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Interventions to reduce urinary tract infections among hospitalized children: A systematic review

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Review article

Interventions to reduce urinary tract infections among hospitalized children: A systematic review

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Abstract

Background: Among the bacterial infections, urinary tract infection (UTI) is commonly diagnosed among the children. Although there is a variety of research on diagnosis and treatment of UTI, still the clinician faces many challenges in day-to-day care of the children. Studies have reported that the incidence of UTI is highest among the first year of life and decreases in the later life. The appropriate interventions to diagnose and manage the UTIs are important to reduce them among children. **Purpose:** The purpose of this systematic review is to identify the interventions to reduce UTIs among hospitalized children. **Data sources:** The electronic databases of PubMed, CINHAL and Scopus were searched in January 2017. **Study selection:** All quantitative studies published in English, whose aim was regarding the care of urinary catheters among hospitalized children were included. Interventional studies with at least catheter associated UTI as an outcome were included in the review. **Data extraction:** Two authors reviewed the study design, participant and intervention details, outcomes, and quality measures of the articles. **Data synthesis:** The review included 245 articles (PubMed= 224, CINHAL= 11, Scopus=10). Twenty seven of these articles were present in multiple databases, so their removal meant that 216 unique studies were identified in the search. Each of the articles was independently screened for titles and abstracts of 216 studies. Among these, 166 articles were excluded for various reasons. Hence, the full text of 50 articles was assessed for eligibility. From these, 36 articles were excluded due to lack of resonance with the subject matter. The remaining 14 articles were finally included. **Conclusion:** Various practices are followed by health care professionals such as hand hygiene, limiting the use of catheters, managing incontinence and sterile techniques during insertion of the catheter.

Key words: Catheter, children, catheter associated urinary tract infection (CAUTI), Urinary tract infection (UTI)

Introduction

Urethral catheterization is a routine procedure which facilitates direct drainage of the urine and it is done by inserting a catheter into the bladder through the urethra. It is one of the highly practiced procedures in the diagnosis and treatment of patients (Gould, Umschied, Agarwai, Kuntz, & Pescueo, 2013). Study has reported that the incidence rate of UTI is 7.8% for girls by the age of seven years (Haque, Ahmed, Rafique, Abbas, Jurair, & Ali, 2016). Children are brought to the emergency department with complaints of decreased oral intake, crying or fever which are one of the serious causes of UTI. Most of the children are diagnosed to have bacterial infection, but some symptoms remain undiagnosed which affects the prognosis of the disease (Kepenekli, Soyasal, Yalindag, Ozgur, Ozcan, & Akar, 2014). Most of the patient care involves urethral catheterization; if proper care is not taken, it brings some risks and complications (Davis, Kleiger, & Meredith, 2011). Study has reported that indwelling catheters are associated with mortality and morbidity, and must be used minimally and should be avoided (Long, & Vince, 2012). It is identified that the major risk factor for UTI is insertion of catheter and carrying it for longer duration (Pelowe, & Rogers, 2015).

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Methods

Study design

The systematic review was done based on the Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) criteria. The search was targeted mainly based on the literature reviews for all the interventions to prevent UTIs among hospitalized children.

Eligibility criteria

To identify the literature reviews available for the interventions to prevent UTI among the hospitalized children in depth search was performed. With the help of the inclusion and exclusion criteria, randomized controlled trials and non-randomized trials were included.

Search strategy

It included hospitalized child/ postoperative child/ paediatric/ toddler/ pre-schooler/ schooler/ adolescent and catheters/ catheter/ urinary catheter and catheter care/ urinary catheter care and urinary tract infections/urinary tract infection/CAUTI.

Participants

As we were interested in identifying the interventions to reduce UTI, hospitalized children were selected who were admitted under medical and surgical units. However, acute care hospitals, psychiatric hospitals and community settings were excluded.

Interventions

Studies included certain interventions such as aseptic techniques, appropriate use of catheters, proper maintenance and routine care, removal of catheters, interventions to prevent infection and more concentration on hand hygiene.

Outcomes

Primary outcome

Health care associated UTI: Infection which occurs after admission of the child to the hospital which was not identified initially.

Secondary outcome

Catheter associated urinary tract infection (CAUTI): UTI which occurs in the children during or after use of urinary catheter.

Study selection and data extraction

The search identified 245 articles (PubMed= 224, CINHAL=11, Scopus=10). Twenty seven of these articles were present in multiple databases, so their removal meant that 216 unique studies were identified in the search. Each of the articles was independently screened for titles and abstracts of 216 studies. Among these, 166 articles were excluded for various reasons. Hence the "full text" of the 50 articles was assessed for eligibility. From these 36 articles were excluded due to lack of resonance with the subject matter and were not relevant to the topic.

Study Selection (Figure 1)

Screening of all the records which were retrieved by performing systematic search title and abstract were screened based on inclusion criteria and duplication of records were identified by one author. Articles which were full text were assessed for quality and it was scored by two authors.

Data extraction and quality assessment

Data which was relevant based on inclusion and exclusion criteria such as study design, participants and outcomes were abstracted independently by two authors. Quality check was performed by two authors using a checklist for assessing both randomized and non-randomized studies.

Data analysis

Based on the selected studies the interventions and outcomes were combined into summaries.

Results

Study selection

The search identified 245 articles (PubMed= 224, CINAHL= 11, Scopus=10). Twenty seven of these articles were present in multiple databases, so their removal meant that 216 unique studies were identified in the search. Each of the articles was independently screened for titles and abstracts of 216 studies. Among these, 166 articles were excluded for various reasons. Hence, the full text of the 50 articles was assessed for eligibility. From these, 36 articles were excluded due to the lack of resonance with the subject matter and they were not relevant to the topic.

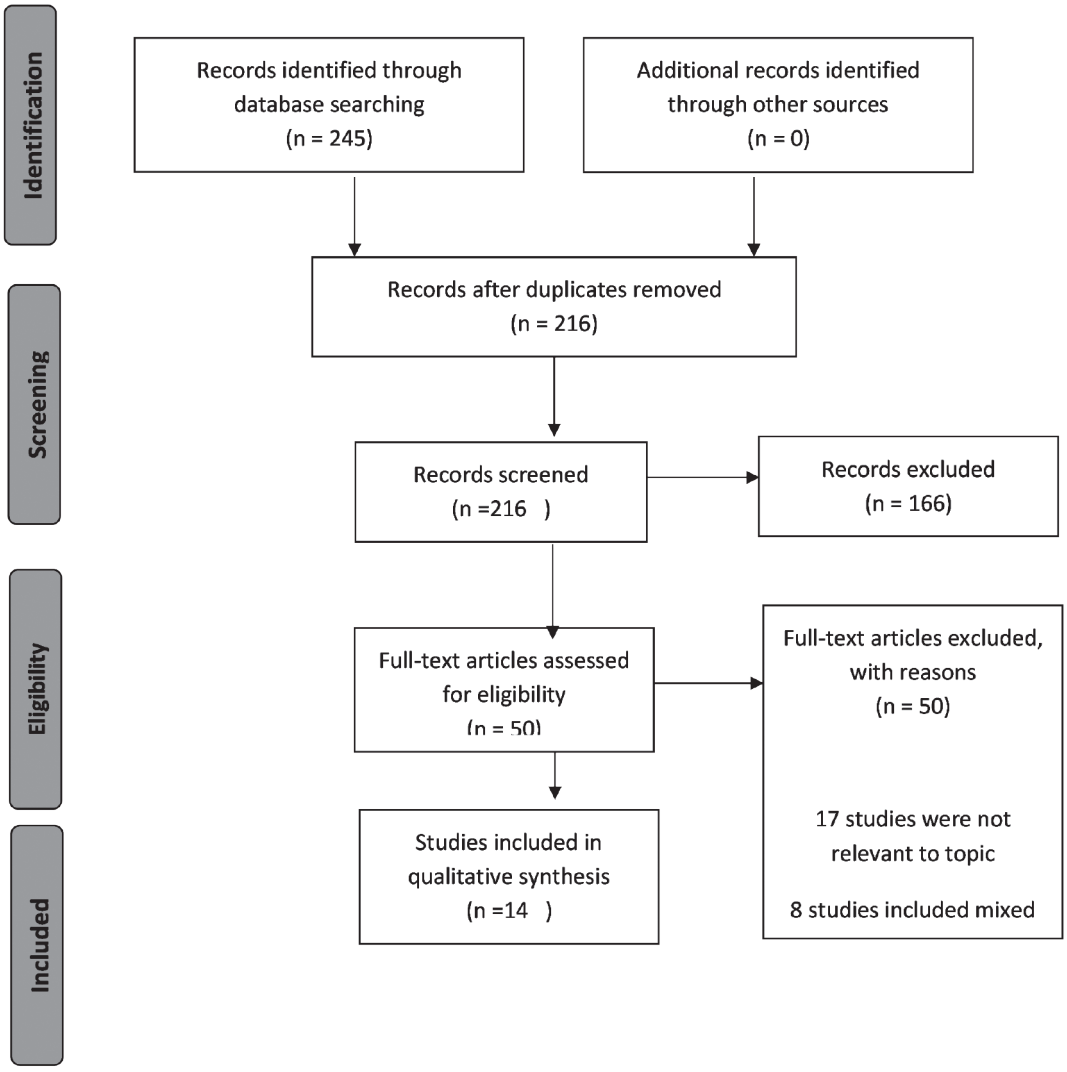

Figure 1: PRISMA flowchart

Characteristics of included studies

Table 1 describes the 14 interventional studies in terms of different interventions which help to decrease UTI. These searches included nine randomized controlled trials and five non randomized controlled trials. All the studies involved catheterized participants in the setting. As mentioned in the Table 1, ten studies involved single interventions and four studies involved multiple interventions. Interventions which focused on catheter use and care were evaluated in 14 studies, hand hygiene in three studies, use of antiseptic silver in one study, reduce the unnecessary urinary catheterization in one study, skin care in three studies, use of aseptic techniques in five studies and appropriate indications, prompt removal incontinence care in one study.

Outcomes of included studies

Table 1 mainly describes on outcomes reported for UTI and CAUTI. Three studies reported on CAUTI and eleven studies reported on UTI.

Discussion

Broad systematic review was performed to reduce UTI and CAUTI among hospitalized children. Studies reported decreased UTI and CAUTI were 14. With the help of this review, it was confirmed that majority of the interventions have been implemented for prevention of CAUTI which has also given some importance among hospitalized children. Most of

Table 1:

Description of Included Studies

First author and year	Study design and sample	Intervention to reduce UTI	Outcome
Bonafill et al. 2014	Randomized controlled trial and 742 samples	**Description of intervention:** Urinary catheters were coated with antiseptic silver alloy coating and the trained health care staffs perform urethral catheterization	Urinary tract infection
Loeb et al. 2008	Randomized controlled trial and 51 patients	Reduce the unnecessary urinary catheterization	Urinary tract infection
Webster et al. 2006	Randomized controlled trial and 685 patients	Catheter removal at 22:00 hour and 6:00 hour	Urinary tract infection
Sami et al. 2014	Randomized controlled trial and 102 patients	Solution used (sterile water or 10% povidone-iodine)	Catheter associated Urinary tract infection
Patrick et al. 2012	Pre-post NRT and 807 patients	Skin care and hand washing	Urinary tract infection
Davis et al. 2011	Pre-post NRT and 305 patients	Infection control practices	Catheter associated Urinary tract infection
Ercole et al. 2012	Pre-post NRT and 183 patients	Decrease length of hospital stay	Catheter associated Urinary tract infection
Falco et al. 2014	Pre-post NRT and 114 patients	Clean perineal area	Catheter associated Urinary tract infection
Hay et al. 2013	Randomized controlled trial and 186 patients	Increase hydration	Catheter associated Urinary tract infection
Long et al. 2012	Randomized controlled trial and 134 patients	Hand hygiene	Urinary tract infection
Loeb et.al 2008	Randomized controlled trial and 123 patients	Contact precautions and hand hygiene	Urinary tract infection
Platt et al. 2015	Randomized controlled Trial and 408 patients	Diagnosis of UTI, hand hygiene, use of gloves, gown and use of personal protective equipment	Urinary tract infection
Roger et al. 2015	Pre-post NRT and 677 patients	Use of antibiotics and infection control program	Urinary tract infection
Sami et al. 2014	RCT (Cluster) and 392 patients	Aseptic techniques for inserting catheter, hand hygiene, timely removal, emptying of the urinary bag, safe secure of the catheter, prevention of incontinence and hand hygiene	Urinary tract infection

the studies reported on the hand hygiene and steps to improve catheter care. Some studies had focused on incontinence and its management.

Health personnel's should conduct programs to reduce CAUTI either by education or by formulating guidelines. It is important to create awareness regarding proper usage of catheter such as careful insertion, hand hygiene, maintenance of catheters, regular assessment and other precautions when the child is on the catheter. Routine urine test and use of antibiotics must be monitored regularly.

The limitation of this review is that majority of the studies have provided some information on the interventions for catheter care. The strength of this review is detailed search which had targeted on interventions and outcomes on UTI.

Conclusion

This review had proposed interventions to reduce UTIs among the hospitalized children. Most of the interventions were on prevention of CAUTI in hospital provided the strongest evidence on prevention of UTIs. Limitations of this review are other strategies such as incontinence care and evidence based guideline must be framed which can overall improve the wellbeing among hospitalized children.

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