likert scale, where zero corresponded to "strongly disagree" and five to "strongly agree". The score was calculated by multiplying the sum of the scores of even and odd items. For odd items, the individual score is calculated by subtracting 1 from the score the respondent gave to the item; for pair items, the score is calculated by subtracting 5 from the score given to the item. Scores vary from 0 to 10[20]. In stage 4, the fitness of the evaluation form for EVD patients and the synthesis of the protocol were analyzed by the nursing and medical leaders, responsible for the ICU, before being included in the Tasy® system of the institution.

In accordance with ethical precepts regarding research with human beings, the research was sent to the Platform Brazil and only started after the research project had been approved by the Research Ethics Committees of the institutions involved. The proponent received CAAE 55423322.5.0000.5345, and the co-participant received CAAE 55423322.5.3001.5335.

RESULTS

Stage 1: early evaluation of the practices carried out by nurses in adult patients with EVD

The profile of the six nurses who filled in the survey to evaluate their knowledge about nursing care for EVD patients is presented in Table 1.

Regarding the analysis of the results of the questionnaire as filled in by nurses, in regard to the care provided to patients with EVD, Table 2 presents the 22 topics mentioned in the questions. There are questions whose answers are marked as "lack of knowledge" and "lack of training", indicating the need for training on the topic to improve the care provided.

Stage 2: indicator matrix

The matrix of indicators was elaborated by researchers, considering the protocol developed by the team, the characteristics of the service, and the experience of researchers. Then, some items were used to assemble the matrix, as prescribed by literature[19] in order to maintain a logical sequence. To discuss and define the final matrix of indicators, it was necessary to carry out several individual meetings with nursing supervisors and physicians. It was found that nurses had many doubts about the indicators proposed, asking how the collection would be conducted, since this

Table 1 – Profile of the six nurses who filled in the questionnaire about care for patients with an external ventricular drain. Porto Alegre, Rio Grande do Sul, Brazil, 2022.

Variables		n	%
Sex	Female	5	83.3%
	Male	1	16.7%
Age group (years)	From 24 to 30 years	2	33.3%
	From 31 to 40 years	3	50.0%
	From 41 to 54 years	1	16.7%
Educational level	MS	1	16.7%
	Complete post-graduation	3	50.0%
	Incomplete post-graduation	2	33.3%
Field of action in the hospital	Surgical center	1	16.7%
	Intensive care unit	5	83.3%
Time of work	Up to 1 year	2	33.3%
	From 1 to 3 years	1	16.7%
	From 4 to 7 years	1	16.7%
	More than 8 years	2	33.3%

Source: Research data, 2022.

information is not currently collected and, therefore, it was necessary to create, after that, a specific form to be used after the protocol was implemented. The most polemic indicator was the one about infection, since this topic is feared and seldom explored, as professionals tend to be blamed by this event, instead of there being an analysis of the process as a whole, including intrinsic and extrinsic patient factors, especially considering the elements that would improve process related to scientific evidence-based practice.

The meetings with the medical team professionals were similar, in-person and individual. The participants agreed with all indicators proposed and with the items comprised, providing active contributions to improve the indicators proposed. They suggested improvements in order to obtain more complete data: in the "permanence" indicator, they suggested adding, in the objectives, a correlation of the base pathology with the EVD and its complications; in the indicator "complications", they suggested adding, in the objectives, infection and drainage of the orifice, catheter traction, catheter obstruction, intracranial hemorrhage, etc.

In the third stage, the six indicators proposed to monitor and implement the protocol were also evaluated by the nurses who participated in the online self-instructional course. The result was: the responses of four indicators (complications, infection, results, and process) were 50% "completely agree" and 50% "I don't agree nor disagree". "Regarding the indicator structure, 66.67% responded "strongly agree" and 33.33% responded "I do not agree nor disagree". In the indicator of permanence, 33.33% responded "strongly agree", 33.33% responded "I do not agree nor disagree", 16.67% responded "I partially agree", and 16.67% do not agree with the indicator. The indicators were improved with the main actors of the neurosurgery service in the second stage, leading to six indicators proposed to monitor after the protocol was implemented, which are presented in Chart 2.

Table 2 – Topics mentioned in the questionnaire with six participants regarding care to patients with external ventricular drains and percentage in relation to lack of knowledge and of training. Porto Alegre, Rio Grande do Sul, Brazil, 2022.

Topics mentioned in the questions of the survey	% Lack of knowledge	% Lack of training
Head of the bed adjusted at 30°	16.67%	16.67%
When to clamp the system	12.50%	37.50%
Changing to the "starting position" when necessary	12.50%	25.00%
Leveling the "starting position" after handling	---	16.67%
Height of the drainage level	12.50%	25.00%
Frequency of wound dressing evaluation	---	---
Gauze dressing	14.28%	14.28%
Transparent film dressing	---	---
Aseptic technique for system manipulation	12.50%	12.50%
Maximum capacity of the pouch in order to empty its contents	14.28%	14.28%
Watching for signs of catheter obstruction	14.28%	14.28%
Not repositioning the catheter	---	---
Evaluate level of consciousness	---	---
Drainage flow of the liquor	---	---
Characteristics of the drained liquor	---	---
Clamping the system to precisely measure the ICP	25.00%	50.00%
Clamping the system after administering medication	22.22%	33.33%
Frequency of liquor collection: only when necessary	11.11%	33.33%
Site of liquor collection: on the proximal port, done by the physician	14.28%	28.57%
Aseptic technique for the procedure of cerebrospinal fluid collection	12.50%	12.50%
Early, safe, and viable patient mobilization	25.00%	12.50%
EVD weaning	12.50%	25.00%

Source: Research data, 2022.

Stage 3: online self-instructional course

The construction of the course was guided by the CID model, and, in the stage of the analysis, several alternatives were developed to maintain an attractive format: slides, spoken videos, and animation. The information collected in the first stage of the research was also used.

In the design stage, we opted for animations, none too long, to make the course more attractive. The total hour load of the course was of six hours, divided in three

Chart 2 – Matrix of indicators proposed to evaluate the implementation of the nursing health care protocol for patients with external ventricular drains. Porto Alegre, Rio Grande do Sul, Brazil, 2022.

Name of the indicator	Objective	Calculation method	Source
Mean time of EVD permanence in days	To ascertain the duration of EVD permanence	Sum of the number of days in which the EVD was used in the patients/number of patients with EVD	Patient's medical records
Time of permanence of EVD in days per pathology	To correlate the base pathology and its complications with the time of EVD	Sum of the number of days patients used the EVD/ number of EVD patients per base pathology	Patient's medical records
Adherence to training	To investigate the number of nurses who participated in the course about EVD care	Number of nurses who participate in the educational program with more than 75% of presence/total number of participants	Report about the presence in the continuing education course on EVD produced by the education sector of the institution
Rates of EVD-related infections	To identify rates of EVD-related infections	Total number of EVD-related infections in the period/ total number of surgical procedures in the period x 100	Hospital Infection Control Service
Number of EVD complications per patient per base pathology	To correlate the base pathology with the number of EVD complications	Sum of the number of EVD complications in the patients/number of patients according with base pathology	Patient's medical records
Mean number of EVD complications per patient	To identify EVD-related complications (infection, drainage of the orifice, catheter traction, catheter obstruction, intracranial hemorrhage, etc.)	Identification of type and number of EVD-related complications per patient/ number of patients with EVD	Patient's medical records

Source: Research data, 2022.

modules of three hours each. For each video lesson, a script was elaborated, and a list of bibliographic references was provided to support the content discussed. At the end of each class, an evaluative activity was elaborated, and complementary texts were made available to emphasize the contents addressed.

In the development stage, the course was built in the Renderforest® video creation platform, which makes available backgrounds, themes, icons, fonts, background music, and narration to make the experience of watching the video more attractive. Regarding theoretical frameworks, we followed recommendations from the protocol in place and from recent scientific research to support our classes. We produced eight videos in the platform, with different lengths. The introductory videos of each module lasted from 47 seconds to 2 minutes and 17 seconds, while the videos with the content of the classes lasted from 4 to 8 minutes. For each video lesson, we developed a technical sheet, specifying the following variables: series, title, duration, format, description, tags, and link for online access. Chart 3 shows some specifications of both modules of the course.

The implementation stage was only possible due to a partnership with the educational sector of the institution, which made the course available on the institution platform, meaning that, in the future, all nurses will be able to access the course with their institutional login.

In addition to making access easier, the platform has a clear and accessible design, enabling the calculation of hour loads in the continuing education trajectory of the student. A pilot study was carried out in two stages to evaluate the course: the first was an assessment of the indicators adopted to evaluate the outcomes (presented in stage 3), in which nurses who participated in the course evaluated the matrix of indicators elaborated in the previous stage; the second involved an evaluation of the usability of the course developed. The calculated mean of the course, based on Likert scale adapted to the System Usability Scale was 58.75. According to literature, a System Usability Scale score above 50 is "acceptable", and one above 70 is "good"[20,21]. Regarding the topic "I thought this course was easy to use", there was one answer "I disagree" and three answers "I do not agree nor disagree". Therefore, the pilot evaluation showed an opportunity to refine the course as a whole to increase this score, thus improving the educational experience of the student.

Three months after the course was made available on the educational platform of the institution, we found that 37 students had enrolled, 21 (56.8%) were still doing the course, 11 (29.7%) were approved, and 5 (13.5%) had not started. The data generated by the platform showed the number of participants per sector, according to the registration of the nurse in the institution. Of the 37 people enrolled, 21 (56.8%) are ICU nurses, 8 (21.6%) are CC nurses, 6 (16.2%) are nurses whose sector could not be identified, 1 (2.7%) was a nursing supervisor, and 1 (2.7%) was a nurse from an inpatient unit.

Monitoring of indicators and synthesis of the health care protocol

Despite being based on recommendations that are part of the preexisting protocol, since this is an institutional document, there were changes in the presentation of the content proposed by participants to attend to the needs of the institution, not interfering in the recommendations of scientific evidence. In addition to the necessary items, indicators were proposed as the result of a consensus with the key actors of the service.

The contribution of professionals to adapt the document to the reality of the institution delayed the process, since each of them spent some time to read and give feedback, and later, it was necessary to adjust and double check. It was found that some nurses did not entirely understand how methodologically rigorous the elaboration and validation of a protocol was, claiming that their current practices were not in accordance with what was mentioned in the protocol, which caused disagreements and delays in the conclusion of the document.

The need to create an electronic register of nursing care for EVD patients was found due to reports from professionals in the field, since the daily evaluation of the device was carried out manually, in a piece of paper that was later filed, without being included in the patient's electronic records. In this meeting, the creation of a daily EVD evaluation in the Tasy® system was proposed, as it would allow the nurse to register the information that was collected but was absent from electronic records. Some information regarding the indicators to be collected was also included. Therefore, the record comprised the following items: date of EVD insertion; base pathology; place where it was inserted (SC or ICU), professional/team responsible for the insertion; integral dressing or unclean dressing, with a field for observations; whether or not the dressing was changed on the day of the evaluation; whether the change was performed using the aseptic technique of the protocol; whether the dressing used sterile gauze with a bandage, transparent film or only transparent tape; and whether there were complications (if so, which, with spaces for option selection and writing). In the end of the form there is an observation field to record any important items of the evaluation which is yet to be contemplated by previous items. This form was created together with the ICU supervisor, being later validated by the nurse who was the technical responsible for the institution and for the quality sector.

Chart 3 – Specifications of both modules of the online self-instructional course from the series Nursing Care Protocol for adult patients with external ventricular drains. Porto Alegre, Rio Grande do Sul, Brazil, 2022.

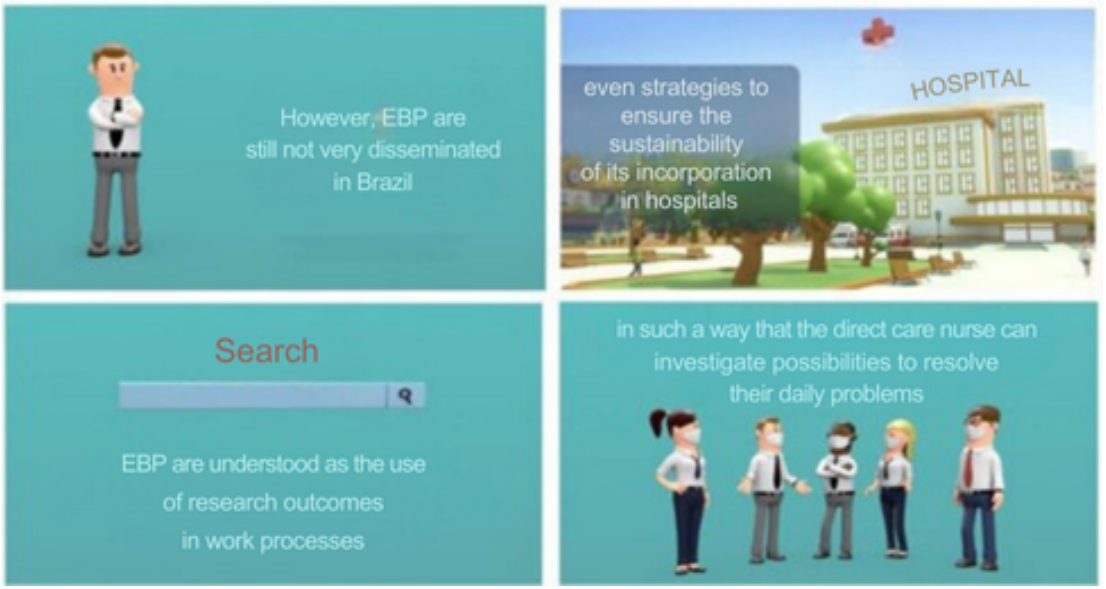
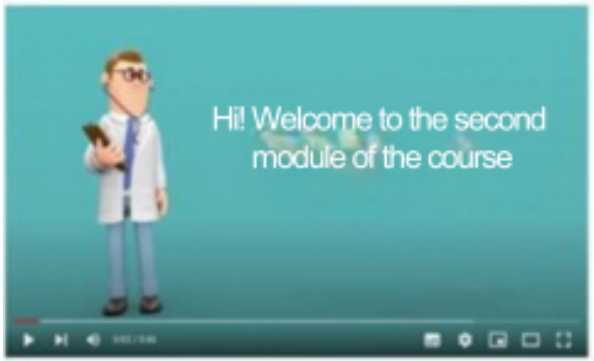
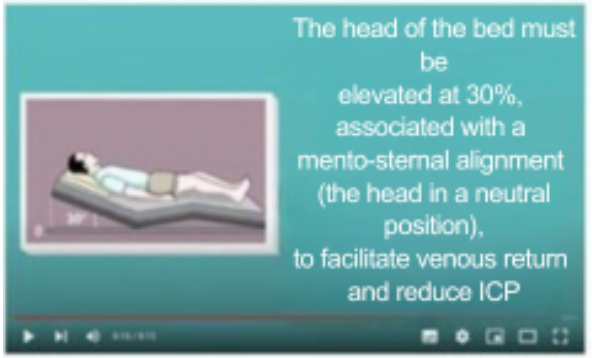
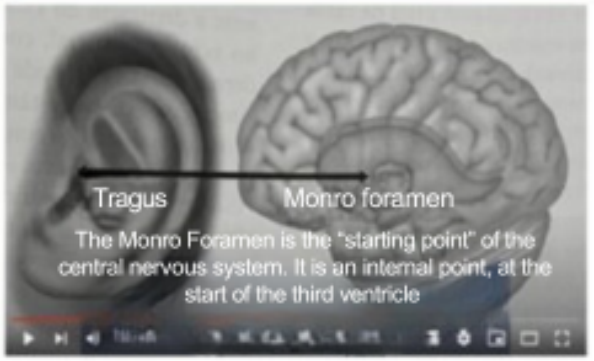
Module 1	
Content addressed	Evidence-based practice and Protocol-focused health technologies
Topics and duration of the five videos	(1) Research presentation (1 minute and 57 seconds), (2) introduction to the module (2 minutes and 17 seconds), and three theoretical classes, which were: (3) Evidence-based practice (4 minutes and 18 seconds), (4) Health technology (6 minutes and 36 seconds) and (5) Applicability in nursing (3 minutes and 35 seconds)
Images of the educational video "Introduction to the course" and access link to the module playlist	 https://www.youtube.com/playlist?list=PLAc98Vo6LS9KVktJuYXqiTLrWFC--L13I

Chart 3 – Cont.

Module 2	
Content addressed	Implementation of the nursing care protocol for patients with external ventricular drains
Topic and duration of the three videos	(1) Introduction to the module (47 seconds) and two theoretical classes, which were: (2) Neurosurgical patient (8 minutes and 16 seconds) and (3) EVD (4 minutes and 6 seconds)_
Images of the educational video with scenes from Module 2 and an access link to the module playlist	    https://www.youtube.com/playlist?list=PLAc98Vo6LS9LhD9TY9xfSc4Zpt54JVylU

DISCUSSION

The initial analysis with the nurses found a lack of training in regard to EVD knowledge and the need to invest in educational initiatives aimed at improving health care practices. The lack of specific knowledge in this field directly affected the efficacy of care, showing the need to increase the competence of nurses to foster significant improvements in the health service[5]. In this context, a course elaborated based on protocols contributed to disseminating scientific evidence-based health care models.

During the research, the authors did not find any studies detailing experiences with courses for nursing care provided to patients with EVD. Thus, the course was elaborated according to the references available at the time[1–4,9,14]. Some participants of this study did not consider that the course was easy to apply, which is in line with the unique character of this experience.

A study[5] investigated the ability of nurses to retain knowledge after an educational intervention that consisted of a live lecture and a video, finding that health care education topics require a regular and organized approach. The findings showed that professionals significantly retained their knowledge one week after intervention, but this retention was not maintained after three months. This suggests that time directly influences the permanence of learning. Methods should be employed that facilitate integrating the knowledge acquired with practical skills, thus promoting the development of clinical reasoning and professional proficiency[5].

The uncertainties and questions about indicators, coupled with the resistance of colleagues to accepting these changes, were significant questions. In this regard, a research[23] addressed several aspects of the implementation of change, reiterating the complexity of this process in organizational contexts.

Since the implementation of new protocols requires changes in care routines, professionals often resist the new practices established, showing, for example, little motivation, no familiarity with the use of new protocols, negative expectations, lack of awareness of new evidence, and others. Health services presented some obstacles to the implementation of new protocols, such as: lack of material and human resources, lack of awareness about the value and the benefits from the change, and lack of institutional policies for the continuous improvement and use of best practices. It is relevant for leaders to be engaged during the process to maintain practices to be implemented[23,24].

The differences between the contribution from physicians and nurses in the second stage of this study reflects their different stories, educational structures, and professional cultures. Nevertheless, both professions have been increasingly recognizing the relevance of evidence-based practices (EBP) to promote safe, efficient, and high-quality health care. It is worth noting that the expression "evidence-based" originated in medicine, a discipline that pioneered this movement as a new model for medical practice and the support for clinical decision-making. In this context, the evidence from clinical research gained priority over intuitions and specialist opinions. Later, the concept expanded, being adopted in many other fields of health and related practices, including nursing[12,25].

As nursing moves forward in its ability to conduct research and implement practices based on scientific evidence, it pushes forth a care strategy that is more integrated and collaborative in regard to the patient. The protocol[14] that supported this study is published and available for access in full by the public. The stage of synthesis of the protocol is very important, as it is essential to adapt the protocol, ensuring it is well-adjusted to institutional demands and specificities. In this context, it is pertinent to carefully adapt the protocols, to facilitate their daily professional use and promote an efficient and practical integration of the guidance there, ensuring that its application is more fluid and adjusted to the specific reality of each workplace. Although it is relatively common to see patients with EVD in ICUs, few studies discuss the development and implementation of a protocol for these patients, especially in the field of nursing[9].

The use of a protocol for providing care to EVD patients should consider the resources available, meaning that later studies are necessary to evaluate the need for updating the protocol, as items could be added, reformulated, or excluded according with their place of implementation[9].

It is worth noting that the pandemic imposed significant limitations on this study, affecting data collection, the access of participants to in-person group activities, and the implementation of the protocol proposed due to the reorientation of resources and efforts.

This research produced a proposal that allowed optimizing the implementation of the health care protocol. In October 2023, the research team continued this work, starting an implementation guided by the proposals presented. In July 2024, we considered the effective implementation of the protocol, since the entire ICU team had been trained to provide evidence-based care. The protocol was made available for consultation in the Tasy system, and indicators

started to be collected. For future publications, we would like to show the applicability of the protocol in an ICU that specializes in neurology, evaluating its impact on the clinical outcomes of the patients, the effectiveness of professional training, and including a cost-benefit analysis.

CONCLUSION

The collaboration of the team involved and the institutional support allowed structuring a proposal to implement and monitor the nursing care protocol for patients with external ventricular drains, according to the analysis of current practices, adapted to the reality of the institution. The initial survey of these practices found that some of the care recommended was already taking place, but found some gaps which showed the need for training sessions, in order to incorporate certain pieces of evidence into daily practice. Therefore, we built a self-instructional training course for the nursing team, available on the institutional platform. We elaborated a matrix of specific indicators for the continuous evaluation of practices and synthesized the protocol, responding to the demands of the quality sector. The proposal presented will allow an evidence-based standardization of nursing care that is accessible and focused on the training of professionals to apply the protocol, with repercussions on the quality of care and the safety of the patient.

Such an implementation requires a multifaceted approach, raising awareness and engaging leadership. This study provides a model that can be replicated by other institutions. Future research could evaluate the impact of its implementation on critical clinical indicators, in order to consolidate and expand knowledge about the benefits of standardizing nursing care.

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