

Development of the “Ultrasound: bladder” nursing intervention according to the Nursing Interventions Classification

Desenvolvimento da Intervenção de Enfermagem “Ultrassonografia: bexiga” segundo a Nursing Interventions Classification
Desarrollo de la intervención de enfermería “ecografía de vejiga” de acuerdo con la Nursing Interventions Classification

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Abstract

Objective: To develop a nursing intervention using bladder ultrasound according to the Nursing Interventions Classification.

Methods: This is a methodological study in two steps: integrative literature review and intervention development. For the integrative literature review step, four databases were investigated (PubMed, CINAHL, LILACS and Scopus), including free access studies available in full, in English, Portuguese and Spanish, without time limits. In the intervention development step, the Guidelines for Submission of a New or Revised Nursing Interventions Classification Intervention were followed.

Results: In the integrative literature review, 328 primary studies were found in the databases, 17 of which were included in the final analysis. Studies with a descriptive design stood out, with level of evidence VI being prevalent. The findings made it possible to develop each component of the nursing intervention (title, definition, 17 activities, level of training and estimated time for completion).

Conclusion: The nursing intervention entitled “Ultrasound: bladder” was developed, submitted the Nursing Interventions Classification Editorial Committee and accepted for publication in the 8th edition of the Classification.

Resumo

Objetivo: Desenvolver uma intervenção de enfermagem com o uso de ultrassonografia de bexiga segundo a Nursing Interventions Classification.

Métodos: Estudo metodológico em duas etapas: revisão integrativa de literatura e desenvolvimento da intervenção. Para etapa da revisão integrativa de literatura foram investigadas quatro bases de dados (PubMed, CINAHL, LILACS e SCOPUS), incluindo estudos de acesso gratuito e disponíveis na íntegra, nos idiomas inglês, português e espanhol, sem delimitação temporal. Na etapa de desenvolvimento da intervenção, foram seguidas as Diretrizes para Submissão de uma Intervenção à Nursing Interventions Classification Nova ou Revisada.

Resultados: Na revisão integrativa de literatura foram encontrados 328 estudos primários nas bases de dados, sendo incluídos 17 na análise final. Destacaram-se estudos com delineamento descritivo, sendo prevalente o nível de evidência VI. Os achados possibilitaram desenvolver cada um dos componentes da intervenção de enfermagem (Título, Definição, 17 atividades, Nível de Formação e o Tempo Estimado para realização).

Conclusão: A Intervenção de Enfermagem intitulada “Ultrassonografia: bexiga” foi desenvolvida, submetida ao Comitê Editorial da Nursing Interventions Classification e aceita para publicação na oitava edição da Classificação.

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Conflict of interest: nothing to declare.

Resumen

Objetivo: Desarrollar una intervención de enfermería con el uso de ecografía de vejiga de acuerdo con la Nursing Interventions Classification.

Métodos: Estudio metodológico en dos etapas: revisión integradora de la literatura y desarrollo de la intervención. Para la etapa de revisión integradora de la literatura se investigó en cuatro bases de datos (PubMed, CINAHL, LILACS y SCOPUS), con la inclusión de estudios de acceso gratuito y disponibles con texto completo, en idioma inglés, portugués y español, sin límite temporal. En la etapa de desarrollo de la intervención, se siguieron las directrices para el envío de una intervención a Nursing Interventions Classification Nueva o Revisada.

Resultados: En la revisión integradora de la literatura, se encontraron 328 estudios primarios en las bases de datos, de los cuales se incluyeron 17 en el análisis final. Se destacaron los estudios con diseño descriptivo, con prevalencia de nivel de evidencia VI. Los resultados permitieron desarrollar cada uno de los componentes de la intervención de enfermería (título, definición, 17 actividades, nivel de formación y tiempo estimado para la realización).

Conclusión: La intervención de enfermería titulada “Ecografía: vejiga” fue desarrollada, enviada al Comité Editorial de la Nursing Interventions Classification y aprobada para publicar en la octava edición de la Clasificación.

Introduction

Urinary system problems, such as retention and incontinence, are common to care practice in different contexts, requiring nurses to take specific actions to prevent, alleviate or solve such conditions.^(1,2) Among the various types of care applicable in these situations, bladder ultrasound (US) performed by nurses has been presented as a safe and effective alternative when compared to traditional clinical methods.⁽³⁾

Bladder US performed by nurses has been described in the literature since the 1990s.⁽⁴⁾ Using US, it is possible to assess the urinary volume contained in the bladder without the need for bladder catheterization, which reduces the risk of urinary infection and increases patient comfort.^(5,6) Furthermore, the position and functionality of already inserted bladder catheters can be assessed, avoiding the unnecessary removal of functional catheters or even indicating the removal of obstructed or defective catheters.⁽⁷⁾ Therefore, US is characterized as a non-invasive technology, applicable at the bedside, which can reduce infections.

As the COVID-19 pandemic occurred in 2020, there was greater interest in technologies to aid clinical assessment and perform procedures with greater accuracy, given the inherent decrease in proximity to patients that the pandemic scenario demanded.^(6,8)

Along these lines, in Brazil, the Federal Nursing Council (COFEN - *Conselho Federal de Enfermagem*) issued Resolution 679/2021, standardizing using US by nurses, as long as there is prior training and conditional on non-issuance of a nosological report and diagnosis. Furthermore, it reiterates that this

practice must occur based on the Nursing Process (NP).⁽⁹⁾ Among the steps of NP, bladder US is classified as a direct care intervention, as it aims to improve patient outcomes and requires effective nurse-patient contact for it to take place.^(10,11) However, in an analysis of the most recent edition of the Nursing Interventions Classification (NIC), a standardized nursing language system used worldwide, there is only one intervention described on the use of US by nurses, “Ultrasonography: obstetric and gynecologic (6982)”, which does not include any aspects of urinary or bladder assessment, highlighting an important gap in the aforementioned Classification.⁽¹⁰⁾

A nursing intervention, according to NIC, is any treatment that a nurse puts into practice, based on clinical judgment and knowledge, to improve patient outcomes. It comprises the title, followed by numeric code, definition and care activities. Since 2002, NIC has also considered the estimated time components and level of training required to carry out interventions. NIC allows including new interventions, as long as they have 50% or more activities different from those of similar interventions already included in the Classification.⁽¹⁰⁾

Considering the above, considering that bladder US is a safe, non-invasive, reliable and consolidated practice in many care contexts, it is not yet described in NIC as a nursing intervention. Linked to the constant development of nursing terminologies that enrich and strengthen the discipline as a science, the development of a nursing intervention is understood as necessary, based on a literature review with the following guiding question: How is bladder US performed by nurses and what care is

needed to carry it out? Therefore, the present study aims to develop a nursing intervention using bladder US according to NIC.

Methods

This is a methodological study in two steps: integrative literature review (ILR)⁽¹²⁾ and intervention development following the Guidelines for Submission of a New or Revised NIC Intervention.⁽¹⁰⁾

The ILR step was carried out in five phases: problem identification; literature search; data assessment; data analysis; and data presentation. This method allows to broadly explore different methodological approaches, whether qualitative or quantitative, identifying, through careful interpretation and analysis, possible clinical applications of findings through data integration.⁽¹²⁾

To this end, the Scopus, Latin American and Caribbean Literature in Health Sciences (LILACS), Cumulative Index to Nursing and Allied Health Literature (CINAHL) and PubMed databases were used. As this is a proposal for a new nursing intervention for NIC, no limit was established regarding the temporality of the studies investigated. Free articles available in full, in Portuguese, English and Spanish, considering cohort studies, descriptive studies, randomized clinical trials, quasi-experimental research, literature reviews, guidelines or government studies as valid, were included. Duplicate articles were considered only once, with reflective studies, experience reports, letters to the editor, editorials and reviews being excluded.

Prior to the start of searches, the ILR protocol, describing the planned methodological path, was submitted for validation by researchers with experience in conducting review studies and/or in the thematic area of the intervention to be developed. Upon approval, the protocol was presented to an experienced librarian to help define the best search strategy in the databases. The search strategy was composed from the Health Sciences Descriptors (DeCS/MeSH) “Ultrasound”, “Bladder” and

“Nursing”, using the Boolean operators “AND” and “OR”.

Data collection took place from June to August 2021. The initial selection of articles was carried out by three independent researchers, based on reading the title and abstract. Full reading of articles was carried out by four independent researchers. The researcher in charge reviewed the inclusion and exclusion criteria application, assessing, after the full reading step, the level of evidence (LoE) of included articles, being considered: Level I, systematic review or meta-analysis; Level II, randomized controlled clinical trial; Level III, controlled clinical trial without randomization; Level IV, well-designed cohort or case-control studies; Level V, systematic review of descriptive and qualitative studies; Level VI, descriptive or qualitative studies; Level VII, authority or expert opinion.⁽¹³⁾

The data extracted to characterize the articles were title, authors, year, journal, country of publication and method used. To answer the guiding question, information was collected that could compose the title, definition and activities of the nursing intervention being developed, following NIC recommendations as well as the level of training and estimated time to perform bladder US. The two phases of search (initial selection and data extraction) were carried out using instruments created by the researcher in Google Forms. The review step report follows that recommended by the PRISMA Statement,⁽¹⁴⁾ and, after completing all the steps mentioned, 17 studies met the inclusion criteria (Figure 1).

In the second step, the Guidelines for Submission of a New or Revised NIC Intervention were followed, available in NIC, Appendix B, 7th edition, which contains specific guidelines in five theoretical steps for developing new interventions.

In the first step, it is recommended to search for “suggested readings”, understood as consistent texts that offer support for the intervention and proposed activities, such as recognized textbooks, government guidelines or guidelines from respected scientific societies in the related area, in addition to scientific articles.^(10,11)

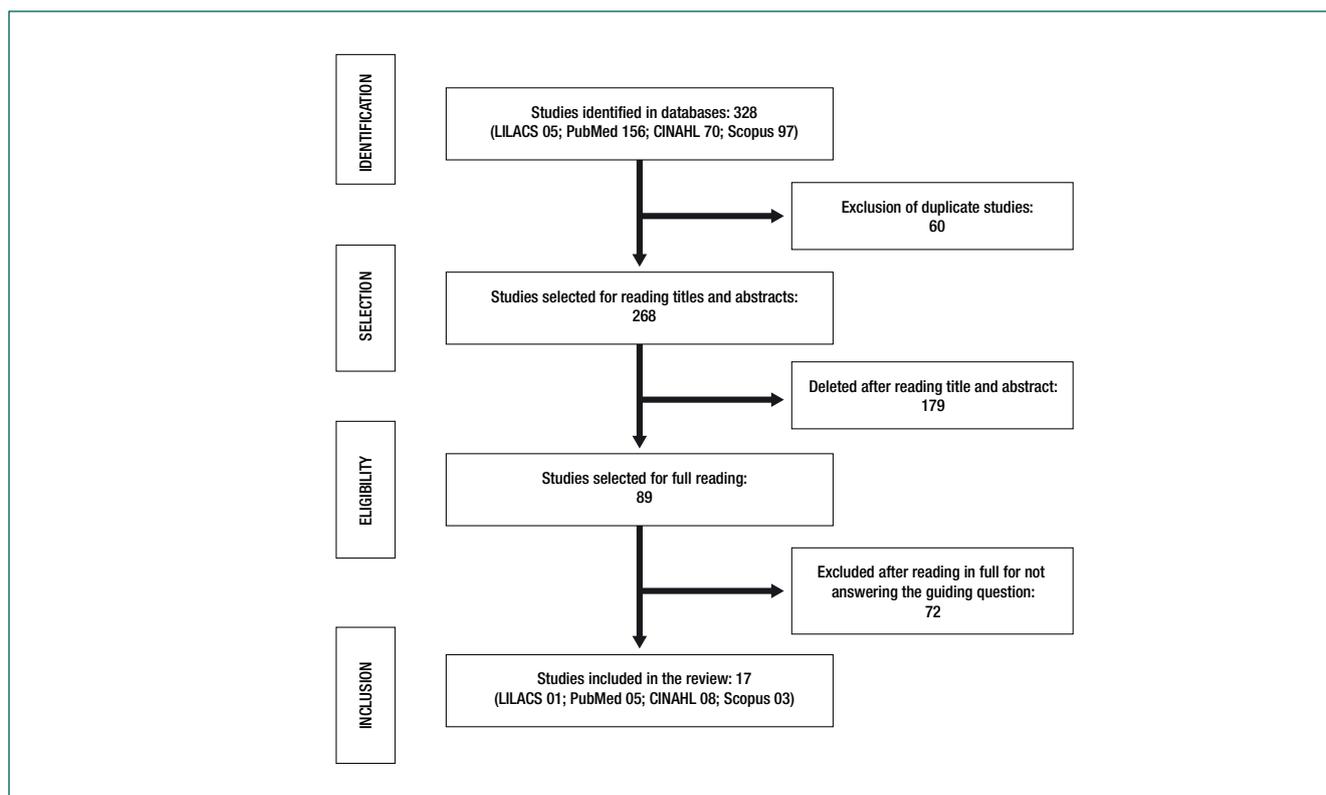


Figure 1. Database search flowchart

In the second step, the intervention title is requested to be created in accordance with the “general principles for intervention titles” which comprise five points: use statements with nouns and without use of verbs; if the title is composed of two main concepts, use a colon to separate the conceptual cores; use capital letters at the beginning of the title; include in the title modifiers that represent nursing actions, based on their meanings, the relationship with the concepts that make up the title and acceptability of terms in general practice.^(10,11)

In the third step, definition creation is indicated following the “general principles for defining interventions” that describe four points: using phrases – and not complete sentences – that describe nursing behavior, which must be sufficiently clear and complete for itself, eliminating the need for examples; avoid terms for patients or nurses and, if necessary, prefer “patient” or “person”, not “client”; do not use a verb at the beginning of the sentence; avoid using any term from the title in the body of the definition.^(10,11)

In the fourth step, it is recommended that care activities be created, listed in logical order

and as dictated by “general principles for activities”, composed of 10 points, among which the following stand out: start each activity with the most active verb appropriate for each care situation; describe activities generically, without using trademarks; avoid combining different ideas in the same activity; write similar activities in the same way between interventions; in important activities, but carried out only in some situations, use the terms “as appropriate” or “if necessary” at the end of the activity.^(10,11)

The fifth step establishes that a supporting text be written, “rationale for inclusion”, which needs to indicate how the proposed intervention differs from those already existing in the Classification.^(10,11)

Results

In the ILR step, all databases investigated contributed at least one publication to the final sample, with the CINAHL database being the one with the largest number of studies includ-

ed (eight studies). As for the temporal distribution, a certain uniformity was observed between 1993 and 2021, accounting for a greater number of studies in 2005 and 2016, with three studies each. In relation to the journals' topic, general nursing, emergency, care for dependent patients (older adults, rehabilitation, etc.) and urological nursing were found (Chart 1).

Chart 1. Synoptic chart of articles included in integrative literature review

Authors	Database	Year	Journal	Country	Method	LoE*
Hoke, et al. ⁽¹⁵⁾	CINAHL	2016	American Journal of Nursing	United States	Quality improvement study	VI
Yatim, et al. ⁽¹⁶⁾	CINAHL	2016	International Journal of Urological Nursing	Singapore	Quality improvement study	VI
Buchko, et al. ⁽¹⁷⁾	CINAHL	2012	Urologic Nursing	United States	Literature review	V
Sweeney, et al. ⁽⁷⁾	CINAHL	2021	Advanced Emergency Nursing Journal	United States	Case study	VI
Stevens, et al. ⁽¹⁸⁾	CINAHL	2005	MEDSURG Nursing	United States	Descriptive study	VI
Altschuler, et al. ⁽¹⁹⁾	CINAHL	2006	MEDSURG Nursing	United States	Descriptive study	VI
Baumann, et al. ⁽²⁰⁾	CINAHL	2008	American Journal of Emergency Medicine	United States	Case study	VI
Resnick ⁽²¹⁾	PubMed	1995	Rehabilitation Nursing	United States	Pilot study	VI
Omli, et al. ⁽²²⁾	CINAHL	2008	Journal of the American Geriatrics Society	Norway	Cohort	IV
Lee, et al. ⁽²³⁾	PubMed	2007	Journal of Advanced Nursing	United States	Quasi-experimental study	III
Carnaval, et al. ⁽²⁴⁾	LILACS	2019	Revista SOBECC	Brazil	Descriptive study	VI
Chen, et al. ⁽⁶⁾	PubMed	2018	Journal of Cardiovascular Nursing	Taiwan	Cohort	IV
Patraca ⁽²⁵⁾	Scopus	2005	Nursing	United States	Descriptive study	VI
Teng, et al. ⁽²⁶⁾	PubMed	2005	Journal of Nursing Research	United States	Descriptive study	VI
Chan, et al. ⁽⁴⁾	PubMed	1993	Journal of Neuroscience Nursing	Australia	Descriptive study	VI
Wilson, et al. ⁽²⁷⁾	Scopus	2015	Annals of Long-Term Care	United States	Descriptive study	VI
Yates ⁽²⁸⁾	Scopus	2016	Nursing Times	United Kingdom	Descriptive study	VI

*LoE: level of evidence.

Regarding origin, 11 are research from the United States, with other countries including one study each (Australia, Brazil, Norway, United

Kingdom, Singapore and Taiwan). Regarding language, 16 studies are presented in English and only one in Portuguese, with none in Spanish. The most prevalent LoE was LoE VI, with 13 studies, followed by two studies of LoE IV, and one study of LoE III and one of LoE V. Among the descriptive studies, special issues or specific editorial sections focused on clinical practice and execution of nursing procedures or clinical cases stand out. Based on the 17 studies, it was possible to develop a Nursing Intervention with 21 components, including title, definition, 17 care activities, in addition to the level of professional training and estimated time for completion (Chart 2). Among the studies included, all contributed to the construction of nursing intervention components, although no study has included all the components developed.

Two^(18,28) studies stood out in this construction, supporting a greater number of components, where one⁽²⁸⁾ supported 15, and another⁽¹⁸⁾ 14 components of the intervention. On the other hand, two other^(15,26) studies were those that contributed the smallest number of components, counting seven⁽²⁶⁾ and six⁽¹⁵⁾ components. Furthermore, it appears that four components were referenced in all the studies analyzed, such as: title, definition and activities “*Determine the clinical indication for bladder ultrasound (e.g., suspected urinary retention or assessment of postvoid residual volume)*” and “*Perform bladder volume measurements as appropriate*”, while “*Use the color Doppler function as appropriate*” was referenced by only one study.

Discussion

Initially, before starting the search, the intervention title was thought to be something like “*Ultrasonography: urinary system*” or just “*Ultrasonography: urinary*”. However, the terms commonly related to practice in the literature were “*bladder ultrasound*”, “*bladder assessment by ultrasound*” and “*bladder scanner*”, with no mention of a complete urinary system assessment, with renal or ureter assessment, for instance.^(7,5,19) Regarding the intervention title, NIC requests that brief state-

Chart 2. “Ultrasound: bladder” nursing intervention developed from the literature review process

Intervention components	Reference studies
Title: “Ultrasound: bladder”	04, 05, 07, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28
Definition: Perform ultrasound examinations to determine bladder status or the position and/or effectiveness of a bladder catheter.	04, 05, 07, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28
Activities	
Determine the clinical indication for bladder ultrasound (e.g., suspected urinary retention or assessment of postvoid residual volume)	04, 05, 07, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28
Instruct patient and family about the indications and procedures for the exam, its purpose and limitations	18, 20, 21, 27
Apply appropriate protocol for bladder ultrasound assessment (e.g., assessment of postoperative or postpartum urinary retention, assessment of decreased urine output with or without a bladder catheter, measurement of postvoid residual volume)	05, 04, 15, 16, 17, 18, 21, 23, 24, 28
Select the appropriate transducer for bladder examination	05, 04, 18, 20, 21, 25, 27, 28
Identify previous abdominal surgeries, scars, tumors, megalias, ascites, visceral distension or other anatomical features with the potential to confuse bladder assessment	07, 19, 20, 25, 28
Apply ultrasound gel to the suprapubic region or directly to the transducer	04, 18, 19, 20, 21, 25, 28
Correctly position the transducer just above the pubic symphysis	05, 04, 18, 19, 20, 25, 28
Get a clear image of the bladder and center it on the monitor	18, 19, 20, 22, 25, 28
Perform bladder volume measurements as appropriate	04, 05, 07, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28
Use the color Doppler function as appropriate	07
Identify on the ultrasound image the position of the distal tip of the urinary catheter, catheter function and cuff volume as appropriate	07, 18, 23, 25
Identify and measure post-void residual volume with ultrasound 10 to 20 minutes after bladder emptying	17, 18, 19, 21, 22, 23, 05, 25, 26, 27, 28
Perform bladder assessment by systematic ultrasound if necessary	15, 16, 18, 20, 21, 23, 24
Discuss bladder assessment with the referring practitioner, consultants and patient as appropriate	16, 19
Assist patient in removing the gel as appropriate	04, 20, 28
Clean the ultrasound device	19, 21, 25, 27, 28
Document the examination findings, including the reason for bladder ultrasound, urine volume measured, patient response to the procedure and any particularities found	16, 19, 23, 25, 27, 28
Level of training required to carry out the intervention: Registered nurse with a <i>lato</i> or <i>stricto sensu</i> graduate degree.	04, 05, 07, 17, 18, 20, 21, 22, 23, 24, 26, 27, 28
Estimated time to carry out the intervention: 15 minutes or less.	04, 26, 27

ments be used, with no more than three words, using only nouns and with a maximum of two nuclei, where one indicates the nursing action and the other, the specificity of the action.⁽¹⁰⁾ Therefore, the most appropriate title was defined as “Ultrasound: bladder”.

Regarding the definition, NIC requests that a concise sentence be described and that defines the concept contained in the title without the need for examples.⁽¹⁰⁾ With this in mind, the definition was developed taking into account the main uses of bladder US in assessing bladder status (volume and shape) and the presence and function of bladder catheters when installed.^(4,16,25,28)

The main application of bladder US by nurses is the measurement of bladder volume, a uniform care activity among the studies included.^(4,5,7,15-28) Bladder catheterization is an invasive procedure that poses a risk of infections and trauma to the urinary tract.^(29,30) However, using US, it is possible to reliably measure the bladder volume, thus estimating the amount of urine retained in the organ in a non-invasive way, increasing patient com-

fort and protecting them from the risks inherent to catheterization.^(16,22,29,30)

As for the populations covered in the studies, the majority of them are individuals with bladder emptying problems, whether due to retention or incontinence, or with a high risk of developing these problems, with at least one indication of bladder US constant in each publication analyzed.^(4,5,7,15-28)

Furthermore, patients with urinary incontinence, found in large numbers in geriatric clinics, benefit from the use of bladder US in the systematic analysis of bladder urinary volume so that urinary leaks due to bladder capacitance deficits can be avoided and urinary catheterization can be indicated in a timely manner.^(21,27) Urinary retention is a common problem in patients with benign prostatic hyperplasia and post-operatively.^(17,24,26,27) In these cases, bladder US offers bladder volume assessment, indicating the occurrence of retention and the need for bladder catheterization.^(3,31) It is also possible to assess the functioning of already inserted urinary catheters, observe their correct positioning inside the bladder and support the safe and timely removal of these devices.^(16,28)

On the other hand, in those patients who present incomplete bladder emptying, it is possible to identify the post-void residual volume with US. This type of assessment makes it possible to plan the need for a new US or even recommend catheterization to completely empty the bladder. In the literature consulted, the time for measuring post-void residue varied from five to 20 minutes after urination.^(17,23,27) This evidence supported the decision to maintain an interval between 10 and 20 minutes, considering the mean time of 15 minutes, which was the most mentioned in the studies consulted.^(17,23,27)

Bladder US can be performed using basically two types of device, complete US devices and scanner-type devices, with a variety of models of each type available on the market.^(20,25,31) This diversity of existing devices constituted a certain challenge to the development of nursing intervention, as the technique used for each device modifies the US examination performance.

For example, there are devices that automatically calculate bladder volume, others offer tools for measuring bladder dimensions in centimeters or millimeters, requiring the application of a formula (lateral-lateral measurement x antero-posterior measurement x cephalo-caudal measurement x 0.52). Others apply the formula automatically based on dimensions measured by the operator.^(25,31,32) Likewise, in devices such as bladder scanners, there is only one transducer option to be used, while in complete US devices the nurse must choose the curvilinear transducer, suitable for bladder assessment.^(25,32) Therefore, the intervention focused on highlighting the main points of the exam, regardless of the device used, privileging the main possibilities of each technology.

Some studies have brought US applications with bladder scanners, which are simpler devices, specific to bladder examination, and which basically offer bladder volume measurement.^(7,18,25) On the other hand, complete devices allow to assess the bladder in real time, making it possible to identify, including installed bladder catheters, cuff volume in the case of Foley catheter and whether it is correctly positioned.⁽²⁰⁾ Another feature of these devices is the color Doppler, an interesting addition to bladder assessment.⁽⁷⁾

When using US to assess the bladder, what is expected to be found is a semi-oval structure, with anechoic content and, when assessed with color Doppler, with an absence of flow or minimal flow (ureteral jets) inside it.^(31,32) In a study⁽⁷⁾ included in the review, a case is presented where what was thought to be the bladder upon assessment with bladder scanner-type US, was actually a large arterial aneurysm, a type of structure that would be more easily identified using color Doppler. Therefore, color Doppler is a tool that complements bladder US assessment, allowing it to be differentiated from other structures.⁽⁷⁾

Regarding the level of training necessary to carry out the Intervention, the literature very consistently presented the need for training nurses to perform bladder US.^(4,5,7,17,18,20,21-24,27,28) NIC indicates that every new Intervention submitted reports the professional training required for its implementation, establishing three levels of training: 1 - nursing technician; 2 - registered nurse (basic education, whether bachelor's or graduate); 3 - registered nurse with a *lato* or *stricto sensu* graduate degree.⁽¹⁰⁾ Furthermore, NIC describes that any additional course to basic nursing training that generates certification, based on the training levels set, are considered "graduate". The need for specific training to perform bladder US is in line with what is standardized in Brazil by COFEN through Resolution 679/2021.⁽⁹⁾

Regarding the time required to carry out the intervention, NIC establishes five categories: 1 - 15 minutes or less; 2 - 16 to 30 minutes; 3 - 31 to 45 minutes; 4 - 46 to 60 minutes; and 5 - more than an hour.⁽¹⁰⁾ Only three studies provided information regarding the time of bladder US. One of them⁽⁴⁾ empirically states that "the entire [bladder US] procedure is performed in less than five minutes", while another⁽²⁷⁾ states that "measuring bladder volume with ultrasound typically requires less than two minutes from the nursing team". However, a reference clearly pointed out that the average time to perform bladder US is 45 seconds, with a standard deviation of 17 to 119 seconds.⁽²⁶⁾ Therefore, the estimated time of 15 minutes or less, the first category established by NIC, was considered sufficient to carry out the intervention.⁽¹⁰⁾

The present study has a limitation, inherent to an initial theoretical study. “Ultrasound: bladder” description lacks other validation steps, content and clinical so that the findings described here can demonstrate their practical implications in the real care environment, characterizing them as existing phenomena in nursing practice. This nursing intervention was submitted to the NIC Editorial Committee and accepted for publication in its 8th edition, scheduled for 2023, in the English version.

An important implication for nursing practice is the development of a product, in this case the complete description of a nursing intervention according to NIC, which guides the use of an existing technology (US) and which has a clinical application that is still little explored in the field of Brazilian nursing. “Ultrasound: bladder”, when included in NIC, gives global visibility to a term that, despite being new to the Classification, has already been used by nurses around the world for over 30 years.

Conclusion

The present study allowed, based on a broad literature review, to develop an unprecedented nursing intervention for NIC entitled “Ultrasound: bladder”.

Collaborations

Moraes VM, Lucena AF, Bavaresco T, Cruz ACB, Oliveira KLR, Silva TS, Sosnoski M and Almeida MA contributed to study design, data analysis and interpretation, article writing, critical review of relevant intellectual content and approval of the final version to be published.

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