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SUMMARY WITH CRITICAL APPRAISAL

Jewellery and Nail Polish Worn by Health Care Workers and the Risk of Infection Transmission: A Review of Clinical Evidence and Guidelines

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Context and Policy Issues

Healthcare associated infections (HAIs) are considered an important public health problem. In a 2012 report by the Public Health Agency of Canada (PHAC), it was estimated that 5% to 10% of patients hospitalized in Canada will develop a HAI.¹ Pathogens (microorganisms) that cause HAIs can be transmitted from other patients, hospital personnel, or the hospital/medical centre environment.² Microorganisms can be transmitted to patients via direct or indirect contact, and health care workers are often the conduit for this transmission.³ These microorganisms can include such pathogens as *Clostridium difficile* and antibiotic-resistant organisms such as methicillin-resistant *Staphylococcus aureus* (MRSA). The hands of a health care worker can become contaminated by any procedures involving contact with patients, including taking a pulse, blood pressure, or body temperature.³ The health care worker may then have contact with other patients, resulting in cross-transmission or cross-infection from health care worker to patient.

The World Health Organization considers hand hygiene – handwashing using soap and water or a disinfectant hand rub – to be an important process in the prevention of pathogen transmission by the contact route.³ However, there are questions regarding aspects of hand hygiene which may impact adequate hand disinfection. Two issues are the wearing of hand or wrist jewellery and wearing nail polish. It has been found that skin under rings may be more heavily colonized with microorganisms than the rest of the hand, and that rings may also increase the risk of glove tears. Wrist jewellery may prevent proper washing of the skin, and skin may not be dried properly following handwashing if wrist jewellery is present.⁴ As well, chipped nail polish or nail polish worn for more than four days has been shown to foster the presence of microorganisms which resist removal by handwashing.⁴ Some guidelines have previously recommended that when performing hand hygiene, nails be free of nail polish, and no wearing of jewellery below the elbows,² but it is felt that the evidence supporting these recommendations may be inconclusive. Considering the differing opinions regarding the role that the wearing of nail polish and hand or wrist jewellery might have in impacting disinfection during the handwashing process, this report aims to review the current clinical evidence and evidence-based guideline recommendations for this procedure.

Research Questions

1. What is the clinical evidence regarding the effect of health care workers wearing nail polish or hand and wrist jewellery on infection transmission?
2. What are the evidence-based guidelines regarding health care workers wearing hand and wrist jewellery in a hospital or residential care setting?
3. What are the evidence-based guidelines regarding health care workers wearing nail polish in a hospital or residential care setting?

Key Findings

One systematic review concluded that wearing finger rings in a surgical setting did not result in an increased risk of surgical site infections, however the conclusions were based on low-quality evidence using mainly surrogate outcomes. A second systematic review stated that there was insufficient evidence to determine the effect of nail polish on surgical site infection. Three guidelines present recommendations for general health care settings. Two guidelines recommend removal of all hand and wrist jewellery and no wearing of nail polish, while one guideline recommends allowance of a simple finger band and unchipped nail polish. The guidance in all cases does not appear to be based on strong evidence.

Methods

Literature Search Methods

A limited literature search was conducted on key resources including PubMed, The Cochrane Library, University of York Centre for Reviews and Dissemination (CRD) databases, Canadian and major international health technology agencies, as well as a focused Internet search. For research question 1, no filters were applied to limit the retrieval by study type. For research questions 2 and 3, methodological filters were applied to limit retrieval to guidelines. Where possible, retrieval was limited to the human population. The search was also limited to English language documents published between January 1, 2012 and January 25, 2017.

Rapid Response reports are organized so that the evidence for each research question is presented separately.

Selection Criteria and Methods

One reviewer screened citations and selected studies. In the first level of screening, titles and abstracts were reviewed and potentially relevant articles were retrieved and assessed for inclusion. The final selection of full-text articles was based on the inclusion criteria presented in Table 1.

Table 1: Selection Criteria

Population	Patients in a hospital or residential care setting
Intervention	Q1: Adornments (i.e., hand or wrist jewellery worn by health care workers; nail polish worn by healthcare workers) Q2: Hand or wrist jewellery worn by health care workers Q3: Nail polish worn by health care workers
Comparator	Q1: No adornments Q2 and 3: No comparator required
Outcomes	Q1: Clinical outcomes (e.g., mortality, rate of infection transmission, rate of infection [including surgical site infection, hospital acquired infection, etc.], length of hospital stay) Q2 and 3: Evidence-based guideline recommendations regarding appropriateness of health care workers wearing adornments or nail polish in a hospital or residential care setting
Study Designs	Health technology assessments, systematic reviews, meta-analyses, randomized controlled trials, non-randomized studies, and evidence-based guidelines

Exclusion Criteria

Articles were excluded if they did not meet the selection criteria outlined in Table 1, they were duplicate publications, or were published prior to 2012. Guidelines that were not developed using a systematic, evidence-based process were not included.

Critical Appraisal of Individual Studies

The included systematic reviews were critically appraised using the AMSTAR checklist⁵ and guidelines were assessed with the AGREE II instrument.⁶ Summary scores were not calculated for the included studies; rather, a review of the strengths and limitations of each included study were described narratively.

Summary of Evidence

Quantity of Research Available

A total of 275 citations were identified in the literature search. Following screening of titles and abstracts, 268 citations were excluded and seven potentially relevant reports from the electronic search were retrieved for full-text review. Four potentially relevant publications were retrieved from the grey literature search. Of these potentially relevant articles, six publications were excluded for various reasons, while five publications met the inclusion criteria and were included in this report. Appendix 1 describes the PRISMA flowchart of the study selection.

Additional references of potential interest are provided in Appendix 5.

Summary of Study Characteristics

A tabular description of the included study characteristics is provided in Appendix 2.

Study Design

What is the clinical evidence regarding the effect of health care workers wearing nail polish or hand and wrist jewellery on infection transmission?

Two systematic reviews (SRs) were identified regarding the wearing of nail polish or hand or wrist jewellery.^{7,8} No individual randomized controlled trials (RCTs) or non-randomized studies were identified.

The SR published in 2016 (Francis et al.)⁷ included 17 studies, regarding the relationship between the presence of personal items in the operating room and surgical site infections, with seven of these studies (n = 2,318) assessing the wearing of hand or wrist jewellery during surgery, and none addressing the wearing of nail polish. The literature for this SR was searched up to February 2015.

The second SR was a Cochrane Review, published in 2014 with a literature search to July 2014 (Arrowsmith and Taylor),⁸ and was an update to a previous review. The SR identified no new RCTs that directly measured surgical infection rates related to wearing of nail polish or hand jewellery (rings). One RCT (n = 102) was included that measured bacterial contamination of health care worker hands, comparing those with freshly applied nail polish, old or chipped nail polish, and no nail polish. This was the

same RCT identified in the previous versions of the review, and was published in 1994.

What are the evidence-based guidelines regarding health care workers wearing hand and wrist jewellery or nail polish in a hospital or residential care setting?

Three evidence-based guidelines were identified that included recommendations for wearing nail polish or hand and wrist jewellery in health care settings.⁹⁻¹¹

One guideline (Loveday et al., 2014)⁹ followed a National Institute for Health and Care Excellence (NICE)-accredited process for guideline development, using comprehensive a literature search. The evidence quality of included studies was evaluated according to the Scottish Intercollegiate Guideline Network (SIGN), and a strength of recommendation was reported for each statement.

A guideline from the NICE, 2012¹⁰ was developed in accordance with the NICE guideline methodology, using a comprehensive literature search. Evidence quality was assessed using Grading of Recommendations Assessment, Development and Evaluation (GRADE), and the strength of recommendation was reported for each statement.

A third guideline, by the Public Health Agency of Canada (PHAC), 2012¹¹ was also identified. The guideline did not provide a detailed methodology, nor were details of the literature search provided. Evidence quality was graded using PHAC's own grading system, and a strength of recommendation was reported for each statement.

Country of Origin

What is the clinical evidence regarding the effect of health care workers wearing nail polish or hand and wrist jewellery on infection transmission?

The SR by Francis et al.⁷ was conducted by authors in the US. There is no information provided on the country of origin for the included studies. The Cochrane SR⁸ was conducted by authors in the UK, and the included RCT for this SR was conducted in the US.

What are the evidence-based guidelines regarding health care workers wearing hand and wrist jewellery or nail polish in a hospital or residential care setting?

The included guidelines were from the UK^{9,10} and Canada.¹¹

Patient Population

What is the clinical evidence regarding the effect of health care workers wearing nail polish or hand and wrist jewellery on infection transmission?

The two SRs^{7,8} focused on health care workers in a surgical setting. In the Francis SR,⁷ six of the studies included various types of health care workers (dental surgeons, non-clinical staff, other surgical staff, and medical students), although little detail was actually provided regarding the types of health care workers in the individual studies. There was no patient interaction with the health care workers in these six studies, as bacterial counts on the hands were the measured outcomes. A seventh study

included one physician with a total of 2,127 operations, but the type of surgery was not specified.

The single trial included in the Cochrane review⁸ consisted of 102 scrub nurses. Again, there was no patient interaction, as the measured outcome was bacterial counts on the hands of the nurses.

What are the evidence-based guidelines regarding health care workers wearing hand and wrist jewellery or nail polish in a hospital or residential care setting?

The three included guidelines focused on health care workers in hospital and acute care settings (Loveday et al.),⁹ primary health care and community settings (NICE),¹⁰ and any health care settings (PHAC).¹¹

Interventions and Comparators

What is the clinical evidence regarding the effect of health care workers wearing nail polish or hand and wrist jewellery on infection transmission?

Six studies included in the Francis et al. SR⁷ compared bacterial counts before and after scrubbing for surgery, with finger rings and without finger rings. One of the included studies compared surgical infection rates as associated with a single physician, in the years before and after wearing a wedding band.

The Cochrane review's included study compared bacterial contamination on the hands of nurses with freshly polished nails, nails with old polish (more than 4 days), or unpolished nails, before and after scrubbing for surgery.⁸

What are the evidence-based guidelines regarding health care workers wearing hand and wrist jewellery or nail polish in a hospital or residential care setting?

The guidelines⁹⁻¹¹ focused, for the purposes of this report, on hand hygiene techniques with regard to wearing of nail polish or hand and wrist jewellery.

Outcomes

All included studies⁷⁻¹¹ were focused on the prevention of health care-associated infections from health care workers to patients. However, the studies included in the SRs approached this by including studies with surrogate outcomes of bacterial counts on health workers' hands. One included study directly measured infection.

Summary of Critical Appraisal

A tabular description of the critical appraisal of the included studies is provided in Appendix 3.

What is the clinical evidence regarding the effect of health care workers wearing nail polish or hand and wrist jewellery on infection transmission?

Francis et al.⁷ performed a comprehensive literature search, screened and selected articles in duplicate, and provided limited characteristics of the included studies. However, it was unclear if the SR had an a priori design, if a grey literature search was performed, or if there was duplicate data extraction. A list of excluded studies

was not provided, and the scientific quality of the included studies was not used in formulating conclusions.

The Cochrane review⁸ had an a priori design, with a comprehensive literature search, duplicate study selection and data extraction, lists of included and excluded studies, and assessment of study quality. It is unclear if a grey literature search was performed, although there was hand searching of the literature.

What are the evidence-based guidelines regarding health care workers wearing hand and wrist jewellery or nail polish in a hospital or residential care setting?

The guidance by Loveday et al.⁹ followed a rigorous methodology accredited by NICE. It included a systematic literature search, clearly described scope and purpose, key recommendations, and editorial independence. The guidance clearly describes selection criteria and evidence is linked to the recommendations. There are few limitations to this guideline. It is unclear if views and preferences of the target population were sought, a procedure for updating the guideline was not provided, there are no tools or advice provided for implementation, and no monitoring or auditing criteria are provided.

The NICE guidance¹⁰ followed rigorous methodology, including a systematic literature search, and clear descriptions of scope and purpose, key recommendations, and editorial independence. The guidance clearly describes selection criteria and evidence is linked to the recommendations. The main limitation identified was a lack of auditing criteria provided in the guideline.

The guidance by PHAC¹¹ is clearly presented in the areas of scope and purpose, key recommendations, and editorial independence, and there are explicit links between the evidence and recommendations. It is unclear if systematic methods were used to search for evidence, criteria for selecting the evidence were not described, the views and preferences of the target population (patients and public) were not sought, there is no procedure provided for updating the guidelines, and there are no tools or advice provided for implementing recommendations.

Summary of Findings

The main findings and guideline recommendations are provided in tabular format in Appendix 4.

What is the clinical evidence regarding the effect of health care workers wearing nail polish or hand and wrist jewellery on infection transmission?

One systematic review⁷ concluded that there was no evidence that finger rings worn by health care workers in a surgical setting resulted in an increased number of surgical site infections. A second systematic review⁸ stated that there was insufficient evidence to determine the effect of nail polish on surgical site infection.

The SR published in 2016 (Francis et al.)⁷ included 17 studies; seven of these studies (n = 2,318) assessed wearing hand or wrist jewellery during surgery, and none addressed wearing nail polish. The included studies were described by the authors as three observational, one “level III” retrospective cohort, two comparative, and one

RCT, but the quality of the included studies was not presented. The level III retrospective cohort study reported on surgical infection rates; the remaining studies reported on the surrogate outcome of bacterial contamination on the skin of health care workers. The authors of the review state that none of the included studies except the “level III” retrospective cohort study investigated a causal link between personal items in operating rooms and surgical site infections. Bacterial count data was not provided for any of the included studies. The conclusion that wearing wedding rings in the operating room does not result in increased infection is based on the single retrospective cohort study that reported on number of infections, but infection data from that study is not provided in the SR.

The second SR was a Cochrane Review, published in 2014 (Arrowsmith and Taylor),⁸ and was an update to a previous review. The SR identified no new RCTs that measured surgical infection rates related to wearing of nail polish or hand jewellery (rings). One RCT (n = 102) comparing freshly applied nail polish with old or chipped nail polish or no nail polish reported on the surrogate outcome of bacterial loads, pre- and post-surgical scrub. This was the same RCT identified in the previous versions of the review, and was published in 1994.

The authors found no significant difference in bacterial counts between freshly-polished nails and unpolished nails, between unpolished nails and chipped polished nails, or between freshly-polished nails and chipped polished nails. The authors noted, however, that the included study was not powered to detect significant differences for the outcome measured.

What are the evidence-based guidelines regarding health care workers wearing hand and wrist jewellery or nail polish in a hospital or residential care setting?

Two guidelines (Loveday et al. and NICE)^{9,10} recommend that health care workers remove wrist and hand jewellery, and wear no nail polish. One of the guideline recommendations is based on a low level of evidence from non-analytic studies or expert opinion,⁹ and the second guideline recommendation is based on a previous version of the guideline, which is no longer available, therefore the level of evidence for this item was not presented.¹⁰ The guideline from PHAC¹¹ recommends that health care workers wear no jewellery except a simple ring (i.e., band), and it also recommends that nail polish not be chipped. These recommendations are based on a moderate level of evidence.

Limitations

Two SRs were identified regarding the wearing of nail polish or finger rings in a surgical setting, and there are major limitations associated with both. One SR⁷ included seven studies (six non-randomized studies and one RCT) of unspecified quality. Six of the studies reported on the surrogate outcome of bacterial contamination on hands of health care workers, and one of the studies reported on the outcome of surgical site infection. The second SR⁸ found only one relevant RCT that was underpowered to detect significant differences in the surrogate outcome of bacterial load. In summary, the two SRs comprise eight clinical trials in total, seven of which measured only surrogate outcomes. The reporting of surrogate outcomes is a limitation because it is not possible to predict whether bacterial load on the hands of health care workers would result in surgical site infections. The one clinical trial

included in a SR⁷ that reported directly on surgical site infections found that there was no increased risk of infection with wearing a single finger band. The trial included one surgeon and measured the rate of infection in the years before and after a wedding band was worn. It is difficult to determine the generalizability of this finding, with only one participant. Further, because both SRs were focused on a surgical setting only, it is unclear if the results are generalizable to other areas of health care, where hand hygiene might be less vigorous and gloves might not be worn by health care workers after performing hand hygiene.

Three guidance documents were identified.⁹⁻¹¹ The Canadian guideline¹¹ recommends that a simple wedding band and unchipped nail polish are acceptable. It indicates that this is based on moderate quality of evidence, but does not specify if the associated evidence is from trials with surrogate or direct outcomes. The other two guidelines^{9,10} recommend the removal of all hand and wrist jewellery and recommend that nails be free of nail polish.^{9,10} However, it appears that this guidance may be based on low quality studies and/or expert opinion. There is a clear limitation to all these recommendations based on the perceived quality of evidence that was used to inform them.

Conclusions and Implications for Decision or Policy Making

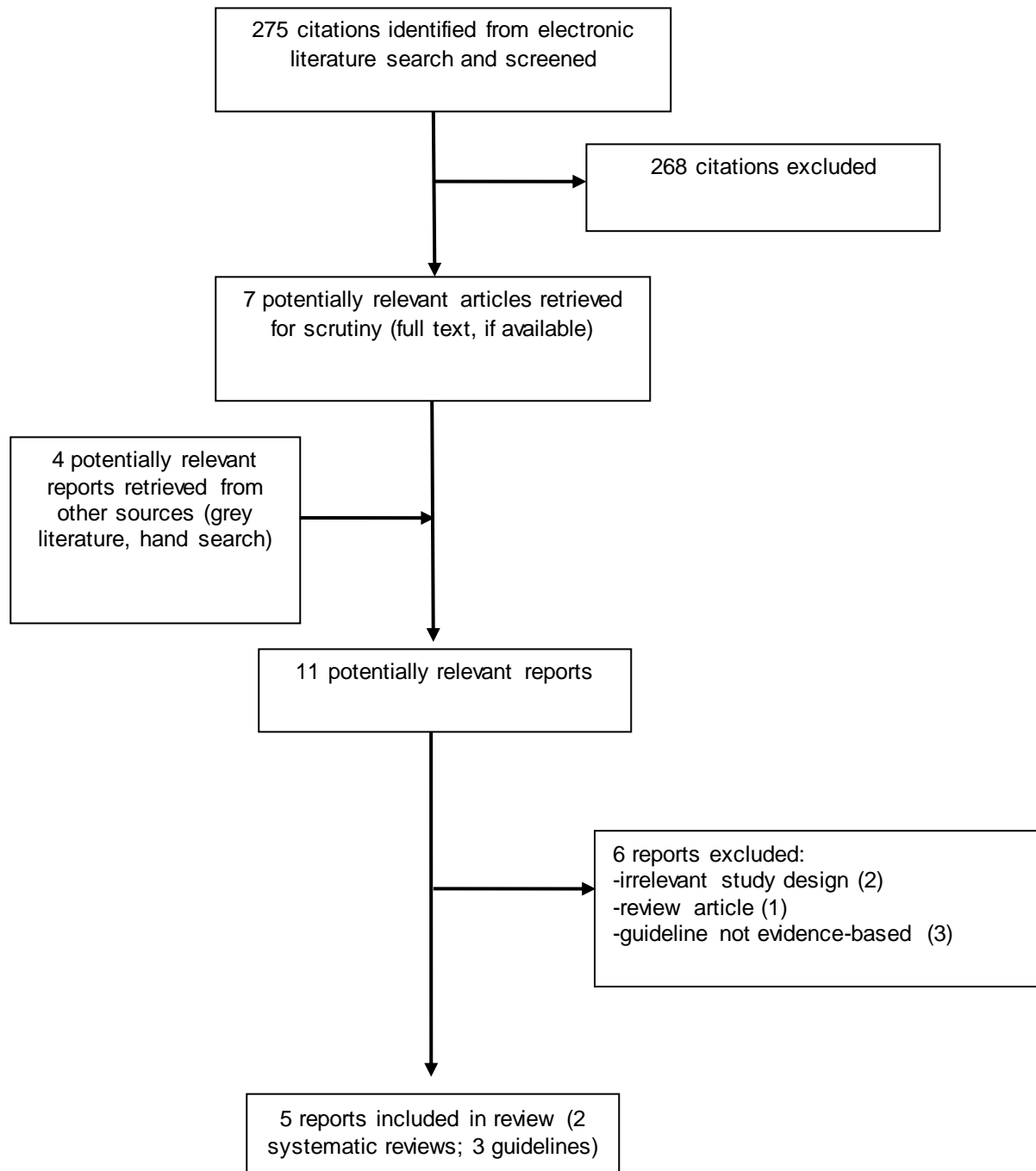
One systematic review concluded that wearing finger rings in a surgical setting did not result in an increased risk of surgical site infections, however the conclusions were based on low-quality evidence using mainly surrogate outcomes. A second systematic review stated that there was insufficient evidence to determine the effect of nail polish on surgical site infection. Three guidelines present recommendations for general health care settings. Two guidelines recommend removal of all hand and wrist jewellery and no wearing of nail polish, while one guideline recommends allowance of a simple finger band and unchipped nail polish. The guidance in all cases does not appear to be based on strong evidence.

The level of evidence for the wearing of nail polish or hand and wrist jewellery by health care workers and the risk of infection transmission does not appear to be strong. Studies suggest that risk of infection transmission in a surgical setting is not impacted by wearing of jewellery or nail polish. In other health care settings, guidelines do not specifically agree. It appears that wearing a simple finger band and unchipped nail polish may be acceptable, although removal of all finger and wrist jewellery and wearing no nail polish may be the safest option to prevent infection transmission in most health care settings.

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Appendix 1: Selection of Included Studies



Appendix 2: Characteristics of Included Publications

Table 2: Characteristics of Included Systematic Reviews

First Author, Publication Year, Country; Databases and Search Dates	Types and Numbers of Studies; Setting	Number and Type of Studies Regarding Jewellery or Nail Polish; Total Population	Clinical Outcomes Measured
Francis, 2016, ⁷ US MEDLINE, Embase, Scopus, Cochrane Library, Web of Science, CINAHL to February 20, 2015	17 non-randomized studies; Surgical setting	7 studies regarding jewellery: 3 observational, 1 level III retrospective cohort, 2 comparative, and 1 RCT; N = 2,318	6 studies reported bacterial counts; 1 study reported infections following surgery
Arrowsmith, 2014, ⁸ UK Cochrane Wounds Group Specialised Register, Cochrane CENTRAL, NHS EED, MEDLINE, EMBASE, CINAHL to July 23, 2014	1 randomized controlled trial; Surgical setting	1 randomized controlled trial regarding nail polish; N = 102	1 study reported bacterial counts

N = number of participants; UK = United Kingdom, US = United States

Table 3: Characteristics of Included Guidelines

Objectives		Methodology			
Intended users/ Target population	Intervention of Interest	Evidence collection, Selection and Synthesis	Evidence Quality and Strength	Recommendations development and Evaluation	Guideline Validation
Loveday, 2014 ⁹					
Hospital managers, members of hospital infection prevention and control teams, and individual healthcare practitioners	Health care associated infections; wrist and hand jewellery; nail polish	Followed a NICE-accredited process for guideline development. Comprehensive literature search based on consultation with scientific advisors and a guideline development advisory group; selection of evidence relevant to each research question.	Evidence quality assessed according to the Scottish Intercollegiate Guideline Network (SIGN) for study quality assessment. A strength of recommendation was reported for each statement.	Recommendations developed by a team of specialist infection prevention and control researchers and clinical specialists and a Guideline Development Advisory Group (comprising lay members and specialist clinical practitioners).	Reviewed by key stakeholders, including Royal Colleges, professional societies and organizations, patients, and trade unions.

Table 3: Characteristics of Included Guidelines

Objectives		Methodology			
Intended users/ Target population	Intervention of Interest	Evidence collection, Selection and Synthesis	Evidence Quality and Strength	Recommendations development and Evaluation	Guideline Validation
National Institute for Health and Care Excellence (NICE), 2012 ¹⁰					
The UK's National Health Service and people providing health care in other settings	Health care associated infections; wrist and hand jewellery; nail polish	Developed in accordance with the methods outlined in the NICE Guidelines Manual 2009. Comprehensive literature search, selection, and synthesis involving scientific advisors, a guideline development advisory group, and expert lay persons	Evidence quality assessed using GRADE (Grading of Recommendations Assessment, Development and Evaluation). A strength of recommendation was reported for each statement.	Recommendations developed by an independent advisory group comprising practitioners (both specialists in the topic and generalists), service or care providers or commissioners, and others working in the area covered by the guideline, plus at least 2 lay members (people using services, their family members or carers, or members of the public and community or voluntary sector with relevant experience).	Reviewed by key stakeholders, including national organizations, local Healthwatch organizations; public sector providers and commissioners of care or services; private, voluntary sector and other independent providers of care or services; companies that manufacture drugs, devices, equipment or adaptations, and commercial industries relevant to public health; government departments and national statutory agencies.
Public Health Agency of Canada (PHAC), 2012 ¹¹					
Infection prevention and control professionals, health care organizations and health care providers	Hand hygiene in health care settings; wrist and hand jewellery; nail polish	Detailed methodology is not provided, nor are details of the literature search provided. Synthesis was performed by a steering committee	Evidence was graded based on PHAC's own grading system. A strength of recommendation was reported for each statement.	Guideline working group comprising a team of specialist infection prevention and control and health care professionals.	Reviewed by external stakeholders, including health care professional groups.

Appendix 3: Critical Appraisal of Included Publications

Table 4: Strengths and Limitations of Systematic Reviews and Meta-Analyses using AMSTAR⁵

Strengths	Limitations
Francis et al., 2016 ^f	
<ul style="list-style-type: none"> • There was duplicate screening of articles. • A comprehensive literature search was performed. • Characteristics of the included studies were provided. • Author conflicts of interest were reported as none. 	<ul style="list-style-type: none"> • It is unclear if there was an a priori design. • It is unclear if there was duplicate data extraction. • There is no indication that a grey literature search was performed. • A list of excluded studies was not provided. • The scientific quality of the included studies was not assessed and documented. • The scientific quality of the included studies was not used in formulating conclusions. • The likelihood of publication bias was not assessed. • Funding support for the report was not indicated.
Arrowsmith and Taylor, 2014 ^g	
<ul style="list-style-type: none"> • There was an a priori design. • There was duplicate study selection and data extraction. • A comprehensive literature search was performed. • Lists of included and excluded studies were provided. • Characteristics of the included studies were provided. • Scientific quality of the included studies was assessed and documented. • The scientific quality of the included studies was used appropriately in formulating conclusions. • The likelihood of publication bias was assessed. • Author conflicts of interest and funding support were reported. 	<ul style="list-style-type: none"> • Hand searching was performed but it is unclear if a grey literature was performed.

Table 5: Strengths and Limitations of Guidelines using AGREE II⁶

AMSTAR Item	Loveday, 2014 ⁹	NICE, 2012 ¹⁰	PHAC, 2012 ¹¹
Scope and Purpose			
The overall objective(s) of the guideline is (are) specifically described.	√	√	√
The health question(s) covered by the guideline is (are) specifically described.	√	√	√
The population (patients, public, etc.) to whom the guideline is meant to apply is specifically described.	√	√	√
Stakeholder Involvement			
The guideline development group includes individuals from all the relevant professional groups.	√	√	√
The views and preferences of the target population (patients, public, etc.) have been sought.	?	√	X
The target users of the guideline are clearly defined.	√	√	√
Rigour of Development			
Systematic methods were used to search for evidence.	√	√	?
The criteria for selecting the evidence are clearly described.	√	√	X
The strengths and limitations of the body of evidence are clearly described.	√	√	√
The methods for formulating the recommendations are clearly described.	√	√	√
The health benefits, side effects, and risks have been considered in formulating the recommendations.	√	√	√
There is an explicit link between the recommendations and the supporting evidence.	√	√	√
The guideline has been externally reviewed by experts prior to its publication.	√	√	√
A procedure for updating the guideline is provided.	X	√	X
Clarity of Presentation			
The recommendations are specific and unambiguous.	√	√	√
The different options for management of the condition or health issue are clearly presented.	√	√	√
Key recommendations are easily identifiable.	√	√	√
Applicability			
The guideline provides advice and/or tools on how the recommendations can be put into practice.	X	√	X
The guideline describes facilitators and barriers to its application.	√	√	X
The potential resource implications of applying the recommendations have been considered.	√	√	√
The guideline presents monitoring and/or auditing criteria.	X	X	√
Editorial Independence			
The views of the funding body have not influenced the content of the guideline.	√	√	√
Competing interests of guideline development group members have been recorded and addressed.	√	√	√

√ = Yes; X = No; ? = Unable to determine

NICE = National Institute for Health and Care Excellence; PHAC = Public Health Agency of Canada

Appendix 4: Main Study Findings and Author’s Conclusions

Table 6: Summary of Findings of Included Systematic Reviews

Main Study Findings	Authors’ Conclusions
Francis et al., 2016 ^f	
<ul style="list-style-type: none"> • Included 7 studies that specifically addressed wearing jewellery during surgery. • 6 studies used a surrogate outcome of bacterial contamination; the review does not provide the outcomes regarding wearing of jewellery for these studies • 1 study directly evaluated surgical site infections as an outcome measure; based on a single surgeon performing operations before and after wearing a wedding ring. The authors concluded there was no relationship between wearing a wedding band and increased number of surgical infections, however they do not provide actual data on the findings. 	<p>There is no direct evidence that personal items in operating rooms leads to an increased risk of surgical site infections.</p> <p>There was no relationship between wearing a wedding band and increased number of surgical infections.</p>
Arrowsmith and Taylor, 2014 ^g	
<ul style="list-style-type: none"> • There were no RCTs, controlled trials, cohort, or case-controlled studies identified regarding the effect of wearing rings and surgical infection. • One underpowered RCT evaluated the effect of nail polish on the surrogate outcome of bacterial contamination. The comparison of chipped or fresh nail polish with unpolished nails found no statistically significant difference in bacterial counts. This included study was the only RCT found in the previous versions of this SR. <ul style="list-style-type: none"> ○ Unpolished nails vs freshly-polished nails: bacterial colonies 154 vs 438; mean difference -284; 95% CI -692 to 124; ○ Unpolished nails vs chipped polished nails: bacterial colonies 895 vs 438; mean difference 457; 95% CI -456 to 1370; ○ Freshly-polished nails vs chipped polished nails: bacterial colonies 154 vs 895; mean difference -741; 95% CI -1582 to 100 • No studies were identified that evaluated infections as an outcome measure. 	<p>There is insufficient evidence regarding the effect of wearing of finger rings or nail polish on postoperative wound infection.</p>

CI = confidence interval; RCT = randomized controlled trial

Table 7: Summary of Guideline Recommendations

Recommendations	Level of Evidence
Loveday et al., 2014 ⁹	
<p>“Healthcare workers should ensure that their hands can be decontaminated effectively by: removing all wrist and hand jewellery[...] making sure that fingernails are short, clean, and free from false nails and nail polish”</p>	<p>Level D (Based on non-analytic studies and expert opinion); Best practice recommendation based on clinical experience of the Guideline Development Advisory Group, and patient preference and experience</p>
National Institute for Health and Care Excellence (NICE), 2012 ¹⁰	
<p>“Healthcare workers should ensure that their hands can be decontaminated throughout the duration of clinical work by: removing wrist and hand jewellery. ...making sure that fingernails are short, clean and free of nail polish” p. 15</p>	<p>Recommendations are based on the 2003 version of this guideline, which has since been withdrawn. No new evidence on jewellery and nail polish was incorporated for the current guideline. Unable to determine the level of evidence the original recommendation was based upon.</p>
Public Health Agency of Canada (PHAC), 2012 ¹¹	
<p>“Hand jewellery other than a simple ring (i.e., band) should not be worn when providing patient care.” p.45 ” Natural nails should be kept short, and nail polish, if worn, should not be chipped.” p.45</p>	<p><i>Jewellery</i>: Level BII (Moderate level of evidence based on studies of high/medium quality, with a clear trend but some inconsistency of results or extrapolation from multiple strong design studies of medium quality or moderate design studies of high/medium quality, with consistency of results or one strong design study with support from multiple weak design studies of high/medium quality, with consistency of results).</p> <p><i>Nail polish</i>: Level BI (Moderate level of evidence based on direct evidence from multiple moderate design studies of high quality, with consistency of results or extrapolation from multiple strong design studies of high quality, with consistency of results).</p>

Appendix 5: Additional References of Potential Interest

Guidelines and Recommendations – Unclear Methods

Ontario Agency for Health Protection and Promotion (Public Health Ontario), Provincial Infectious Diseases Advisory Committee. Infection prevention and control for clinical office practice [Internet]. Toronto: Queen's Printer for Ontario; 2015 Apr. Available from:

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Chan D, Downing D, Keough CE, Saad WA, Annamalai G, d'Othee BJ, et al. Joint practice guideline for sterile technique during vascular and interventional radiology procedures: from the Society of Interventional Radiology, Association of periOperative Registered Nurses, and Association for Radiologic and Imaging Nursing, for the Society of Interventional Radiology [corrected] Standards of Practice Committee, and Endorsed by the Cardiovascular Interventional Radiological Society of Europe and the Canadian Interventional Radiology Association. *J Vasc Interv Radiol* [Internet]. 2012 Dec;23(12):1603-12. Available from:

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