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Bladder catheter-associated urinary tract infection: integrative review

Infecção do trato urinário relacionada ao uso de cateter vesical: revisão integrativa

Infección del tracto urinario relacionado con el uso del catéter vesical: una revisión integradora

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ABSTRACT

Objective: To analyze, through literature, the main preventive measures recommended to reduce rates of bladder catheter-associated urinary tract infection. **Method**: It is an integrative literature review, which has as sample cohort, case-control and clinical trial studies, randomized or not, published in Portuguese, English or Spanish, in the period between 2009 and 2018. The collect and data analysis occurred in April and May 2019. **Results**: The publications emerged from studies performed in intensive and non-intensive care units, in different countries. Among the preventive measures, hand hygiene and shorter usage time of bladder catheter were highlighted. **Conclusion**: The present review allowed different national and international data to be analyzed, they corroborate preventive strategies adopted in the Brazilian context; however, the limitations of this study are in highlighting in literature only two preventive measures.

DESCRIPTORS

Urinary Tract Infections; Urinary Catheters; Prevention & Control.

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INTRODUCTION

Health care-Associated Infections (HAI) are considered a public health problem of great magnitude, by substantially increasing the health care costs, contributing to increase length of stay and mortality rates.[1]

Urinary Tract Infection (UTI) is presented as one of the most relevant HAI, since it is responsible for about 45% of HAI in adult patients, in average, 25% of them undergo bladder catheterization. It is worth noting that when this procedure is adopted, representative part of patients using bladder catheter do not present clinical indication, or it is wrong.[1]

UTI can be classified as: Catheter-associated urinary tract infection associated with health care (UTI-AC), Catheter-associated urinary tract infection not associated with health care (UTI-NAC) and other urinary system infections (USI).[1-2]

The use of urinary devices is associated with serious infectious complications. They can be prevented by taking prophylactic measures such as proper insertion, using aseptic technique; proper catheter maintenance, which goes beyond the correct handling, passing by adequate infrastructure for prevention, process surveillance, training and problematization of everyday actions, with stimulus of permanent education practices; and creation of bundles of measures, which aim to prevent the aggravation.[1-3]

In this way, concerning bladder catheter-associated HAI, the following is questioned: What preventive measures are recommended to reduce rates of urinary tract infection, due to not taking prophylactic measures, aiming to reduce serious infectious complications?

To answer the question, it was used as objective to analyze, through literature, the main preventive measures recommended to reduce rates of bladder catheter-associated UTI.

METHOD

It is an integrative literature review, in order to gather results of studies developed by means of different methods, allowing authors to synthesize results without harming the epistemological affiliation of the included empirical studies.[4-6] The systematization included six organizational steps: Step I – identification of study subject and/or question; Step II – establishment of criteria for inclusion and exclusion of studies and systematized search in literature; Step III – definition of information to be extracted from selected studies according to the review guiding question; Step VI – selection with later evaluation of studies included in review; Step V – interpretation of the results found; Step VI – knowledge synthesis.[6]

Steps I, II and III corresponded to the elaboration of search strategy. Step IV, of study selection, occurred through electronic search of original articles, which answer the following investigation question: Regarding bladder catheter-associated health care-associated infections, what preventive measures are recommended to reduce rates of urinary tract infection, due to not taking prophylactic measures, aiming to reduce serious infectious complications? PICO[7] framework is represented by the acronym: Problem, Intervention, Comparison and Outcomes; thus, these four components are the essential elements to make the research question that will guide the search in databases in any review study.

Chart 1 – Description of research question form using PICO framework.

Acronym	Definition	Description	Practical question component
P	Problem	Bladder catheter-associated health care-associated infections.	In bladder catheter-associated health care-associated infections.
I	Intervention	Preventive measures recommended to reduce rates of urinary tract infection.	To identify what preventive measures are recommended to reduce rates of urinary tract infection.
C	Comparison	Not taking prophylactic measures.	Due to not taking prophylactic measures.
O	Outcomes	Reduction of serious infectious complications.	To aim to reduce serious infectious complications.

Source: Study data.

The sample consisted of cohort, case-control and clinical trial studies, randomized or not, published in full in Portuguese, English or Spanish, in the period between 2009 and 2018, the time frame occurred as from 2009 the Brazilian Health Regulatory Agency started to, periodically, publish manuals directed at preventing health care-associated infections. Articles that did not meet the inclusion criteria were excluded, after analysis of methodological and statistical consistency.

The databases accessed are: Latin American and Caribbean Center on Health Sciences Information (LILACS), via Virtual Health Library (VHL); Medical Literature Analysis and Retrieval System Online (MEDLINE), via PubMed; SciVerse (SCOPUS), via ELSEVIER; Web of Science and Cumulative Index to Nursing and Allied Health Literature (CINAHL), via EBSCO. To have access to the databases, computers connected to World Wide Web (Internet) were used at the Federal University of Mato Grosso.

The descriptors used were: Health Sciences Descriptors (DeCS), for LILACS; Medical Subject Heading (MeSH) for MEDLINE; DeCS and MeSH for obtaining terms for CINAHL and keywords for SCOPUS. After making the search strategy, the following were obtained: "Urinary Tract Infections", "*Infecciones Urinarias*", "*Infecções Urinárias*", "Urinary Catheters", "*Catéteres Urinarios*", "*Cateteres Urinários*". All the combinations between the descriptors were performed using the Boolean operator AND.

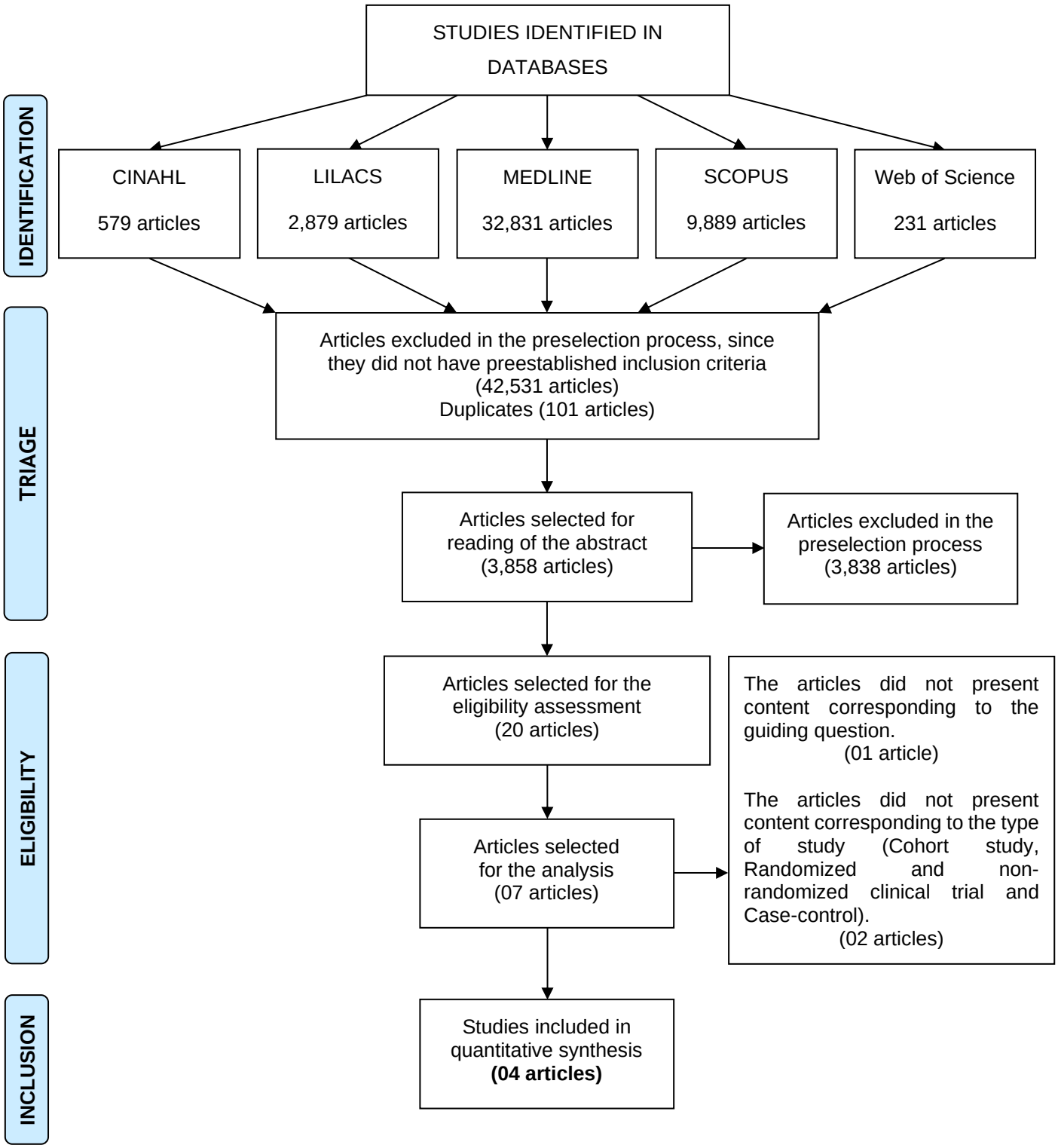
The combinations and data analysis occurred from April to May 2019, performed by researchers independently. For data collecting, the descriptors were inserted in electronic databases, previously selected, respecting the inclusion and exclusion criteria described. Right after this process, the articles were selected by means of reading of titles, which present correlation with the main subject. Subsequently to analysis of titles, the articles were classified through a careful reading of their abstracts, and those that approximated the subject were selected for full reading. For consolidation, full reading and evaluation of 7 articles were performed.

At the end of the selection, randomized and non-randomized clinical trials were submitted to methodological quality analysis proposed by Jadad, which comprises five criteria with 0 to 5 score. Score less than 3 indicates that the study has low methodological quality, and its results will be, hardly, extrapolated for other scenarios.[8]

The selection of cohort and case-control studies occurred using the Newcastle-Ottawa scale. Study score was calculated in three domains: group selection (0 – 4 points), comparability (0 – 2 points) and results (0 – 3 points), considering the maximum score of 9 points, which represents high methodological quality. The articles that present score less than 4, indicate limited evidence or low quality, thus being excluded.[9]

After the analysis from the methodological quality, using the respective scales, 4 articles were selected to form the review, 3 excluded after methodological analysis by the respective constructs. For the study description, flowchart Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA)[4,10] was used and guided the study search and selection, as Figure 1.

Figure 1 – Flowchart, according to PRISMA, for selection of studies found. Rondonópolis – MT, Brazil, 2019.



RESULTS

After searches in electronic databases previously cited, from application of scales, the results of Chart 2 are presented, in order to comprise the analysis of selected studies to form the review, in order to comprise the authors, year and country where the study was performed, objective of each study, methodological design, participants, protection factors and the scores established during the methodological analyses of studies, aiming to answer the investigation question.

Chart 2 – Analysis of studies selected to form the review.

Authors/ Country	Objective	Design	Participants	Protection factors	Jadad score	Newcastle –Otawa score
Mccalla et al., 2018[11] (United States)	To verify if the hand hygiene compliance system is effective in reducing health care-associated infections.	Non-randomized clinical trial	Preintervention (14,297) and intervention (36,890) periods	Hand hygiene	05	NA
Fukuoka et al., 2018[12] (Japan)	To assess the risk of catheter-associated urinary tract infection related to duration of catheterization in Pediatric ICU.	Cohort study	1,890 children of a Pediatric ICU in Japan	Duration of bladder catheter use less than seven days	NA	08
Rosenthal et al., 2012[13] (Argentina, Brazil, China, Colombia, Costa Rica, Cuba, India, Lebanon, Macedonia, Mexico, Morocco, Panama, Philippines, Peru and Turkey)	To assess the impact of a multidimensional infection control strategy to reduce incidence of catheter-associated urinary tract infection in patients in Adult ICUs.	Cohort study	56,429 patients hospitalized in 57 General ICUs	Duration of urinary catheter use and early removal less than seven days	NA	08
Thulin et al., 2010[14] (Sweden)	To determine if an improved hygiene can reduce the incidence of symptomatic urinary tract infections in patients treated by cystectomy for urinary bladder cancer.	Cohort study	452 patients	Hand hygiene	NA	09

Source: Study data.
Caption: NA: Not applicable.

As for the study development site, they are performed, respectively, in adult intensive care unit, pediatric intensive care unit and two in non-intensive care unit. Concerning the region, they are performed, respectively, in the United States, Sweden, Japan and one is considered multicenter, and it was concomitantly performed in fifteen countries (Argentina, Brazil, China, Colombia, Costa Rica, Cuba, India, Lebanon, Macedonia, Mexico, Morocco, Panama, Philippines, Peru and Turkey). All the articles were published in international journals, the first one was about a clinical trial without randomization and the others were cohort studies.

DISCUSSION

The preventive measures to reduce bladder catheter-associated urinary tract infections (UTI) are considered important actions, which collaborate to prevent the infectious process from the use of bladder catheter. Among these prophylactic quality measures, the following were cited by the authors of the studies which form the review: proper hand hygiene (HH) of professionals who handle the bladder catheterization system[11-12] and reduced usage time of bladder catheter to reduce cases of UTI in hospital.[13-14]

According to international guidelines, HH is considered the most impactful prophylactic action in health service, widely recommended by World Health Organization (WHO) in five moments, in addition to the staff periodic training on care associated with ITU prevention, with emphasis on the maintenance of aseptic technique in catheter insertion and maintenance, as well as on vigilance of this aggravation by means of health care-associated infection (HAI) control service.[1,15-16]

A study performed in the United States aimed to verify if HH, when performed properly, is effective in reducing HAI, without specifying the infectious site. The authors highlighted the participation of professionals involved in direct patient care, before and after an educational intervention directed at HH, resulting in a significant reduction in UTI cases over the period studied.[16-18]

According to WHO, the multimodal strategy prioritizes five moments that favor the change in practices and behaviors: change in health service

environment (infrastructure); permanent education of professionals involved in health care; evaluation and feedback on care indicators directed at HH and its relation to risk factors for the development of infections, in addition to notes in workplace and favorable institutional safety climate.[16-17]

In this perspective, the importance of HH as preventive measure to reduce rate of bladder catheter-associated UTI was notable, since the authors proposed the use of an automated reminder system for health professionals, in which it is solicited that professionals conclude HH whenever opportunity occurs, in consonance with the moments established to perform the procedure recommended by WHO.[11,16-19]

In the study performed in Sweden, it was highlighted that the effectiveness of HH is related to the performance of procedure properly, respecting the right technique, the moments indicated for its performance and the inherent care to bladder catheter in hospital environment.[12]

In addition to the right technique of catheter insertion, there are other important measures for the prevention of this aggravation, such as: the consistent indication of the use of bladder catheter; timely removal of catheter, conditioned to positive clinical evolution of the individual who is using bladder catheter; verification of alternatives to measure and control diuresis, previously to insertion; care in the maintenance of invasive device, including the maintenance of integrity of closed system in case of use of indwelling bladder catheter; a care team properly trained; and an effective surveillance system of use and of complications related to use.[1] It is worth mentioning that they are all considered protection factors, that is, positively contribute to reduce rates of bladder catheter-associated UTI.

The Japanese study highlighted that the prolonged use of bladder catheter increases the risk of catheter-associated UTI by 5% each day, likewise, it is suggested that the immediate removal of urethral catheter is strongly recommended whenever possible.[12] The multicenter study included in the final sample of this review presents the prolonged permanence time of bladder catheter as a risk factor for the development of UTI and highlight the importance of catheter removal as soon as possible, as a protective factor.[13] While in the Japanese study performed in pediatric intensive care units, the need to reduce the permanence time of urinary catheter in children became effective in the UTI preventive aspect.[12] Equally to the findings of the multicenter study, it was highlighted that the usage time of urinary catheter substantially contributed to an increased UTI rate in developing countries, since the prolonged use of catheter increases the proliferation of bacteria and fungi in urinary system. Thus, the authors suggest as preventive measure the time assessment of the catheter permanence time;[13] however, a protocol with the usage period was not established, since it should be related to the clinical indication and the need of maintenance of such indication.

Other studies highlighted preventive measures for bladder catheter-associated UTI; however, the methodological rigor proposed in the selection phase of the final sample did not allow the inclusion of scientific articles with methodological weaknesses in the light of the scales used for the analysis process.

CONCLUSION

In sum, the present review allowed to bring international data, from different realities, which corroborate the preventive strategies adopted in Brazilian context, as proper hand hygiene and the usage time of bladder catheter, with consistent indication and care directed at early removal of bladder device, focusing in reducing urinary tract infection (UTI) in hospital.

The study has limitations in highlighting only two preventive measures found in literature, after the evaluation of scientific articles in the analysis phase, in consonance with the benchmarks established for the selection process of articles. Thus, it is suggested that further studies directed at the subject be performed,

with methodological consistency, which demonstrate the effectiveness of other preventive measures, both in bladder catheter insertion and in maintenance, aimed to reduce rates of UTI.

RESUMO

Objetivo: Analisar, por meio da literatura, as principais medidas preventivas recomendadas para redução das taxas de infecção do trato urinário relacionada ao cateter vesical. **Método**: Trata-se de uma revisão integrativa da literatura, tendo como amostra estudos de coorte, caso-controle e ensaio clínico, randomizados ou não, publicados em português, inglês ou espanhol, no período compreendido entre 2009 e 2018. A coleta e a análise dos dados ocorreram nos meses de abril e maio de 2019. **Resultados**: As publicações emergiram de pesquisas realizadas em unidades de terapia intensiva e em unidades não intensivas, em diferentes países. Dentre as medidas preventivas foram evidenciadas a higienização das mãos e menor tempo de uso do cateter vesical. **Conclusão**: A presente revisão permitiu analisar diferentes dados nacionais e internacionais, que corroboram as estratégias preventivas adotadas no contexto brasileiro, no entanto, as limitações desse estudo estão em evidenciar na literatura apenas duas medidas preventivas.

DESCRITORES

Infecções Urinárias; Cateteres Urinários; Prevenção & Controle.

RESUMEN

Objetivo: Analizar, a través de la literatura, las principales medidas preventivas recomendadas para reducir las tasas de infección del tracto urinario relacionado con catéter vesical. **Método**: Esta una revisión integradora de la literatura, estudios de cohorte como muestra, control de casos y ensayo clínico, aleatorizado o no, publicado en portugués, inglés o español, en el período entre 2009 y 2018. La recopilación y análisis de datos tuvo lugar en abril y mayo 2019. **Resultados**: Publicaciones surgidas de investigaciones realizadas en unidades de cuidados intensivos y unidades de cuidados no intensivos, en diferentes países. Entre las medidas preventivas se evidenciaron la higiene de las manos y menor tiempo de usar del catéter vesical. **Conclusión**: Esta revisión nos permitió analizar diferentes datos nacionales e internacionales, que corroboran las estrategias preventivas adoptadas en el contexto brasileño, sin embargo, las limitaciones de este estudio son mostrar en la literatura solo dos medidas preventivas.

DESCRIPTORES

Infecciones Urinarias; Catéteres Urinarios; Prevención & Control.

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COLLABORATIONS

WSO and ABKMRB: substantial contributions to work conception or design. WSO, ABKMRB and SROM: substantial contributions to data collecting, analysis and interpretation. SROM, JRSJ, GAS and BSS: substantial contributions to writing the article or to its critical review. SROM: substantial contributions to the final version to be published. All the authors agree and take responsibility for the content of this manuscript version to be published.

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Does not apply.

AVAILABILITY OF DATA

Does not apply.

FUDING SOURCE

Does not apply.

CONFLICTS OF INTEREST

There are no conflicts of interest to declare.