**ABSTRACT**

**Objective:** to know the volume of solution used for maintenance, prevention and/or treatment of infection of the Totally Implanted Central Venous Catheter (T-I-CVC) described in the literature. **Method:** it is an integrative literature review aimed at answering the following question **<< What is the volume of solution used to perform the maintenance, treatment and/or prevention of infection of the Totally Implanted Central Venous Catheter (T-I-CVC) described in the literature? >>**. The inclusion criteria were publications in Portuguese, English and Spanish, freely available in their full versions, published from January 2002 to June 2012, in the databases MEDLINE and SciELO virtual library. The search period was from April to June 2012. We have used a structured form. **Results:** we have selected five papers, and one more was added due to it addressing catheter maintenance procedures. **Conclusion:** there was variation in the volume of solution used in these catheters. Accordingly, it is important to define a proper volume of solution to be used in these devices. **Descriptors:** Indwelling Catheters; Maintenance; Nursing Assessment

**RESUMO**

**Objetivo:** conhecer o volume da solução utilizada para manutenção, prevenção e/ou tratamento de infecção do Cateter Venoso Central Totalmente Implantado (CVC-TI) descrito na literatura. **Método:** revisão integrativa da literatura com o propósito de responder à questão **Qual é o volume da solução utilizada para fazer a manutenção, tratamento e/ou prevenção de infecção do Cateter Venoso Central Totalmente Implantado (CVC-TI) descrito na literatura?>>. Os critérios de inclusão foram publicações em Português, Inglês e Espanhol, disponíveis gratuitamente em textos completos, publicadas de janeiro de 2002 a junho de 2012, nas bases de dados MEDLINE e biblioteca virtual SciELO. O período de busca foi de abril a junho de 2012. Utilizou-se um formulário estruturado. **Resultados:** foram selecionados cinco artigos, e mais um foi acrescentado por abordar a manutenção do cateter. **Conclusão:** houve variação do volume da solução que é utilizada nesses cateteres. Assim, torna-se importante um estudo que defina o volume correto de solução a ser utilizado nesses dispositivos. **Descritores:** Cateteres De Demora; Manutenção; Avaliação em Enfermagem.

**RESUMEN**

**Objetivo:** conocer el volumen de la solución utilizada para mantenimiento y prevención y/o tratamiento de infección del Catéter Venoso Central Totalmente Implantado (CVC-TI) descrito en la literatura. **Método:** revisión integrativa de la literatura con el propósito de responder la pregunta **<< ¿Cuál es el volumen de la solución utilizada para hacer el mantenimiento y/o prevención/tratamiento de infección del Catéter Venoso Central Totalmente Implantado (CVC-TI) descrito en la literatura?>>. Los criterios de inclusión fueron publicaciones en portugués, inglés y español, disponibles gratuitamente en textos completos, publicados de enero de 2002 a junio de 2012 en las bases de datos MEDLINE y biblioteca virtual SciELO. El período de búsqueda fue de abril a junio de 2012. Nosotros usamos un formulario estructurado. **Resultados:** fueron seleccionados cinco artículos, un fue acrescentado por abordar el mantenimiento del catéter. **Conclusión:** hubo variación del volumen de solución que se utiliza en estos catéteres. Así se torna importante un estudio que defina el volumen correcto de solución a ser utilizado en esos dispositivos. **Claves:** Catéteres De Demora; Manutenção; Avaliação em Enfermagem.
INTRODUCTION

The incidence of cancer in the world is increasing, including in Brazil, in a rhythm similar to the population aging stemming from a greater life expectancy. The estimates for the year 2012, also valid for the year 2013, show the occurrence of approximately 518,510 new cancer cases, including cases of non-melanoma skin cancer, enhancing the magnitude of the cancer-related problem in the country.

Most chemotherapeutic treatments used to treat the several types of neoplastic diseases are intravenously administered. In case of prolonged intravenous antineoplastic therapies, it is essential having an adequate vascular access. Because of the treatment time, the endothelial irritabilities caused by medicinal drugs and the risk of tissue necrosis, which can also take place, in case of leakage into the subcutaneous region by some of them, usually it indicates the use of central venous catheters, which can be inserted in peripheral veins, such as the Peripherally Inserted Central Catheter (PICC), or inserted in deeper veins, such as the Semi-Implanted Central Venous Catheter (SI-CVC) and the Totally Implanted Central Venous Catheter (TI-CVC).

Increasingly, patients with cancer make use of this type of device, since it provides a venous access that is safe, easy and widely accepted, but this device is not free of complications, and the most common are infection and thrombosis. The indications for implanting the TI-CVC are: administration of chemotherapy, blood products, antibiotics, parenteral nutrition, analgesics and frequent necessity for blood sample collection. It consists of a siliconized rubber device, whose distal extremity is coupled to a puncturable camera, which remains under the skin, embedded in a place in the subcutaneous tissue, over a bone surface and implanted through a surgical procedure. When not being used, it is recommended that a monthly maintenance is made with heparinized solution, in order to prevent its obstruction by blood clots, which could prevent it later use, as the case might be.

Regarding the search for an ideal protocol of heparinization for defining the dose, the quantity of solution to be aspirated from the catheter, as well as the catheter’s irrigation, there is no scientific subsidies that could support one or other conduct. The specialized literature shows heparin doses ranging from 10 to 1,000 IU/ml, and an interval of applications that varies from twice a day to once a month. It should be highlighted that it is common in everyday practice to realize the use of heparin solutions of 100IU/ml in a quantity slightly higher than the catheter’s priming, that is to say: the internal volume thereof.

It is observed a variation in relation to the definition of the volume of solution to be used in these catheters when the objective is to treat or prevent an infection or even a heparinization of such a device. Thus, we have observed some recommendations for monthly heparinization with heparin solution for maintenance routine of the Port-a-Cath®, with volumes of 2 ml, 3 ml and 5 ml, among other values, and it was also observed variations in the volume of antibiotic solution used in these catheters to block thereof, that is to say: antibiotic therapy in lock, this technique is used in some institutions for treating and/or preventing catheter-related infections.

These considerations justify the interest in developing an integrative review about the volume of solution used to perform the maintenance, treatment and/or prevention of infection of the Totally Implanted Central Venous Catheter (TI-CVC), in order to support the conduct of nurses and assist in the development of further researches. Thus, the integrative review emerges as a methodology that provides the synthesis of knowledge and the incorporation of the applicability of results of significant studies in practice.

Accordingly, the proposed objective for this study was:

- To know the volume of solution used for maintenance and prevention and/or treatment of infection of the Totally Implanted Central Venous Catheter (TI-CVC) described in the literature.

METHOD

It is a descriptive study of integrative review, as it allows to summarize the already completed researches and to extract conclusions from a topic of interest. In addition, its purpose is to gather and synthesize research findings on a particular theme or issue, in a systematic and orderly manner, thereby contributing to the whole understanding of the theme to be studied.

In order to guide the integrative review, we have formulated the following question << What is the volume of solution used to perform the maintenance, treatment and/or prevention of infection of the Totally Implanted Central Venous Catheter (TI-CVC) described in the literature? >>
During the data collection of papers, we made use of a suitable instrument used by researchers, professors and students, of a post-graduation program in Nursing. The tool was subjected to apparent and content validation by experts with experience in research.

The used tool contained the following variables: title, year and journal in which the paper was published, authors, qualification and origin of the authors, purpose (objective), sample size, characteristics, scenario, research design and tools, the main findings and conclusions.

The capture of publications was processed through the Virtual Health Library (VHL) and U.S. National Library of Medicine - National Institutes of Health (NCI/PubMed). We have established as criteria for inclusion in the sample: full articles online. Moreover, the descriptors indwelling catheters, maintenance and heparin were used, with time cutout from 2002 to 2012, in English, Spanish and Portuguese. The exclusion criteria were: papers that, although discourse about maintenance, not addressed the volume of solutions introduced into the TI-CVC, and papers that addressed indwelling catheters, but it was not the catheter of the study question, such as the case of the indwelling bladder catheters (IBC), the Peripherally Inserted Central Catheter (PICC), among others. The literature search period took place between April and June 2012.

The descriptors were worked in a correlated form in both investigated databases. Accordingly, 23 publications were found in the VHL and 99 in the NCI/PubMed, as shown below in Figures 1 and 2. At the end, after reading all papers and application of exclusion criteria, the sample was composed of five papers that answered the research question. Subsequently, we included one paper that did not appear in the search through the aforementioned descriptors, but discussed very well on the investigated theme. Thus, six papers were included, as shown in Figure 1:
Inclusion criteria of research: papers available in their full version and published in the last 10 years (2002-2012), in English, Spanish and Portuguese, with the basic descriptors: cateteres de demora (BVS) and indwelling (NCI / PubMed), making a correlating between the first and the second, the first with the third, and so on and so forth.

Exclusion criteria of research: both in the VHL and in the NCI/PubMed were excluded all papers that did not addressed the Totally Implanted Central Venous Catheter (TI-CVC) whose descriptor, in the Medical Subject Headings (MeSH), is cateteres de demora or indwelling catheters, that is to say: we excluded papers that addressed the semi-implantable catheters such as Hickman’s device, Hemodialysis Catheter (HC), Peripherally Inserted Central Catheter (PICC), arterial catheters, and so on and so forth; and also the papers that addressed the TI-CVC, which discoursed on concentration/dose of solutions, but did not address the volume to be introduced into the catheter.
The analyses were performed through reading, grouping and analysis of papers. The findings were presented in tabular form and descriptive language, in order to ease visualization and understanding of readers.

**RESULTS AND DISCUSSION**

In this review, taking into account the six selected studies, four (66.7%) are from Europe, given that two are from Spain, one is from Germany and the other is from France; another one (16.6%) is from the United States and the last one (16.6%) was developed in Brazil. The table below shows some of the characteristics of the selected papers.
Both in the paper 1st of the above table, represented in figure 3, and in the paper 2nd, published in 2006, in Spain, it was approached the antibiotic blocking in catheters. But, as regards the volume of the antibiotic in question, there was a difference between their volumes, since in the first, the authors made a reference whose description was the use of 2 ml of saline solution with antibiotic for blocking; as for the second, this blocking was done with 3 ml of a solution containing antibiotic in line with what is described in the paper.

The paper 3rd, which was published in 2005, in Germany, deals with the use of a volume of antibiotic recommended for blocking, both with vancomycin and with amikacin. Vancomycin is the most often used antibiotic to treat infections by gram-negative.

In totally implantable catheters, it was injected 3 ml of the antibiotic solution.

The anti-bacteria used to treat infections associated with catheters were vancomycin, for gram-positive, and ciprofloxacin, for gram-negative bacilli.

In the study, it was demonstrated that a low prophylactic warfarin dose compared to low molecular weight heparin dose (nadroparin) had statistically different efficacies in upper limbs thrombosis in patients with cancer and long-term central venous catheters. It was used 5 ml of heparinized saline solution in these catheters.
anticoagulant substances in preventing thrombosis of extremities in patients with cancer, carriers of long-term central venous catheters. This paper recommends the use of 5 ml of heparinized solution to hold its maintenance. In the same year, it was published the article 5\textsuperscript{14}, in the United States of America (USA), in which a blocking solution to prevent infection of implantable catheters in children with cancer was addressed, and the used volume of this solution for blocking the catheters was 2 ml. Thus, we decided to add the paper 6\textsuperscript{th}, because it is a more recent publication in relation to the previous ones (2011) and is derived from a dissertation developed in a Brazilian university, where there was also a literature review on the issue at stake; its authors suggested the use of 3 ml of heparinized solution for the maintenance of the catheter in question.

Regarding the profile of the authors, five papers were written by physicians and one by nurses. This draws attention to the fact that nurses, mainly from the field of oncology, can manipulate these devices and, in many places, this manipulation is unique to nurses. Furthermore, when we sought information about this kind of nursing care in handling these devices, a little amount of publications by these professionals can be found. Although most publications are in English, only one of them is coming from a country that has it as the primary language, since the other countries have Spanish, German, French and Portuguese as their primary languages, thereby demonstrating once again the credibility that the English language has in the scientific community.

Another important factor observed in this study is the variation found in the volume defined for using in the internal part of totally implanted central venous catheters, both for blocking antibiotics, where it was observed a variation between 2 and 3 ml of the solution in question, and for cases of making use of heparinized solution that is used for its anticoagulant properties in preventing and/or treating infections related to them. Accordingly, it is important to define a proper volume of solution to be used in these devices, thereby avoiding the discrepancy observed when investigating the current state about the theme. To that end, it will require further studies that address this issue with sights to define a volume of ideal solution for such devices.

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It was noticed an increase in demand for medical treatments for the various types of neoplastic diseases through intravenous pathway. Consequently, it will require further use of this type of catheter, thereby increasing the likelihood of having patients with multiple catheters in the work routine of nurses.

As shown in this review, there was variation in the volume of solution used in these catheters, both for their maintenance and for preventing and/or treating infections related to them. Accordingly, it is important to define a proper volume of solution to be used in these devices, thereby avoiding the discrepancy observed when investigating the current state about the theme. To that end, it will require further studies that address this issue with sights to define a volume of ideal solution for such devices.

**CONCLUSION**

The scientific production made by nursing professionals with regard to care actions related to maintenance and block totally

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*English/Portuguese*

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