



A structured approach to documenting a search strategy for publication: A 12 step guideline for authors

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SUMMARY

Aim: This paper describes a structured approach for documenting a search strategy, prior to the scholarly critique and review of the retrieved literature.

Background and context: There has been a shift in publication expectations when it comes to the presentation of a literature review, from the more traditional narrative review to a more systematic approach, following a specific framework.

Methods: This paper presents a 12 step framework for documenting the search strategy prior to undertaking a critique and synthesis of the retrieved literature. The authors provide a worked example about potential sources of cross contamination including hospital bath basins and soap and water bathing.

Discussion: An overview of the 12 step framework is presented. This includes step-by-step instructions on how to conduct and write a search strategy for a literature review. A number of resources available for creating reviews and critiquing reviews are referenced, but these are not exclusive.

Conclusion: Reviews can be an important and valuable contribution when undertaken well, providing the reader with evidence of a clear structure. This paper provides a 12 step framework that will be of benefit to students, educationalists, and researchers required to embark on a review.

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Introduction

Background and context

Reviews can be undertaken in a number of different areas and can include: policy reviews, literature reviews, and systematic reviews. A well-executed review is something that is positively received by academics and practitioners alike as they can provide a thorough analysis and critique on a specific subject. Reviews are undertaken for a number of different reasons and are often associated with a specific purpose such as: part of a research project; for postgraduate study; or the development of practice guidelines. A number of nursing and midwifery journals provide specific guidance and advice on how authors present reviews; for example: the International Journal of Nursing Studies and the Journal of Clinical Nursing both recommend

that authors follow the PRISMA guidelines (Moher et al., 2009), whilst the Journal of Advanced Nursing provides a suggested framework for a systematic review. Nurse Education Today encourages the submission of systematic and scholarly reviews, but provides no specific guidelines on undertaking a review.

During the last 20 years systematic reviews have become widely accepted and published formats for focused reviews of existing literature. This is a highly valued and rigorous approach to evaluating the literature on specific topics, and the requirements for documentation of search strategies are specified in the guidelines used for systematic reviews (The Joanna Briggs Institute, 2008, Higgins and Green, 2009). Authors who undertake a more traditional narrative literature review may encounter difficulty when they submit them for publication, due to the perceived inadequate documentation of the approach used to conduct the literature search (O'Connor, 1992). Although a literature review may be written for a broad topic (Bettany-Saltikov, 2010), the likelihood of publication can be enhanced by a clearly articulated search strategy. A search strategy is the process used to “translate the clinical query (research question) into a format that the search engine can understand” (Gillespie and Gillespie, 2003) page 140, and a literature review should clearly describe the key components of the search (Evans, 2004). The purpose of this paper is to describe a structured approach for documenting a search strategy, prior to the scholarly critique and review of a body of retrieved literature.

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Initiative/innovation

The following steps should be documented to guide the reader to understand the process used to conduct the search or search strategy.

1. *Provide a purpose statement* to describe the question to be addressed in the literature search (Gillespie and Gillespie, 2003, Evans, 2004; Bettany-Saltikov, 2010).
2. *Document the databases or search engines* used (Evans, 2004; The Joanna Briggs Institute, 2008, Higgins and Green, 2009). Specify whether other sources (e.g. Information gateways) were also accessed/searched and whether manual searching was also conducted (Timmins and McCabe, 2005).
3. *Specify the limits applied* to the search e.g. dates, language, human studies etc. (Evans, 2004; The Joanna Briggs Institute, 2008, Higgins and Green, 2009).
4. *List the inclusion criteria and exclusion criteria* for the search to assist you to avoid missing important studies and avoid including “false positive” search results (Gillespie and Gillespie, 2003, Evans, 2004; Bettany-Saltikov, 2010, Timmins and McCabe, 2005, The Joanna Briggs Institute, 2008; Shaw et al., 2004, Higgins and Green, 2009). Criteria may include population characteristics and diagnoses, types of interventions, outcome measures and types of studies (Bettany-Saltikov, 2010); and may be restricted to primary research only (Timmins and McCabe, 2005), or specific methodologies (The Joanna Briggs Institute, 2008). Exclude specific literature reviews and systematic reviews—they can be included in the background section (Bettany-Saltikov, 2010) but may not be directly focused on the topic being reviewed and are not original research articles (Brain, 2010).
5. *List the search terms used*. These terms should be derived from the purpose statement and identify the concepts of interest (Gillespie and Gillespie, 2003, Evans, 2004, Timmins and McCabe, 2005, The Joanna Briggs Institute, 2008, Higgins and Green, 2009, Brain, 2010, Lloyd-Jones and Masterton, 2010). They should be tested several times to make sure that they are effectively locating literature on the topic described in the purpose statement. It can be helpful to do this in consultation with a librarian (Gillespie and Gillespie, 2003, Timmins and McCabe, 2005, McGowan and Sampson, 2005). You may choose to use text search terms or subject index terms e.g. MeSH, or a combination of these for the search. You should include information such as exploding or focusing search terms, and the use of Boolean operators e.g. OR, AND and indicate whether the terms used were truncated and if various ways of spelling the terms, plurals and synonyms were included (Gillespie and Gillespie, 2003, Timmins and McCabe, 2005, Brain, 2010, McGowan and Sampson, 2005).
6. *Document the search process* for each search engine including search engine, terms and number retrieved on a search results table.
7. *Assess retrieved articles for relevance* using inclusion and exclusion criteria (Bettany-Saltikov, 2010). Include the use of reference management programs and other resources. Methodical documentation of the included articles on the search results table, as you progress through the search process, will assist you to avoid replication and omission of references (Timmins and McCabe, 2005, Lloyd-Jones and Masterton, 2010).
8. *Document a summary table of included articles* (Timmins and McCabe, 2005, Maslin-Prothero and Bennion, 2010, Cummings et al., 2010) with headings such as: author, type of study, purpose, sample, design, data collection and key findings (The Joanna Briggs Institute, 2008, Higgins and Green, 2009). This will produce a rapid and succinct summary of the literature for review.
9. *Provide a statement specifying the number of retrieved articles* at the end of the search process i.e. search results (Evans, 2004, Timmins and McCabe, 2005, Booth, 2006; Lee et al., 2010; The Joanna Briggs Institute, 2008).
10. *Conduct quality appraisal of retrieved literature*. Quality appraisal will assist to exclude papers that are poorly designed/executed/inadequately described studies, where results are biased, or affected by study limitations (Evans, 2004; The Joanna Briggs Institute, 2008). You can also use levels of evidence grading to appraise the literature (Gillespie and Gillespie, 2003). Use recognised checklists/review instruments and provide a summary statement of quality appraisal results (Evans, 2004; Bettany-Saltikov, 2010; The Joanna Briggs Institute, 2008, Higgins and Green, 2009). The number of articles in this statement is likely to be less than the number in the search results statement. The results of articles retrieved and included subsequent to quality appraisal can also be illustrated on a flow diagram if desired (The Joanna Briggs Institute, 2008; Brain, 2010, Hammick et al., 2010). There are many tools for conducting quality appraisal of literature and they are usually designed to assist researchers to undertake specific types of evaluation of literature. Some internationally recognised tools for appraising quantitative and qualitative literature are available from: The Critical Appraisal Skills Program (CASP), Levels of Evidence scoring systems, Joanna Briggs Institute (JBI) and Cochrane Review Tools. Some examples of quality appraisal checklists for appraising quantitative and qualitative articles are available from the following websites:
The Critical Appraisal Skills Program (CASP) <http://www.casp-uk.net/> Accessed 15 February 2012.
International Centre for Allied Health Evidence (ICAHE) <http://www.unisa.edu.au/cahe/Resources/CAT/default.asp> Accessed 15 February 2012.
The Centre for Evidence Based Medicine <http://www.cebm.net/index.aspx?o=1025> Accessed 15 February 2012.
The National Health and Medical Research Council of Australia http://www.nhmrc.gov.au/_files_nhmrc/file/guidelines/evidence_statement_form.pdf Accessed 15 February 2012.
Joanna Briggs Institute (JBI) <http://jbiconnect.org/services/qari/> and <http://jbiconnect.org/services/mastari/> Accessed 15 February 2012.
The Cochrane Review Tools <http://www.cochrane-handbook.org/> Accessed 15 February 2012.
11. *Critical review of literature*. Only review articles specified in the summary table as included following quality appraisal. The literature review should not summarise the literature. Constructing the summary table can assist the author to avoid writing a summary during the critical review of the literature. The review should be a critical synthesis of the literature. The review can be organised using headings about the main issues addressed in the literature (Timmins and McCabe, 2005, Maslin-Prothero and Bennion, 2010). The review should conclude with recommendations for future research, practice (Evans, 2004; The Joanna Briggs Institute, 2008, Lloyd-Jones and Masterton, 2010) and policy, if relevant.
12. *Check the reference list for accuracy*: Particularly for correct referencing of the same author on multiple publications (Brain, 2010, Lloyd-Jones and Masterton, 2010).

An example of how to document these steps is provided below (Fig. 1):

1. Provide a purpose statement

Topic: Hospital bath basins and soap and water bathing and cross infection in hospitals.

Background: Bath basins and sinks may be a potential source of bacterial transmission (Sievert et al., 2011) and biofilm in taps and hospital plumbing may contain bacteria with a higher level of antimicrobial resistance (Cervia et al., 2009). In addition, bath basins may be emptied down hand washing sinks and may be used

for storing items, disposal of incontinence soiled cloths and emesis basins (Johnson et al., 2009). Some environmental infection control guidelines designed to control the spread of waterborne microorganisms recommend that sinks and wash basins should be cleaned and disinfected on a regular basis using an Environment Protection Authority (EPA) registered product (Clark and John, 2006). Tap mounted filters have also been reported to be effective in reducing colonization of tap water (Clark and John, 2006, Cervia et al., 2009; Trautmann et al., 2005).

In a small study of 40 patients who received traditional basin bed baths and pre-packaged disposable bed baths (no skin antiseptic agents in these packs) on different days reported that microbial counts did not differ significantly between these types of baths, however the study design did not compare these alternative bathing systems using two specific groups of patients and thus the difference in using tap water may not have been able to be demonstrated (Clark and John, 2006).

Recent reviews have identified that emerging evidence suggests that chlorhexidine may reduce HAI (Hospital Acquired Infection) when it is used for daily skin cleansing of patients. This agent is considered to reduce the transmission of Multi-Drug Resistant Organisms (MDRO) between patients, staff and the environment (including bath basins), has been reported to have residual activity on the skin (Milstone et al., 2008; Huskins, 2007; Edgeworth, 2011; Batra et al., 2010, Lin and Hayden, 2010, Sievert et al., 2011); and has few adverse effects. One study has reported a significant increase in adverse effects in a treatment group including skin fissures, itching and burning of the skin; however these effects were reversible in most patients (Wendt et al., 2007).

Many studies in these reviews have been conducted in intensive care units due to the recognised issue that Intensive Care Units (ICU) “in effect, acts as a reservoir for generating and then seeding the rest of the hospital with Methicillin-resistant *Staphylococcus aureus* (MRSA)-colonized patients, making it logical to target control on the ICU” (Edgeworth, 2011) page ii42).

Some reviews and specific studies also recommend cautious adoption of this approach due to the possibility of developing chlorhexidine-resistant MRSA (Edgeworth, 2011; Milstone et al., 2008; Batra et al., 2010, Lin and Hayden, 2010).

A recent Cochrane review about preoperative bathing or showering with skin antiseptics to prevent surgical site infection reported that there was no difference in the risk for Surgical Site Infections (SSIs) in trials comparing soap with chlorhexidine (Webster and Osborne, 2011). This may not reflect the result of sustained use of chlorhexidine in routine bathing and may not have an effect on staff and the environment, however it provides impetus for seeking further evidence to support this practice, particularly in view of the issue of developing microbial resistance.

The purpose of this literature review was to determine whether hospital bath basins and soap and water bathing contribute to cross infection in hospitals.

2. Document the databases or search engines used in your search strategy

A search of the databases: CINAHL, Medline, Mosby's Index, Scopus, Embase, Proquest and Informat, was conducted in June 2011 for the purpose of locating published research about whether hospital bath basins and soap and water bathing contribute to cross infection in hospitals.

A Google scholar search was also conducted to identify any other relevant documents or reports published from conference or seminar programs.

3. Specify the limits applied

To increase the likelihood of identifying all relevant studies, the reference lists of all retrieved articles were hand searched. This search was repeated immediately prior to submission to locate any additional recent publications. The search was limited to English language articles published during 1996–2011.

4. List the inclusion criteria and exclusion criteria

Inclusion criteria for this review were: original research studies that reported whether hospital bath basins (and tap water) used for routine bathing contribute to cross infection in hospitals or recommended practice guidelines for adult patients (Including published conference abstracts).

Papers were excluded if they were focused on paediatric or neonates, specific diagnostic groups, compared alternate agents used for bathing excluding traditional bathing, were written in a language other than English or focused on cross infection due to factors other than bath basins or bath/tap water used for routine bathing of adult patients. Previously published literature reviews and systematic reviews were excluded.

5. List the search terms used

Seven search terms were used to search the databases with the article title, abstracts and body all searched. The search terms used were:

- Bath basins
- Cleanse patients
- Bath water
- Bathing
- Cross infection
- Healthcare Associated Infections (HAI)
- Multi-Drug Resistant Organisms (MDRO)

The search terms were tested to check that they effectively located the types of articles that were consistent with the inclusion criteria prior to conducting the search in all engines.

6. Document the search process

The search was conducted sequentially using the search engines and search terms and results are documented in Table 1 (Search Results), excluding results from search engines that did not identify any additional papers that met inclusion criteria.

7. Assess retrieved articles for relevance

Each of the articles retrieved was assessed for relevance by reading the abstract (and where necessary the entire paper) using the inclusion and exclusion criteria to exclude those papers that were not relevant to this review.

8. Document a summary table of included articles

Articles that met the inclusion criteria were selected and documented in Table 1, and documented in a summary table (Table 2) during the search to avoid duplication in search results. Each selected article was also entered into a reference management database (Endnote) including the search term and engine that located each article.

After the initial search, all articles identified in subsequent searches were checked against the articles in the summary table and duplicates were excluded during the search process. The summary table was completed throughout the searching process and each article that met the inclusion criteria was summarised on this table (Table 2). Subsequently, during the quality appraisal process, some of these articles were excluded and these are identified on the summary table.

9. Provide a statement specifying the number of retrieved articles

The search of the selected databases resulted in the retrieval of 16 papers and the Google search yielded no papers. Hand searching of these papers resulted in the retrieval of an additional 6 papers making a total of 22 relevant papers.

10. Conduct quality appraisal of retrieved literature

Quality appraisal of literature listed in the summary table, was conducted. The quality of selected papers was assessed using the McMaster Critical Review Form—Quantitative Studies and guidelines (Law et al., 1998a; Law et al., 1998b). The number of papers selected for this review of the literature following quality appraisal was 14. The excluded papers remain in Table 2 as an example of the result of the quality appraisal process. It is important to note that conference abstracts may sometimes

provide a brief preliminary analysis, and that there may be substantial differences between the data reported in them and subsequent publication of a completed analysis.

11. Critical review of the literature

It is not the purpose of this paper to present a detailed example of the literature review. Some introductory paragraphs are provided below with some suggestions for the remaining content of this section (Fig. 1).

12. Check the reference list for accuracy

The reference list was checked for accuracy and web links accessed were updated.

Fig. 1

Worked example of introductory paragraphs of a literature review.

Previous research has identified potential sources of cross contamination including hospital bath basins and tap water that have been linked to the acquisition of multi-resistant organisms such as MRSA and VRE by patients. This review of the literature revealed two types of studies predominantly conducted in ICUs. Some studies evaluated bacterial colonisation of bath basins (Johnson et al., 2009), or used bath water to evaluate their potential as a source of contamination (Shannon et al., 1999). Both studies reported very high rates of contamination following soap and water bathing.

Other studies used an experimental design to compare the effect of chlorhexidine (saturated cloths or solution) with soap and water in reducing the prevalence of bacterial colonisation and infection rates in patients (Vernon et al., 2006; Kassakian et al., 2011; Bleasdale et al., 2007; Popovich et al., 2009, 2010; Munoz-Price et al., 2009; Evans et al., 2010; Dixon and Carver, 2010; Wendt et al., 2007; Climo et al., 2009; Borer et al., 2007). The results of some of these studies have been used to produce practice recommendations about routine adult cleansing in ICU (Calfee et al., 2008). These guidelines are supported by more recent evidence from large studies indicating that daily bathing with chlorhexidine instead of soap and water bathing is effective in reducing colonisation and subsequent infection rates (Evans et al., 2010; Kassakian et al., 2011; Climo et al., 2009). In addition, it is simple to implement and relatively inexpensive making it a useful adjunct to existing infection control measures (Climo et al., 2009; Munoz-Price et al., 2009; Vernon et al., 2006; Evans et al., 2010). However caution is advised due to the potential for the development of chlorhexidine-resistant strains of bacteria (Climo et al., 2009; Popovich et al., 2010; Kassakian et al., 2011). Adverse effects have also been reported by some studies and these are more severe for stronger solutions of chlorhexidine (Wendt et al., 2007). Therefore it is recommended that such bathing be used only for high-risk populations of patients such as those admitted to intensive care units (Calfee et al., 2008).

NB This section of the manuscript should present a synthesis of the literature on the topic of interest. The results of the included papers should be presented in detail, identifying similarities and differences in the study designs, results and discussion using headings to guide the reader through the main issues in the literature (Maslin-Prothero and Bennion, 2010). Some issues that could be discussed in further detail here are: differences in reported measures (cases or %/1000 patient days vs, relative risks, prevalence and incidence rates, colonisation vs acquisition), patient cleansing using pre-packaged chlorhexidine cloths vs chlorhexidine solution and tap water; and appropriate study designs to address these issues, including evaluation of compliance with cleansing agents. It should conclude with recommendations for practice and future research.

Discussion

The search strategy is sometimes given only cursory attention in literature review manuscripts. When authors engage in documenting this part of the process thoughtfully and methodically, it provides a clearer understanding for the reader about the literature reviewed, purpose of the review and the process undertaken to conduct the review. Some parts of this process may be underestimated and this can cause reviewers unnecessary time and work during their review of the literature and the writing process. It is really valuable to spend time defining the purpose statement and inclusion and exclusion criteria prior to commencing searching. Experienced reviewers often spend a substantial amount of time testing and refining search terms to determine whether they are accurately locating relevant literature, and whether search terms are adequately focused to avoid locating too many false positive results. Consulting a librarian can be very helpful if you encounter difficulties at this point (Brain, 2010).

One of the challenges that frequently occur during this process is the identification of duplicate papers during searches in multiple search engines. The process described in this 12 step structured approach avoids the inclusion of papers previously identified, as each paper located is documented in the search results and summary

Table 1

Search results for hospital bath basins and soap and water bathing contributing to cross infection in hospitals.

Search engine	Search (S) terms	# Retrieved: (numbers in brackets used in combined searches)	# Met inclusion criteria	Table 2 article ID
CINAHL	S1 Bath basins	6	1	1
CINAHL	S2 Cleanse patients	4	1	2
CINAHL	S3 Bath water	(67)		
CINAHL	S4 Bathing	(2117)		
CINAHL	S5 Cross infection	(13688)		
CINAHL	S6 HAI or MDRO	(284)		
CINAHL	S7 S3 and S5	1	0	
CINAHL	S8 S4 and S5	44	3	3, 4, 5
CINAHL	S9 S4 and S6	1	0	
Totals		56	5	
Medline	S1 Bath basins	2	0	
Medline	S2 Cleanse patients	2	0	
Medline	S3 Bath water	(221)		
Medline	S4 Bathing	(7927)		
Medline	S5 Cross infection	(39921)		
Medline	S6 HAI or MDRO	(1957)		
Medline	S7 S3 and S5	5	0	
Medline	S8 S4 and S5	57	5	6, 7, 8, 9, 10
Medline	S9 S4 and S6	1	0	
Totals		67	5	
Embase	S1 Bath basins	6	4	11, 12, 13, 14
Embase	S2 Cleanse patients	2	0	
Embase	S3 Bath water	(333)		
Embase	S4 Bathing	(10271)		
Embase	S5 Cross infection	(20239)		
Embase	S6 HAI or MDRO	(2804)		
Embase	S7 S3 and S5	7	0	
Embase	S8 S4 and S5	31	0	
Embase	S9 S4 and S6	7	2	15, 16
Totals		53	6	
Manual search	Calfee et al. (2008)		1	17
Reference lists of retrieved documents	Kassakian et al. (2011)		1	18
	Johnson et al. (2009)		2	19, 20
	Popovich et al. (2010)		1	21
	Dixon and Carver (2010)		1	22

tables at the time it is identified as meeting the inclusion criteria. Conducting quality appraisal of literature prior to including it in the review assists the author to exclude studies that may be methodologically flawed or poorly documented. Furthermore, the

summary table serves as a rapid reference for identifying key items/issues in the literature during writing the literature review; and because it is a summary, it allows the author to focus on writing the synthesis and critique of the literature instead of being tempted to

Table 2

Summary table of articles: hospital bath basins and soap and water bathing contributing to cross infection in hospitals (Met inclusion criteria).

	Author (year) country	Study design	Sample size and sites	Comments/key findings	Quality appraisal: include/exclude
1	Johnson, D., L. Lineweaver, et al. (2009). "Patients' Bath Basins as Potential Sources of Infection: A Multicenter Sampling Study." <u>American Journal of Critical Care</u> 18 (1): 31-40. United States of America (USA)	Prospective multicenter: to quantify and evaluate bacterial colonisation in bath basins as a possible reservoir. Sterile culture sponges used to obtain samples 2 hours after patient bathing. No antiseptic soaps used during bathing. Disposable single patient basins used.	92 bath basins (3 ICUs Intensive Care Units: Cardiac, surgical and medical, and a rehab unit) 3 hospitals	98% bacterial contamination: enterococci 54%, gram negative 32%, staph aureus 23%, Vancomycin-resistant Enterococcus (VRE) 13%; Methicillin-resistant Staphylococcus aureus (MRSA) 8%, Pseudomonas aeruginosa (P Aeruginosa) 5%, candida albicans 3%, Escherichia Coli (E coli) 2%.	Include
2	Vernon, M. O., M. K. Hayden, et al. (2006). "Chlorhexidine Gluconate to Cleanse Patients in a Medical Intensive Care Unit: The Effectiveness of Source Control to Reduce the Bioburden of Vancomycin-Resistant Enterococci." <u>Archives of Internal Medicine</u> 166 : 306-312. USA	Prospective sequential-group single-arm trial: Compared soap and water baths (n=483) with chlorhexidine gluconate (CHG): chlorhexidine-saturated cloths (n=642), and subsequently cloths without chlorhexidine (n=662), to determine the effect on acquisition of VRE.	1787 patients Cultures: 758 environmental surfaces and 529 Health Care Workers (HCW) hands (1 medical ICU)	Chlorhexidine-saturated cloths resulted in less VRE colonies on patients skin (47% vs 94% p<.001), less VRE contamination of HCW hands (RR 0.6, 95%CI 0.4-0.8) & environmental surfaces (RR 0.3, 95%CI 0.2-0.5). Incidence of VRE acquisition also decreased (RR 0.4, 95%CI 0.1-0.9).	Include
3	Kassakian, S. Z., L. A. Mermel, et al. (2011). "Impact of Chlorhexidine Bathing on Hospital-Acquired Infections among General Medical Patients." <u>Infection Control and Hospital Epidemiology</u> 32 (3): 238-43. USA	Quasi experimental pre/post intervention study: Compared soap and water baths (control group) with chlorhexidine-saturated cloths (intervention group) to determine the effect on MRSA and VRE Healthcare Associated Infections (HAIs) (Incidence)	Control: 1 year, 7102 patients Intervention: 13 months, 7699 patients (4 general medicine units)	Chlorhexidine cloths resulted in 64% reduced risk of developing MRSA and VRE HAIs (RR 0.36, 95%CI 0.2-0.8) P=0.01	Include
4	Bleasdale, S. C., W. E. Trick, et al. (2007). "Effectiveness of Chlorhexidine Bathing to Reduce Catheter-Associated Bloodstream Infections in Medical Intensive Care Unit Patients." <u>Archives of Internal Medicine</u> 167 (19): 2073-2079. USA	2 Arm Crossover clinical trial (1 year): Compared soap and water baths (control group) with chlorhexidine-saturated cloths (intervention group) to determine effect on incidence of primary blood stream infections (BSI). Intention to treat analysis.	836 patients (2 medical ICUs (MICUs)) 1 hospital	Chlorhexidine cloths resulted in significantly less primary BSI (4.1 vs 10.4 infections/1000 patient days; incidence difference 6.3, 95%CI 1.2-11.0) following 5 days in MICU. 61% reduction.	Include
5	Calfee, D. P., C. D. Salgado, et al. (2008). "Strategies to Prevent Transmission of Methicillin-Resistant Staphylococcus aureus in Acute Care Hospitals." <u>Infection Control and Hospital Epidemiology</u> 29 (S1): S62-80. USA	Society for Healthcare Epidemiology of America/ Infectious Diseases Society of America (SHEA/IDSA) Practice Recommendations	N/A	Use Chlorhexidine for routine adult patient cleansing in ICU to reduce incidence of MRSA and VRE	Include

Table 2 (continued)

	Author (year) country	Study design	Sample size and sites	Comments/key findings	Quality appraisal: include/exclude
6	Popovich, K. J., B. Hota, et al. (2009). "Effectiveness of Routine Patient Cleansing with Chlorhexidine Gluconate for Infection Prevention in the Medical Intensive Care Unit." <i>Infection Control and Hospital Epidemiology</i> 30 (10): 959-963. USA	Pre-post intervention study: Compared effect of daily soap and water bathing (1 year) with CHG bathing cloths (1 year) on rates of Central venous catheter (CVC) associated BSI and Blood culture contamination.	(1 medical ICU 21 beds)	Statistically significant decreases in rate of CVC associated BSI (5.31-0.69, p=0.006) and blood culture contamination (6.99-4.1, p=0.04). Rates reported: cases per 1000 patient days.	Include
7	Munoz-Price, L. S., B. Hota, et al. (2009). "Prevention of Bloodstream Infections by Use of Daily Chlorhexidine Baths for Patients at a Long-Term Acute Care Hospital." <i>Infection Control and Hospital Epidemiology</i> 30 (11): 1031-1035. USA	Pre-post intervention study: Compared effect of soap and water bathing with CHG solution bathing on rates of CVC associated BSI and ventilator-associated pneumonia (VAP). Pre-intervention period 7 months. Intervention period: 8 months.	(1 long term acute care hospital)	Significantly reduced CVC associated BSI rate: 9.5-3.8 cases/1000 patient days. Observed persistent decrease in CVC associated BSI rate of 12%/month (rate ratio 0.88; P=0.02). No effect on VAP.	Include
8	Evans, H. L., T. H. Dellit, et al. (2010). "Effect of chlorhexidine whole-body bathing on hospital-acquired infections among trauma patients." <i>Archives of Surgery</i> 145 (3): 140-6. USA	Retrospective Pre-post intervention (6 months pre and post): to compare soap and water bathing with CHG cloth bathing effect on colonisation of resistant bacteria and HAIs. (VAP, blood stream infections, MRSA and Acinetobacter)	Pre: 253 patients Post (CHG cloths): 286 patients (1 trauma ICU)	Significantly less acquired catheter-related bloodstream infection (2.1 vs 8.4 infections/1000 catheter days, p=0.01), and MRSA VAP (1.6 vs 5.7 infections/1000 ventilator days, p=0.03), and MRSA (23.3 vs 69.3/1000 patient days, p<0.001) colonisation. No effect on VAP or Acinetobacter.	Include
9	Popovich, K. J., B. Hota, et al. (2010). "Daily skin cleansing with chlorhexidine did not reduce the rate of central-line associated bloodstream infection in a surgical intensive care unit." <i>Intensive Care Medicine</i> 36 (5): 854-8. USA	Pre-post intervention comparing soap and water bathing (1 year) with CHG cloths (1 year): outcome measure—central line associated bloodstream Infections (CLABSIs) and blood culture contamination	(1 surgical ICU 30 beds)	No difference in (CLABSIs) Significant decline in blood culture contamination (5.97 vs 2.41/1000 patient days; p=0.003)	Include
10	Dixon, J. M. and R. L. Carver (2010). "Daily chlorhexidine gluconate bathing with impregnated cloths results in statistically significant reduction in central line-associated bloodstream infections." <i>American Journal of Infection Control</i> 38 (10): 817-21. USA	Observational cohort with historical controls: 3 months CHG cloths daily bathing (compared with routine bathing)	(1 surgical ICU) 100% compliance	Significant difference in (CLABSIs): 12.07 vs 3.17/1000 central line days. (73.7% rate reduction; p=0.036). Extended study (16 months): 76% reduction, p<0.001. 8.6 vs 2.1/1000 central line days.	Include
11	Thomas, K. and L. Skelton (2011). "Environmental testing of patient bath basins drive quality improvement efforts for preventing bacterial cross contamination." <i>American Journal of Infection Control</i> 39 (5): E112-E113. USA	Blinded (caregivers) environmental testing of bath basins with internal and external evaluation of 12 samples each.	24 used bath basins plus 5 unused basins. (1 institution)	42-50% positive for gram negative bacteria, 8% staphylococcus aureus, 17-67% enterococcus, 8-67% VRE. External results higher for each organism. Unused basins tested Negative.	Exclude (Conference Abstract— insufficient information for quality appraisal)

(continued on next page)

Table 2 (continued)

	Author (year) country	Study design	Sample size and sites	Comments/key findings	Quality appraisal: include/exclude
12	Moeslein, S. and P. Rajani (2011). "Horizontal reduction of hospital acquired infections in the intensive care unit by replacing bed baths with chlorhexidine impregnated washcloths." <i>American Journal of Infection Control</i> 39 (5): E63-E64. USA	Pre- post intervention study: Using CHG washcloths for 3 months to reduce HAIs	1 ICU	Reduced HAIs overall (16.6 vs 12.8/1000 patient days) and Clostridium difficile infection rate (26.1 vs 9.2/10,000 patient days).	Exclude: (Conference Abstract–insufficient information for quality appraisal)
13	Marchaim, D., S. Panda, et al. (2010). "Hospital bath basins are frequently contaminated with multi-drug resistant organisms (MDRO) which are common icu pathogens." <i>Critical Care Medicine</i> 38 :A7. USA and Canada	Prospective multicenter trial: Randomly Cultured bath basins with blinded lab evaluation to investigate bath basins as potential reservoirs of nosocomial Multi-drug resistant organisms (MDROs).	53 Hospitals from 20 states. 576 basins	63% basins contaminated. Colonisation: 35% VRE, 44% Gram negative bacilli, 4% MRSA	Exclude: (Conference Abstract–insufficient information for quality appraisal)
14	Stone, S., D. Chaffee, et al. (2010). "Did you bathe your patient today? Common sense practice to reducing hospital-acquired infections." <i>American Journal of Infection Control</i> 38 (5): E27-E28. USA	Introduced Prepackaged bathing–pre/post intervention, to reduce Catheter Associated Urinary Tract Infections (CA-UTIs) for 6 months	2 med/surg units–1 hospital	Reduced nosocomial CA-UTIs from 3 per 1000 catheter days to 0%	Exclude: (Conference Abstract–insufficient information for quality appraisal)
15	Lee, Y. J., N. Gendron-Trainer, et al. (2009). "Reduction of MRSA and VRE acquisition by bundling daily 2% chlorhexidine gluconate (CHG) bath and active surveillance culture (ASC) for MRSA at a tertiary care hospital." <i>American Journal of Infection Control</i> 37 (5): E85-86. USA	Introduced CHG cloth bathing–pre/post intervention	ICU 1 hospital	Reduced MRSA and VRE acquisition and colonisation	Exclude: (Conference Abstract–insufficient information for quality appraisal)
16	Cherry-Bukowic, J. R., S. Dickinson, et al. (2009). "Chlorhexidine bathing and colonization with multi-drug-resistant organisms (MDROs) in the SICU." <i>Surgical Infections</i> 10 (2): 200. USA	Pre/post intervention study using CHG bathing to reduce MDRO colonisation and infection	1 Surgical ICU	VRE and MRSA acquisition rate decreased (p=0.004), reduced CA-UTI to 0, reduced VAP (ventilator-associated pneumonia) (5 vs 2.8/1000 ventilator days)	Exclude: (Conference Abstract–insufficient information for quality appraisal)
17	Wendt, C., S. Schinke, et al. (2007). "Value of whole-body washing with chlorhexidine for the eradication of methicillin-resistant Staphylococcus aureus: a randomized, placebo-controlled, double-blind clinical trial." <i>Infection Control and Hospital Epidemiology</i> 28 (9): 1036-43. Germany	Randomised controlled trial (RCT) (double blind) study comparing CHG solution body washing with placebo solution to eradicate MRSA. Recruited MRSA positive patients, 5 days body washing	1 hospital and associated nursing homes. (n=48 intervention) (n=55 control).	MRSA not significantly decreased (p=0.47). Significantly higher rate of adverse effects 75% vs 33% (P=0.01 to <0.001). Intention to treat analysis	Include

Table 2 (continued)

	Author (year) country	Study design	Sample size and sites	Comments/key findings	Quality appraisal: include/exclude
18	Climo, M. W., K. A. Sepkowitz, et al. (2009). "The effect of daily bathing with chlorhexidine on the acquisition of methicillin-resistant <i>Staphylococcus aureus</i> , vancomycin-resistant <i>Enterococcus</i> , and healthcare-associated bloodstream infections: Results of a quasi-experimental multicenter trial." <i>Critical Care Medicine</i> 37(6):1858–1865. USA	Quasi-experimental (pre/post) multicenter trial comparing CHG solution (group 2) and routine bathing (group 1) effect on HAIs and colonisation. Admissions for 6 months.	6 ICUs, 4 hospitals. Baseline admits (n=2670) Intervention admits (n=2650)	Decreased acquisition: MRSA 32%, 5.04 vs 3.44 /1000 patient days (p=0.046), VRE 50%, 4.35 vs 2.19 /1000 patient days (p=0.008), VRE bacteraemia (p=0.02), RR3.35, 95%CI 1.13–9.87; p=0.035.	Include
19	Larson, E. L., T. Ciliberti, et al. (2004). "Comparison of Traditional and Disposable Bed Baths in Critically Ill Patients." <i>American Journal of Critical Care</i> 13(3): 235–241. USA	Comparison of traditional and disposable bed baths (no antimicrobial agent used) effect on microbial counts on patients skin. Both types of bath provided to all patients, total of 2 baths provided.	40 patients in surgical, medical or cardiothoracic ICUs (3).	Microbial counts did not differ significantly	Exclude due to design of study: both types of bath provided to all patients. No clearly defined comparison groups.
20	Shannon, R. J., M. Allen, et al. (1999). "Patient bath water as a source of nosocomial microbiological contamination: An intervention study using chlorhexidine." <i>Journal of Healthcare Safety, Compliance and Infection Control</i> 3(4): 180–184. USA	Intervention study: control group-soap and water bathing, intervention group-chlorhexidine bathing. Compared bacterial content of used bath water to evaluate its potential as a source of contamination.	3 wards: coronary care, MICU and acute pulmonary unit), 1 hospital. 23 samples of used soap and water, and 32 samples of used chlorhexidine and water.	Soap and water: 100% positive for bacterial growth, 61% with high bacterial count and gram negative bacteria. Chlorhexidine and water: 16% positive for bacterial growth, 9% grew gram negative bacteria.	Include
21	Borer, A., J. Gilad, et al. (2007). "Impact of 4% chlorhexidine whole-body washing on multidrug-resistant <i>Acinetobacter baumannii</i> skin colonisation among patients in a medical intensive care unit." <i>Journal of Hospital Infection</i> 67: 149155. Israel	Prospective cohort trial: Pre-post design comparing routine with CHG solution bathing to measure effect on <i>Acinetobacter Baumannii</i> (ACBA) colonization	1 MICU, 4 years admissions. (n=320 in intervention group–2 years). Pre intervention (n=329)	Prevalence of ACBA–BSIs (blood stream infections) decreased 4.6 vs 0.6 /100 patients (p<0.001; OR 7.6), incidence decreased by 85% (7.8 vs 1.25).	Include
22	Holder, C. and M. Zellingner (2009). "Daily bathing with Chlorhexidine in the ICU to Prevent Central Line–Associated Bloodstream Infections." <i>Journal of Clinical Outcomes Management</i> 16(11): 509–513. USA	Plan, Do, Study, Act (PDSA) methodology. Pre/post design using CHG daily baths for 6 months (compliance increased from 40% to 98% in first 3 months).	5 MICUs, 5 hospitals.	BSI rates and MRSA/VRE colonisation reduced from 3.6/1000 patient days to 1/1000 patient days.	Exclude due to study design (Quality improvement project) and lack of reported statistical analyses.

NB The shaded sections would usually not be present in your final table. They are presented here to illustrate excluded papers following quality appraisal.

summarise the literature. Finally, a check of the reference list and other author guidelines about format requirements is advisable to avoid having to make corrections following submission of your manuscript.

Conclusion

This article focuses specifically on the documentation of the search strategy—a component of the literature review that is not always

clearly articulated. Quality reviews, including literature, systematic, or policy reviews are valuable to those engaged in the education, research and practice of midwifery and nursing. Regardless of whether the review focuses on qualitative or quantitative findings, they can be used to guide and inform future research and practice wherever this practice may be e.g. the community, the academy or elsewhere. There are a number of published ways of undertaking systematic or meta analyses of the existing evidence; this paper

provides a 12 step framework for documenting the search strategy which clearly identifies key components including: overall approach, literature search strategies, quality appraisal and documentation of the process. Authors who seek publication of literature reviews may use this structured approach to document the search process that precedes the review of selected literature, in a logical and rigorous manner. The subsequent review of literature will be informed by this process in view of the deliberate selection of literature that meets inclusion criteria (relevant to the topic), a summary of selected papers in the summary table, and exclusion of papers that do not meet quality appraisal criteria. The author will be well prepared for writing the synthesis of the literature, comparing similarities and differences in results and examining emerging issues. Furthermore, they will be well informed about methodological aspects of papers appraised to provide critique of the literature reviewed.

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