Hand hygiene among healthcare workers: A qualitative meta summary using the GRADE-CERQual process

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Abstract

Background: Hand hygiene is considered an effective and potentially modifiable infection control behaviour among healthcare workers (HCW). Several meta-studies have been published that compare quantitatively expressed findings, but limited efforts have been made to synthesise qualitative research.

Objectives: This paper provides the first report of integrated findings from qualitative research reports on hand hygiene compliance among HCW worldwide that employs the GRADE-CERQual process of quality assessment.

Methods: We conducted database searches and identified 36 reports in which authors conducted qualitative or mixed methods research on hand hygiene compliance among HCW. We used Dedoose analysis software to facilitate extraction of relevant excerpts. We applied the GRADE-CERQual process to describe relative confidence as high, moderate or low for nine aggregate findings.

Findings: Highest confidence findings included that HCW believe they have access to adequate training, and that management and resource support are sometimes lacking. Individual, subjective criteria also influence hand hygiene.

Discussion: These results suggest the need for further investigation into healthcare cultures that are perceived as supportive for infection control. Surveillance processes have potential, especially if information is perceived by HCW as timely and relevant.

Keywords

Qualitative, meta-summary, GRADE-CERQual, hand hygiene, healthcare workers

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Background

According to the World Health Organization (WHO, 2011) healthcare-acquired infections (HCAI) account for billions of direct and indirect medical costs throughout the world. Among infection control efforts in acute care settings, hand hygiene is considered one of the most influential and potentially modifiable behaviours practised by healthcare workers (HCW) (Pittet et al., 2006). Compliance with hand hygiene among HCW is estimated to average 40% (WHO, 2009) based on opportunities identified in WHO (2006) guidelines. In a systematic review, Cherry et al. (2012) suggested that compliance rates in general reflect practitioners' less than optimal practice rather than gaps in practical

knowledge, evidenced by the fact that HCW are assessed on a regular basis for competence in hand hygiene.

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In addition to Cherry et al. (2012), other authors such as Erasmus et al. (2010), Gould et al. (2010), Huis et al. (2012), Luangasanatip et al. (2015) and Schweizer et al. (2014) have published meta-analyses or systematic reviews of quantitative hand hygiene research to summarised factors associated with compliance with guidelines or with efficacy of interventions. Aggregate findings from these several reviews suggest that compliance rates in general improve after interventions, although potential direct or indirect causal pathways are not always clear based on the primary research studies. Among recommendations from authors of meta-studies are that future researchers continue to assess the more promising combinations of educational interventions (Cherry et al., 2012) and employ interventions that focus on motivators such as performance feedback and goal setting (Huis et al., 2012; Luangasanatip et al., 2015; Schweizer et al., 2014). Among these six reviews, only Erasmus et al. (2010) emphasised the role of context-specific conditions in compliance. Findings from these aggregate reports, therefore, provide general guidance but fail to fully address individual behavioural, perceptual or other issues that might account for less than ideal hand hygiene compliance rates.

According to Patton (2015), qualitative research includes in its aims exploration of individual and context-dependent experience and meaning making. This suggests qualitative approaches might be particularly well suited to improve researcher and practitioner understanding of the reported disconnect between hand hygiene knowledge and behaviour. Smiddy et al. (2015) integrated findings from 11 qualitative research studies on hand hygiene among HCW. These authors presented results as a thematic analysis emphasising two categories: motivational factors and perceptions of the work environment. However, the authors limited eligibility by including only empirical research articles published in developed countries, while WHO (2009) training documentation suggests that hand hygiene compliance and potential to impact HCAI is a concern throughout the world. Therefore, the purpose of this paper is to provide the first report of integrated findings from qualitative research reports on hand hygiene compliance among HCW worldwide. We additionally aim to expand on findings reported in prior published meta-studies and to identify potential areas of intervention for future behaviourally oriented research efforts. Another unique feature of this research study is our application of the GRADE-CERQual process (Lewin et al., 2015) which was developed as a means of deriving a relative confidence rating for each presented finding in a qualitative research synthesis. Therefore, while our aim and systematic approach to our search is similar to that described in the research report authored by Smiddy et al. (2015), we differ from those authors in our application of eligibility criteria and in our use of the GRADE-CERQual process to assess our integrated findings.

Methods

Sample selection

We began the selection process with the list of 11 articles included in the review authored by Smiddy et al. (2015) and conducted database searches in the following: CINAHL; PubMed; PsychINFO; HealthSource/Nursing Academic; EMBASE; Sage Complete. We completed the search during September 2015. Our subject search terms included logical combinations of the following full or truncated (indicated by *) subject terms: hand hygiene, disinfect*, rub, wash*, sanitize*, gel; and context terms: hospital, health care, clinic; methodological terms: qualitative, focus group, interview, and mixed method*. We restricted our search to sources published after 1 January 2000 in order to focus on research conducted after widespread use of alcohol-based hand sanitisers. Because hand hygiene is a global priority, we included research conducted in any country with the condition that the report be available in English. We also consulted reference lists of the identified articles for additional sources. We considered for inclusion various types of publications.

Our initial search resulted in 586 selections, broken down as follows: EMBASE (91); Medline (72); CINAHL (44); Health Source/Nursing Academic (23); PsychInfo (9); Sage Complete (246); and reference list of one selected article (1). The sample of 586 included nine of the 11 found in the prior review, so after elimination of duplicates, our initial sample consisted of 588 articles. We derived a final sample of 36 articles after applying the following additional elimination criteria, which we developed to focus on articles that addressed the purpose of this research study:

Research and context: We eliminated research reports that described planned but not yet conducted research, evaluation research that assessed participant feedback on aspects of program delivery, research that did not take place in a healthcare setting, research that did not include HCW as participants, research reports not published in an English language version, and any other obvious duplicate entries. We applied these criteria and eliminated 521 articles, including one (Thomas et al., 2005) reviewed by Smiddy et al. (2015).

Methods: We eliminated research reports that were not qualitative in both design and analysis or, in the case of mixed methods reports, did not have a component that was qualitative in both design and analysis. We considered research qualitative in design if the researchers used interview, observation, document analysis or other data collection methods that were planned and implemented to gather descriptive, narrative or experiential information, or other data that were not strictly numerical or based on limited choice offerings. We considered research qualitative in analysis if findings were reported in terms consistent with descriptive, narrative, thematic, phenomenological/lived experience, grounded theory or other interpretive approaches. We eliminated research that provided findings

reported solely in quantitative or statistical terms, even when the findings were originally derived from qualitative data collection. We eliminated 12 reports in this stage that included two (Stevens et al., 2013; Whitby et al., 2006) reviewed by Smiddy et al. (2015).

Relative contribution: We encountered some sources that: (1) represented a secondary or additional interpretation of previously or alternately published findings; (2) included hand hygiene as only one of multiple infection control strategies described; or (3) contained published text of a conference abstract; or (4) presented findings from research in a technical report or as a letter to the editor of a journal. For those sources included in (3) and (4), we conducted an additional directed search to see if the findings were later published in a journal article. If not and when possible, we attempted to contact authors to see if a more detailed description of findings or methods was available. After this, we independently read each article or abstract and arrived at consensus for inclusion or exclusion based on whether: (1) the information in multiple publications exploring the same sample was unique; and (2) there were reported findings focused on hand hygiene practices of HCW; and (3) an ample description of methods was provided to allow completion of our quality assessment process; and (4) ample findings were reported to facilitate extraction and inclusion in this review. We eliminated 19 reports in this stage, resulting in our final sample of 36 research reports.

All authors participated in the final selection process by independently reviewing titles, abstracts and methods or results sections of articles when necessary. We resolved disagreements through discussion until we reached consensus. In the instance of ambiguity, in particular related to design or presentation of findings, we chose to be inclusive rather than exclusive.

Quality assessment

The GRADE-CERQual (Lewin et al., 2015) process is a means by which researchers can develop an assessment that reflects the level of confidence in each integrated or aggregate finding from qualitative research synthesis. Within the GRADE-CERQual process, findings represent integrated summary statements that reflect results from multiple reports. GRADE-CERQual consists of use of four criteria: methodological limitations; relevance; coherence; and adequacy of data. Assessment results from these are used in combination to develop a confidence rating for each reported finding. Because GRADE-CERQual is a relatively recently described process, we provide additional detail for our readers in this report. Below we provide the definition for each criterion as presented by the methodologists who developed the GRADE-CERQual process, and we describe the process we used to assess each criterion for this research report. Categories of assessments are traditionally expressed

in descriptive, qualitative (e.g. minimal, moderate, substantial, etc.) terms to reflect degree of researchers' concerns relative to each criterion.

According to Lewin et al. (2015), methodological limitations represents 'the extent to which there are problems in the design or conduct of the primary studies that contributed evidence to a review finding' (p. 6). To assess the articles in our sample for methodological limitations, we used a modified version of the Critical Appraisal Skills Programme (CASP, 2013) qualitative research checklist. We choose to use this tool because it addresses elements of design and implementation, as specified in the GRADE-CERQual definition, and allowed us to develop a rating to reflect methodological limitations for each research report, which in turn contributed to the final confidence ratings of the aggregated findings. Our modification to CASP consisted of replacement of the usual yes/no/not certain scoring system with 0–5 points for each of the 10 quality control items, which resulted in final quality scores per source in the range of 0–50. Our use of a range of scores per item allowed us to assign partial credit for incomplete information, which we believe provided us with more nuanced ratings.

All authors participated in the CASP process; two authors independently completed a CASP rating form for each research report. When final scores from two reviewers were within 10% (5 points), the average score was used. When final scores deviated by more than 10%, researchers discussed the items that contributed to the disparity and reached consensus to derive a final score for items of disagreement. These consensus scores were then incorporated into the report average score. We calculated interrater reliability using a weighted Kappa coefficient as recommended by Viera and Garrett (2005) when there is greater concern about larger, rather than smaller, differences in scoring. The mean Kappa across all studies was 0.61, which is considered to represent substantial agreement.

The mean CASP score for all sources was 24.75 of 50 possible points (standard deviation = 6.65). Source total scores are shown in Table 1. CASP per item scores are available by contacting the first author. We classified the 17 reports that we assigned a score of 25 or lower (50% of total available points) as illustrations of fair or poor quality of reporting of design and conduct; the 19 reports we assigned a score of 26 or higher were considered to illustrate good or better quality reporting of design and conduct. We expressed these in our assessment of findings as moderate to serious concerns about design and conduct (fair or poor) or minimal to minor concerns about design and conduct (good or better). The impact of methodological limitations on finding confidence ratings is described in Table 2. We provide a sample of the CASP rating form in Figure 1.

Relevance is another GRADE-CERQual criterion and refers to 'the extent to which the body of evidence from the primary studies supporting a review finding is applicable to the context specified in the review question' (Lewin et al.,

Table 1. Source details and assigned ratings.

Source	Location	Participants	Data collection	Facility Type	CASP score	Relevance	Coherence
Barrett and Randle (2008)	UK	Nursing students	Individual interviews	Community or other non-teaching hospital	29.5	Minimal concerns	Moderate concerns
Boog et al. (2013)	Europe	Multiple HCW	Observation and interviews	Community or other non-teaching hospital	23	Indirect relevance	Substantial concerns
Boscart et al. (2012)	Canada	Multiple HCW	Individual interviews	Community or other non-teaching hospital	34	Minimal concerns	Moderate concerns
Brown et al. (2008)	UK	Nurses	Individual interviews	Community or other non-teaching hospital	22.5	Moderate concerns	Substantial concerns
Bryce et al. (2014)	Canada	Regional directors of infection control	Individual interviews	Community or other non-teaching hospital	31	Indirect relevance	Moderate concerns
Cole (2009)	UK	Nursing students	Observation and interviews	Community or other non-teaching hospital	39	Minimal concerns	Moderate concerns
Dawson (2015)	UK	Nurses	Observation and interviews	Community or other non-teaching hospital	22	Minimal concerns	Substantial concerns
De Abreu Botene and Pedro (2014)	South America	Multiple HCW	Observation and interviews	Community or other non-teaching hospital	21	Minimal concerns	Substantial concerns
Dixit et al. (2012)	Canada	Physicians	Individual interviews	Community or other non-teaching hospital	27.5	Minimal concerns	Moderate concerns
Dyson et al. (2011)	UK	Multiple HCW	Observation and interviews	Community or other non-teaching hospital	29.2	Minimal concerns	Moderate concerns
Ellingson et al. (2011)	USA	Multiple HCW	Group interviews	Mix of teaching and non-teaching hospitals	18.5	Moderate concerns	Substantial concerns
Erasmus et al. (2009)	Europe	Multiple HCW	Individual and group interviews	Mix of teaching and non-teaching hospitals	21	Minimal concerns	Substantial concerns
Eveillard et al. (2013)	Europe	Multiple HCW	Observation and interviews	Community or other non-teaching hospital	15	Minimal concerns	Substantial concerns
Hill et al. (2013)	USA	Multiple HCW	Group interviews	Mix of hospitals and clinics	37.5	Moderate concerns	Minimal concerns
Jang et al. (2010a)	Canada	Physicians	Group interviews	Community or other non-teaching hospital	8	Minimal concerns	Substantial concerns
Jang et al. (2010b)	Canada	Multiple HCW	Group interviews	Community or other non-teaching hospital	31.5	Minimal concerns	Moderate concerns
Johnson et al. (2012)	Central America	Multiple HCW	Group interviews	Community or other non-teaching hospital	19	Minimal concerns	Substantial concerns
Jones et al. (2015)	Africa	Multiple HCW	Group interviews	Other (mix of facility and community-based carers)	15	Minimal concerns	Substantial concerns

(continued)

Table 1. (Continued)

Source	Location	Participants	Data collection	Facility Type	CASP score	Relevance	Coherence
Joshi et al. (2012)	Asia	Multiple HCW	Group interviews	Community or other non-teaching hospital	28.5	Minimal concerns	Moderate concerns
Lee (2013)	UK	Nursing students	Participant narrative during simulation	Other (academic setting)	25.5	Minimal concerns	Moderate concerns
Lusardi (2007)	UK	Nursing students	Individual interviews	Community or other non-teaching hospital	16.5	Minimal concerns	Substantial concerns
Marjadi and McLaws (2010)	Asia	Multiple HCW	Observation and interviews	Mix of hospitals and clinics	19.5	Minimal concerns	Substantial concerns
McInnes (2014)	Australia	Administrators and clinical supervisors	Individual interviews	Community or other non-teaching hospital	32	Minimal concerns	Moderate concerns
McLaws et al. (2012)	Middle East	Multiple HCW	Individual and group interviews	Mix of teaching and non-teaching hospitals	27	Minimal concerns	Moderate concerns
Nichols and Badger (2008)	UK	Multiple HCW	Observation and interviews	Community or other non-teaching hospital	21	Minimal concerns	Moderate concerns
Nicol et al. (2009)	Australia	Multiple HCW	Observation and interviews	Community or other non-teaching hospital	26	Minimal concerns	Moderate concerns
Pan et al. (2014)	Asia	Medical students	Observation and interviews	Community or other non-teaching hospital	30.5	Minimal concerns	Substantial concerns
Patterson et al. (2014)	USA	Multiple HCW	Individual and group interviews	Community or other non-teaching hospital	15	Indirect relevance	Substantial concerns
Pink et al. (2014)	UK	Multiple HCW	Observation and interviews	Other (home care)	21	Moderate concerns	Substantial concerns
Salmon & McLaws (2015)	Asia	Multiple HCW	Group interviews	Community or other non-teaching hospital	26	Minimal concerns	Moderate concerns
Samuel et al. (2005)	Africa	Multiple HCW	Observation and interviews	Community or other non-teaching hospital	20	Minimal concerns	Substantial concerns
Seibert et al. (2014)	USA	Multiple HCW	Individual interviews	Community or other non-teaching hospital	30	Moderate concerns	Moderate concerns
Wasswa et al. (2015)	Africa	Multiple HCW	Observation and interviews	Mix of hospitals and clinics	26	Moderate concerns	Moderate concerns
White et al. (2015)	Australia	Nurses	Group interviews	Community or other non-teaching hospital	29.5	Minimal concerns	Moderate concerns
Yuan et al. (2009)	Asia	Multiple HCW	Individual interviews	Community or other non-teaching hospital	24	Minimal concerns	Substantial concerns
Zimmerman et al. (2013)	Canada	Multiple HCW	Individual interviews	Community or other non-teaching hospital	28.5	Moderate concerns	Substantial concerns

Table 2. Findings, first authors, applications of CERQual criteria and explanatory ratings of reviewed sources.

Review finding	First authors of included studies	Methodological assessment	Relevance	Coherence	Adequacy (488 total codes)	Overall confidence in finding	Explanation of rating
HCW reported hand hygiene training is provided on a regular basis, and assert that HCW, as a group, are knowledgeable about hand hygiene practice. Some HCW recommended that changes to content or frequency of training might help improve the effectiveness of training, and extension of training to other staff, patients, families and community members might help improve compliance rates.	Barrett, Boscart, Brown, Bryce, Cole, Dawson, DeAbreu Botene, Dixit, Dyson, Ellingson, Erasmus, Eveillard, Jang (a), Jang (b), Jones, Joshi, Lee, Lusardi, Marjadi, McInnes, McLaws, Nichols, Nicol, Pan, Samuel, Siebert, Wasswa, White, Yuan, Zimmerman	98 codes: minimal to minor concerns about methods (design and conduct) of studies contributing 61 codes; moderate to serious concerns about methods of studies contributing 37 codes	84 codes from studies with minimal concerns about relevance; 10 from studies with moderate concerns about relevance; 4 from indirectly relevant studies	59 codes from studies with moderate concerns about coherence; 39 codes from studies with substantial concerns about coherence	30 of 36 studies; Barrett. 1%* of total codes Minimal concerns with adequacy based on the support for each finding provided in the primary research reports	High	Most coded excerpts from studies with minimal/minor concerns about methods and minimal concerns about relevance; higher proportion of codes from studies with minimal concerns about coherence; minimal concerns with adequacy; 5/6 of studies represented in this finding
HCW reported that their ability to engage in hand hygiene is influenced by management-related factors that include availability of ample human and hygiene resources along with demonstrated support or priority on hand hygiene originating from upper levels of management. HCW also reported that it is important that hand hygiene improvement efforts solicit input from those 'in the trenches' to ensure their support.	Barrett, Boog, Boscart, Brown, Bryce, Cole, Dawson, Dyson, Ellingson, Erasmus, Eveillard, Jang (a), Jang (b), Jones, Joshi, Lusardi, Marjadi, McLaws, Nichols, Nicol, Pan, Patterson, Salmon, Samuel, Siebert, Wasswa, White, Yuan, Zimmerman	113 codes: minimal to minor concerns about methods of studies contributing 61 codes; moderate to serious concerns about methods of studies contributing 52 codes	71 codes from studies with minimal concerns about relevance; 19 from studies with moderate concerns about relevance; Brown from indirectly relevant studies	55 codes from studies with minimal concerns about coherence; 58 codes from studies with substantial concerns about coherence	30 of 36 studies; Brown. 2% of total coded excerpts; minimal concerns with adequacy based on the support for each finding provided in the primary research reports	High	Most coded excerpts from studies with minimal/minor concerns about methods and minimal concerns about relevance; coherence nearly evenly split between minimal concerns and substantial concerns; minimal concerns with adequacy; 5/6 of studies represented in this finding

(continued)

Table 2. (Continued)

Review finding	First authors of included studies	Methodological assessment	Relevance	Coherence	Adequacy (488 total codes)	Overall confidence in finding	Explanation of rating
HCW reported engaging in hand hygiene based on their perceptions of risk as well as assessment of relative cleanliness or dirtiness associated with specific procedures, symptoms or patients	Barrett, Boscart, Bryce, Cole, Dixit, Dyson, Erasmus, Eveillard, Jang (a), Jang (b), Johnson, Joshi, Lee, Lusardi, Marjadi, McInnes, McLaws, Nichols, Nicol, Salmon, Samuel, Siebert, White, Yuan	65 codes: minimal to minor concerns about methods of studies contributing 41 codes; moderate to serious concerns about methods of studies contributing 24 codes	58 codes from studies with minimal concerns about relevance; 4 from studies with moderate concerns about relevance; 3 from indirectly relevant studies	38 codes from studies with moderate concerns about coherence; 27 codes from studies with substantial concerns about coherence	25 of 36 studies; 13.3% of total codes. Minor concerns with adequacy based on the support for each finding provided in the primary research reports	Moderate	Proportionately more studies with minimal/minor concerns about methods and minimal concerns about relevance represented: higher proportion of codes from studies with moderate vs. substantial concerns about coherence; minor concerns with adequacy; just over 2/3 of studies represented in this finding
HCW reported that total compliance is not possible or practical given the realities of daily practice. HCW report actual and observed use of gloves as a time-saving alternative although often with less accompanying use of cleaners or sanitisers than is recommended; additionally, HCW reported that gloves are at times changed less frequently than recommended.	Barrett, Boog, Cole, Dixit, Dyson, Eveillard, Hill, Jang (a), Jang (b), Joshi, Lee, Lusardi, Marjadi, McInnes, McLaws, Nichols, Pan, Patterson, Salmon, Samuel, Siebert, White, Zimmerman	54 codes: minimal to minor concerns about methods of studies contributing 33 codes; moderate to serious concerns about methods of studies contributing Boog codes	46 codes from studies with minimal concerns about relevance; 5 from studies with moderate concerns about relevance; 3 from indirectly relevant studies	2 codes from the study with minimal concerns about coherence; 31 codes from studies with moderate concerns about coherence; Boog codes from studies with substantial concerns about coherence	24 of 36 studies; 11.1% of total codes. Minor concerns with adequacy based on the support for each finding provided in the primary research reports	Moderate	More contributing studies with minimal/minor concerns about methods vs. moderate/serious concerns; higher proportion of codes from studies with minimal to moderate concerns about coherence; minor concerns with adequacy; 2/3 of studies represented in this finding

(continued)

Table 2. (Continued)

Review finding	First authors of included studies	Methodological assessment	Relevance	Coherence	Adequacy (488 total codes)	Overall confidence in finding	Explanation of rating
HCW reported that known surveillance is likely to improve compliance but indicated concerns with accuracy, communication and use of data gathered by electronic monitoring systems. However, there was not consensus among HCW in the sample regarding effectiveness of use of consequences (reward, punishment) in response to hand hygiene compliance.	Boscart, Brown, Bryce, Dawson, Dyson, Ellingson, Jang (b), Johnson, Jones, Joshi, Lusardi, McInnes, McLaws, Pan, Salmon, Samuel, White, Yuan	46 codes: minimal to minor concerns about methods of studies contributing 26 codes; moderate to serious concerns about methods of studies contributing Barrett codes	36 codes from studies with minimal concerns about relevance; 8 from studies with moderate concerns about relevance; 2 from indirectly relevant studies	26 codes from studies with moderate concerns about coherence; Barrett codes from studies with substantial concerns about coherence	18 of 36 studies; 9.4% of total codes. Moderate concerns with adequacy based on the support for each finding provided in the primary research reports	Low	More contributing studies with minimal/minor concerns about methods vs. moderate/serious concerns; half of studies represented; slightly more codes from studies with minimal vs. substantial concerns about coherence; very low proportion of total codes; mixed findings from the studies themselves
HCW reported that compliance with hand hygiene is a patient care practice that should be ubiquitous. HCW also reported that over time engaging in hand hygiene becomes an automatic behaviour.	Boscart, Brown, Cole, Dixit, Dyson, Eveillard, Hill, Jang (a), Jang (b), Johnson, Lusardi, McLaws, Nicol, Pan, Siebert, White, Yuan	36 codes: minimal to minor concerns about methods of studies contributing 25 codes; moderate to serious concerns about methods of studies contributing 11 codes	27 codes from studies with minimal concerns about relevance; 9 from studies with moderate concerns about relevance	2 codes from the study with minimal concerns about coherence; 18 codes from studies with moderate concerns about coherence; 16 codes from studies with substantial concerns about coherence	18 of 36 studies; 7.3% of total codes. Moderate concerns with adequacy based on the support for each finding provided in the primary research reports	Low	Half of studies represented; somewhat more codes from studies evidencing minimal to moderate concerns about coherence; very low proportion of total codes

(continued)

Table 2. (Continued)

Review finding	First authors of included studies	Methodological assessment	Relevance	Coherence	Adequacy (488 total codes)	Overall confidence in finding	Explanation of rating
HCW reported that both hand hygiene behaviour and willingness to confront non-compliant others is influenced by hierarchy of staff within facilities. HCW reported that nurses are frequently perceived as beneath physicians; students reported that they perceived themselves as at risk if confronting non-compliant healthcare professionals.	Barrett, Boscart, Brown, Bryce, Cole, Dixit, Erasmus, Jang (a), Jang (b), Lusardi, McInnes, McLaws, Nichols, Pan, Salmon, White, Yuan, Zimmerman	34 codes: minimal to minor concerns about methods of studies contributing 24 codes; moderate to serious concerns about methods of studies contributing 10 codes	30 codes from studies with minimal concerns about relevance; 3 from studies with moderate concerns about relevance; 1 from an indirectly relevant study	24 codes from studies with moderate concerns about coherence; 10 codes from studies with substantial concerns about coherence	18 of 36 studies; 7.0% of total codes Substantial concerns with adequacy based on the support for each finding provided in the primary research reports	Low	Half of studies represented; proportionately more codes from studies with moderate vs. substantial concerns about coherence; very low proportion of total codes
HCW reported beliefs that are inconsistent with scientific evidence and are not necessarily swayed by presentation of evidence.	Brown, Bryce, Cole, Dawson, DeAbreu Botene, Dixit, Dyson, Erasmus, Jang (b), Joshi, Marjadi, McInnes, Nichols, Nicol, Salmon, Siebert	29 Codes: minimal to minor concerns about methods of studies contributing Barrett codes; moderate to serious concerns about methods of studies contributing 9 codes	24 codes from studies with minimal concerns about relevance; 3 from studies with moderate concerns about relevance; 2 from indirectly relevant studies	18 codes from studies with moderate concerns about coherence; 11 codes from studies with substantial concerns about coherence	19 of 36 studies; 6.0% of total codes Substantial concerns with adequacy based on the support for each finding provided in the primary research reports	Low	Just over half of studies represented; somewhat more codes from studies with moderate vs. substantial concerns about coherence; very low proportion of total codes
HCW reported that dislike of the sensation of alcohol-based hand sanitisers and potential or actual skin irritations associated with sanitisers, are barriers that prevent compliance with hand hygiene policies.	Barrett, Cole, Erasmus, Jang (b), Lee, McLaws, Pink, Salmon, Samuel, White	13 codes: minimal to minor concerns about methods of studies contributing 9 codes; moderate to serious concerns about methods of studies contributing 4 codes	12 codes from studies with minimal concerns about relevance; 1 from studies with moderate concerns about relevance	9 codes from studies with moderate concerns about coherence; 4 codes from studies with substantial concerns about coherence	10 of 36 studies; 2.6% of total codes Substantial concerns with adequacy based on the support for each finding provided in the primary research reports	Low	Less than 1/3 of studies represented; proportionately more codes from studies with moderate vs. substantial concerns about coherence; very low proportion of total codes

* This percentage is reported for each finding and represents the manifest frequency, an effect size analog.

Figure 1. Modified Critical Appraisal Skills Programme (CASP) qualitative research checklist.

Identification	Item #	Item/ Guiding questions	Score 0-5	Score 0-5	Avg	Comments (pls initial any comments)
Author/authors:	1	The authors made a clear statement of the aims of the research <i>What was the goal? What is the relevance?</i>	5	5	5	
Publication date:	2	The authors established the appropriateness of a qualitative methodology <i>Did the authors seek to interpret or illuminate the actions and/or subjective experiences of research participants? If a prior theory or frameworks were described, did these appropriate for the described qualitative research method or methodology?</i>	3	1	2	
Context/location:	3	The authors described the research design <i>Did the authors describe a qualitative methodology or research design? Did the authors justify the research design?</i>	3	1	2	
Reviewer #1 Initials:	4	The authors identified the sampling/recruitment strategy <i>Did the authors explain how participants were selected? Did the authors describe why the participants selected were most appropriate to provide knowledge sought by the study?</i>	2	0	1	
Reviewer #2 Initials*:	5	The authors described how the data were collected and processed <i>Did the authors provide detail about how data were collected? Did the authors identify what form of data were used? Did the authors describe steps in transcription, translation, or other data processing?</i>	1	1	1	
*hide reviewer #1 column while performing review	6	The authors described the relationship between authors and participants <i>Did the authors critically examine and described his/her/their own role, potential bias and influence during formulation of the research question and data collection?</i>	0	1	0.5	
	7	The authors described how ethical issues had been taken into consideration <i>Did the authors describe how research was explained to participants? Was approval secured from the appropriate ethics committee?</i>	1	1	1	
	8	The authors provided an in-depth description of how the data were analyzed and by whom <i>Is there any in depth description of the analysis process? Did the authors use any quality control measures? If applicable, is it clear how themes or categories were derived? Did the data analysis process fit the qualitative methodology?</i>	1	1	1	
	9	The authors clearly stated explicit findings <i>Did the authors present evidence for findings? Did the authors discuss credibility of findings? Did the authors discuss how the findings relate to the aims of the research?</i>	2	2	2	
	10	The authors clearly described the value of the research <i>Did the authors describe the contribution of the study to existing knowledge? Did the authors identify directions for further research? Did the authors discuss relevance or limitations of these findings?</i>	4	3	3.5	
		Totals	22	16	19	
		Score 0-10	Score 0-10	Avg		

"CASP Qualitative Research Checklist" by CASP, used under CC BY 2.0/Scoring added by the authors

2015, p. 6). We used the following primary descriptive categories: minimal concerns about relevance; and moderate concerns about relevance. We added one category—indirect relevance—because we felt it was the most accurate description for studies that peripherally addressed our specific concern within an alternative focus area. Because we assertively pre-screened our sample, we included 26 reports within the category minimal concerns about relevance. We classified an additional seven reports as moderate concerns about relevance because hand hygiene was only one of multiple infection control concerns described. We considered three reports to illustrate indirect relevance due to primary focus on other subject matter including the impact of room design on hand hygiene practice (Boog et al., 2013; Patterson et al., 2014) or consideration of hand hygiene as a multi-site initiative (Bryce et al., 2014). Relevance ratings are shown by source in Table 1 and their impact on finding confidence ratings is described in Table 2.

The GRADE-CERQual criterion coherence refers to 'the extent to which the review finding is grounded in data from the contributing primary studies and provides a convincing explanation for the patterns found in these data' (Lewin et al., 2015, p. 6). Our goal for this criterion was to assess the coherence of all the data from the primary studies or report that support each review finding. We began by assessing evidence authors provided for findings within studies and then we considered coherence across studies per review finding. We classified our interpretation of

evidence as: minimal concerns with coherence; moderate concerns with coherence; or substantial concerns with coherence. We included only one study, Hill et al. (2014), within the category minimal concerns with coherence. Authors of the 17 studies we classified as inspiring moderate concerns with coherence did not always draw a logical link between data and findings, and sometimes lacked detailed descriptions of one or more elements of data processing and analysis. The 18 studies we categorised under substantial concerns with coherence did not, in our view, consistently include ample evidence for presented findings and, along with this, often lacked detailed information about how data were collected, processed and/or analysed. Coherence ratings are shown by source in Table 1 and their impact on finding confidence ratings is described in Table 2.

Adequacy of data is the fourth GRADE-CERQual criterion and Lewin et al. (2015) described this as 'an overall determination of the degree of richness and quantity of data supporting a review finding' (p. 6). We considered and rejected use of sample size in the primary research studies to partially assess this criterion for two reasons. First, the studies included participants in individual and group interviews, and based on our own prior research experiences, we do not necessarily believe that potential to collect rich or expansive data is similar across both types of participants. Second, there were conditions in several studies that made it difficult to derive an accurate participant count, including that Bryce et al. (2014) conducted multiple

interviews per participant, Lee (2013) reported that she stopped short of interviewing all recruited participants because saturation was reached in the analysis, Hill et al. (2013) and Marjadi and McLaws (2010) included non-HCW in group interviews and one report published as a letter to a journal editor (Jang et al., 2010a) provided range and median numbers of group interview participants only. We believed these variations undermined our ability to rely on sample sizes within the sample studies to compare 'rich' data across studies, so we based our adequacy assessment instead on the number of studies containing each finding along with the proportion of coded excerpts assigned to the finding compared to the total number of coded excerpts. This proportion is also referred to as manifest frequency and is presented by Sandelowski and Barroso (2007) as a qualitative analog to statistical effect size. We used these measures to assign categorical assessments of adequacy as follows: minimal concerns, minor concerns, moderate concerns, or substantial concerns with adequacy of data. The impact of adequacy on finding confidence ratings is described in Table 2.

We considered each of these four criteria in combination to assign a confidence rating for each finding and categorised confidence in each developed finding as low, moderate or high.

Data analysis

Because we use the term findings to refer to the results of integrated data analysis, we will refer to the coded findings from each individual report as excerpts. We collectively conducted a process of data analysis in order to derive the relevant excerpts from each research report. We were guided by the extraction process described by Sandelowski and Barroso (2007) and considered eligible excerpts from each research report to be specific reported assertions based on authors' analysis of the data collected for that research study. We also attempted to distinguish between participants' descriptions of themselves as agents and descriptions of observations, opinions or prescriptions related to actions of others, and to reflect this within our aggregate findings.

We used Dedoose version 7.0.2 (Dedoose, 2016) to conduct qualitative coding of excerpts and to compile applicable information to allow us to apply each GRADE-CERQual criterion described above. We used the Dedoose descriptor function to classify reports based on the GRADE-CERQual criteria, as well as other descriptors of interest including study location, design, type of participants, type of data and presentation of results.

We coded by selecting applicable excerpts on the research reports, which were directly imported into the Dedoose software program. We developed the initial codes using open and inductive coding. We followed guidance provided by Gibbs (2007) and, while considering each excerpt, developed a slightly broader, more abstract category label, then

used this label as the initial code. We entered a description of each code and then reviewed each subsequent report in the sample for representative excerpts that might fit under pre-existing codes. Through this process we also created new codes, refined the descriptions of existing codes and combined codes (noting this in the code description) as needed to better represent the data. We assigned each excerpt a single code that we determined was the best fit. We avoided assigning more than one code per excerpt because that would confound the calculation of an effect size analog. We coded each excerpt only one time per source although we reviewed the authors' presentation in full while considering the adequacy of data criterion. After the first bout of coding, we reviewed the first cycle of codes and associated excerpts to identify overlap and association. We clustered similar codes together, documented the combinations within Dedoose and again reviewed the excerpts associated with each cluster for consistency. We continued to form clusters until we had what we believed was an exhaustive set of code clusters. We developed each cluster into one or more summary finding statements by referring to the code labels, the code definitions, other codes that had been merged into the cluster and the excerpts contained in each cluster. We modelled our finding statements on examples provided by Lewin et al. (2015).

Results

Sample profile

Summary information about type of research report, type of facility, qualitative design, use of existing behaviour or other theory, and classification of findings in the sample articles is contained in this section. Locations, type of participants, type of facility and method of data collection are included in Table 1.

The reports represented two brief research reports submitted as letters to the editor (Eveillard et al., 2013; Jang et al., 2010a); one published conference abstract (Jones et al., 2015); one published conference paper (Patterson et al., 2014); one report of a research study embedded in a published technical report (Zimmerman et al., 2013). The remaining 31 sources were published empirical research studies.

Authors of nine of the 36 research reports described their research in terms of an established qualitative methodology. Marjadi and McLaws (2010), McInnes (2014) and Nicol et al. (2009) described use of grounded theory. Cole (2009) and Ellingson et al. (2011) described their respective research studies as mixed methods and presented both qualitative and quantitative data. De Abreu Botene and Pedro (2014) and Yuan et al. (2009) described their research as descriptive; Barrett and Randle (2008) characterized their study design as interpretive descriptive. Pink et al. (2014) used an ethnographic design. Authors of the remaining 27 reports referred to the research design as analogous to the

data collection method (e.g. interview research, focus group research, etc.).

Qualitative research is frequently considered to be an exploratory or inductive method, although authors of sources in our sample applied theory in various ways. Authors of six research reports (Boscart, et al., 2012; Dixit et al., 2012; Dyson et al., 2011; Erasmus et al., 2009; Nicol et al., 2009; White et al., 2015) derived interview guide items from existing health behaviour theories and/or coded data into previously identified and defined theoretical constructs. Nicol et al. described their research design as grounded theory although analysis was guided by the theory of planned behaviour. Hill et al. (2013), Pan et al. (2014) and Zimmerman et al. (2015) referred to existing health behaviour theories as frameworks for their research although these theories were not used to guide data analysis. Brown et al. (2014) used Bourdieu's concept of habitus to frame both data collection and interpretation. Authors of 26 research reports did not employ a theory testing design or use theory to guide analysis. Authors of six of these 26 studies (Dawson, 2015; Dyson et al., 2011; Lusardi, 2007; Marjadi and McLaws, 2010; Pan et al., 2014; Salmon and McLaws, 2015) proposed new theories or developed conceptual models to explain or illustrate their findings. Authors of two of the 26 studies (Barrett and Randle, 2008; Cole, 2009) compared and contrasted their developed findings with existing psychological or behavioural theories.

We categorised the reports of findings based on the continuum of qualitative research findings described by Sandelowski and Barroso (2007). Segments on this continuum range from least abstracted findings, described as 'no findings' (p. 134) reports to the most abstract findings, described as 'interpretive explanation' (p. 134) in which authors have presented a coherent theory to explain the phenomena of interest. We considered authors' presentations in five reports (Barrett and Randle, 2008; Brown et al., 2008; Nicol et al., 2009; Pink et al., 2014; Zimmerman et al., 2013) to represent interpretive explanation. We classified findings from four reports (Bryce et al., 2008; Lusardi, 2007; McInnes, 2014; Nichols and Badger, 2008) as thematic survey. According to Sandelowski and Barroso, this segment of the continuum includes reports that demonstrate less transformation than interpretive explanation and are characterised by a set of fragmented or partial interpretations that are not fully developed into a unified theory. Findings from the remaining 27 reports included in our sample were expressed as what Sandelowski and Barroso termed topical surveys, characterised by presentation of findings or results as lists or broad categories, generally developed based on quantitative measures, such as frequency of occurrence.

Due to the prevalence of topical findings within the reports in our sample, a descriptive presentation to integrated results or meta-summary approach to the findings (Sandelowski and Barroso, 2007) is most appropriate. A

meta-summary can be distinguished from a meta-synthesis by expression of findings in descriptive rather than interpretive terms.

We extracted and coded a total of 488 individual excerpts that reflected assertions authors of these reports made based on their data. The greatest number of coded excerpts from a single source was 42, extracted from Jang et al. (2010b) and the smallest number was four, extracted from each of three reports: De Abreu Botene and Pedro (2014); Hill et al. (2013); Lee (2013). The mean number of excerpts coded per research report was 13.86 (standard deviation = 8.38).

We present and develop our nine integrated findings in the following section and provide the final confidence rating based on the GRADE-CERQual criteria. We present the findings in order of our final quality rating within the categories high, moderate and low. The summary of ratings that comprised the confidence rating and the list of sources representing each finding are contained in Table 2.

High confidence findings

H1. Adequate hand hygiene training for HCW is available but content and reach could be enhanced. Many intervention studies incorporated training or educational components although the participants in the sample reports expressed that hand hygiene knowledge was not necessarily lacking, also that lack of knowledge was not necessarily a contributing factor in lower than ideal compliance rates. Participants suggested that knowledge gaps were most likely to exist in non-professional staff, such as housekeeping, or among patients and patients' family members, and that training directed at those individuals could potentially help reduce HCAI rates.

H2. Management support, evidenced through provision of human and hygiene resources is necessary but frequently lacking. Within this relatively broad category we clustered excerpts that spoke to the need for healthcare management, defined in most of our sample articles as the upper, non-practitioner level of facility or health system administration, to facilitate availability of ample staff and resources, including hand hygiene products, and to demonstrate concern and support for hand hygiene as a vital practice that contributes toward reduction of HCAI. A related finding we identified was that HCW noted that it is important to solicit input from those who are charged with providing direct care in order to encourage 'buy-in' from lower levels of the organisational structure.

Moderate confidence findings

M1. Subjective risk assessment influences hand hygiene practice. Participants in most studies reported a hand hygiene decision process that was influenced by individual or subjective assessments of risk, often to self, that included perceptions of relative cleanliness or dirtiness of a patient

or procedure, and, in some cultures, perceived social status of patients. This could serve to encourage hand hygiene, in the instance of open sores or wounds, or to deter it, if HCW feared offending patients through engaging in obvious hand hygiene.

M2. It is not possible nor practical to fully comply with hand hygiene policies. HCW in various settings suggested that there is not ample time to manage patient care appropriately and to simultaneously engage in frequent hand hygiene. Related to this is the finding that gloves are viewed by many as a common alternative although participants described regular instances of others' overuse of a single pair of gloves as well as observations of HCW who failed to engage in hygiene before and after gloving.

Low confidence findings

L1. Known surveillance, whether via personal or electronic monitoring, improves hygiene practice. Despite the recurrence of this finding, participants expressed concern about the accuracy of electronic monitoring systems. HCW in our sample of studies expressed mixed opinions about the effectiveness of consequences associated with surveillance.

L2. Compliance with hand hygiene should be an instinctive part of care and will become an automatic behaviour through time and experience. Some participants expressed questions about the need for either training or monitoring, asserting that hygiene practice is natural and should be intrinsically motivated. Participants acknowledged that this was not always the case in real world practice.

L3. The inherent hierarchical nature of healthcare settings interferes with workers' willingness to remind each other to engage in hygiene. Some participants reported that physicians are not amenable to reminders from nurses, and both medical and nursing students described concern over being seen as not following norms established by the experienced professionals. In one instance, however, a student nurse reported being chastised by a lower-tier worker for spending too much time on hygiene.

L4. HCW described some beliefs about hand hygiene that are not supported by research. Participants suggested that better evidence was needed to clearly link hand hygiene to HCAs. Participants also questioned the value of complying with hygiene policies in certain circumstances, for example, when leaving a room without having had physical contact with a patient. Additionally, HCW reported that facility HCAI data were not useful when not made available in a timely way or not provided with ample detail. This resulted not so much distrust of data as in lack of confidence in data because it lacked context.

L5. Discomfort or irritation associated with the use of alcohol-based sanitisers is a disincentive of use of these products. Participants were more likely to ascribe this response to others than to themselves, which is consistent with the relatively low prevalence of this finding.

Discussion

Our purpose in conducting this review was to produce the first report of integrated findings from qualitative research on hand hygiene among HCW worldwide in order enhance the findings provided in prior reviews of hand hygiene research and to provide potential areas for future research. Additionally, we believe we improved the credibility of these reported findings through our use of the GRADE-CERQual process. In this section, we first discuss our findings in light of previous review findings. Following, we offer recommendations for potential further investigation based on these findings and our participation in this review process. We conclude this section with a brief reflection on our experience in applying the GRADE-CERQual process that we believe might be of interest to other researchers considering qualitative research synthesis.

Erasmus et al. (2010), in their systematic review, focused on primary studies that investigated compliance with hand hygiene in hospital settings. Erasmus et al. concluded compliance was lower when activity levels were higher, consistent with our finding M2, and higher compliance also resulted when tasks perceived as dirty were required, consistent with our finding M1. Erasmus et al. also concluded, based on their sample, that most results from prior research were derived from direct observation. While it was not represented in all our review studies, participants in those studies we reviewed who were familiar with electronic monitoring systems (Boscart et al., 2012; Dawson, 2015; Ellington et al., 2011; Yuan et al., 2009) expressed the potential for this type of technology to improve compliance, described in our finding L1.

Cherry et al. (2012) focused on educational interventions and concluded that studies included in their review did not provide ample detail to assess specific content that might be more or less effective, although the authors asserted that participation in education was likely to result in improvements in compliance. Our review finding H1 is not entirely consistent with the findings from Cherry et al. We suggest that HCW reported their knowledge about hand hygiene practices is sufficient. Although our findings and the prior review findings differ, one profound difference between the samples in these two studies is range of publication and study dates. Research included in Cherry et al. occurred between 1997 and 2009, with many studies conducted in the early 2000s, while our sample included publication dates ranging from 2008 to 2015, with most publication dates representing the early 2010s. We offer that a great deal of academic research and media reports have emerged during the first decade of the 21st century such that awareness of potential links between HCAI and infection control practices, including hand hygiene, is likely to be far greater.

Recommendations from prior meta-studies including use of educational interventions and strategies such as goal setting and provision of feedback to encourage changes in

individual behaviour patterns with regard to hand hygiene. Our findings suggest practitioners and researchers explore additional directions. Rather than provision of ongoing hand hygiene instructional material, we recommend facility management explore ways to demonstrate support for and priority on the role of hand hygiene as an infection control strategy. We suggest that regular availability of hand hygiene supplies is one method of communicating management support although we acknowledge that this can be a serious challenge in resource poor areas.

Other previous recommendations are directed at individual behaviour change. While our finding M1 speaks to individual decision-making processes, we do not necessarily view a clear link between this type of decision process and the most highly recommended intervention strategies that focus on goal setting or provision of feedback. To address both management support and individual decision-making, we suggest, therefore, that future researchers working within various methodologies conduct investigative efforts to identify both the tangible and perceived elements of optimal hospital cultures and develop methods to begin to duplicate these conditions elsewhere. This is not a simple recommendation, as it is likely to require a great deal of cooperation at the level of upper management, and availability of this cooperation is likely to vary depending on the complexity and elements of both organisational and local culture within any given healthcare system.

Our findings suggest that electronic monitoring, which is becoming more available, elicits a varied response from HCW. Among concerns are possible inaccuracy of data and use of inaccurate data for punishment or rewards. We suggest, based on this and other findings from our research, that use of any type of tracking and reporting, whether for compliance or infection rates, is more meaningful to HCW when useable data are provided promptly. Reports that are incomplete, unclear or delayed are likely to be difficult for individuals to associate with a given time period or even range of dates. We further suggest that establishment of data gathering and reporting systems is another area in which management in healthcare facilities have an opportunity to demonstrate support for infection control efforts as practised by HCW. We encourage healthcare management to regularly elicit input from healthcare professionals to help design reports that are meaningful and likely to be used.

Along with these explicit recommendations, we recommend that researchers consider taking advantage of the range of qualitative designer approaches available, such as various forms of phenomenology, ethnographic or field-work based approaches, or grounded theory, which are often well suited to explore nuance in perceptions and priorities. Several authors of works we reviewed for this research framed qualitative efforts within pre-defined theoretical constructs, but we suggest that the greater strengths of qualitative inquiry are in its ability to explore and begin to fill in knowledge gaps. We encourage authors of future qualitative

research on hand hygiene to consider making greater efforts to interpret, abstract and view findings in a holistic way, rather than presenting free-standing categories. We also believe there is relative loss of potentially 'rich' data when questions are more structured and responses or analyses operate within limited categories. We respectfully offer that, in some instances, efforts designed to assess theoretical constructs might be more efficiently implemented as appropriately powered survey research using existing instruments with established psychometric properties.

A weakness we discovered early in the process is that the CASP form itself is highly dependent on how authors describe their work, although at times authors are not entirely clear or offer inconsistent information. We noted, in particular, a lack of methodological coherence, described by Chenail et al. (2011) as being characterised by inconsistencies among selection of design, type of data, data collection, data analysis and presentation of data. While we acknowledge authors' prerogative to mix methods within and beyond qualitative design, we suggest that provision of descriptions and justifications for methods and design decisions improve reader understanding of and confidence in the work and might also encourage evolution of qualitative research approaches.

Two areas repeatedly received the lowest scores on the CASP instrument: relationship between researcher and participants; and a description of how ethical issues were addressed in the research. We offer that information about the relationship between interviewer and interviewed is important in several of the contexts represented in these studies, because, for example, perceived ability to contribute to students' grades or employees' evaluations might influence responses. We did not anticipate the low score for research ethics given that individuals with ties to academic institutions conducted most research in our sample, and both institutions of higher learning and healthcare facilities have research review boards. We do not know to what extent lack of reported information is associated with lack of consideration or with assertive editing to achieve journal word count limits. It is our hope and expectation that increasingly availability of online articles and/or supplemental information will encourage editors and authors to make available more detailed information that addresses the ethical and quality control elements of qualitative research processes.

Despite the relatively time-consuming nature of use of the GRADE-CERQual process, we believe that the greatest value was in our ability through this process to weight findings based on criteria other than just frequency. While each of these criteria has subjective elements, we believe our reliance on the descriptions provided by Lewin et al. (2015) facilitated our ability to apply these assessments in a systematic and consistent way. Our use of Dedoose software greatly enhanced our ability to organize a large data corpus. Other qualitative analysis programs likely offer similar functions but an advantage for this group in using Dedoose was the

web-based nature of the program that was particularly useful while a portion of this work was completed by authors remotely during the end of the year semester break. More detailed information about how we used Dedoose to complete this report is available by contacting the first author.

Limitations and conclusion

The findings in this review reflect our best effort to represent an integration of the data presented in the 36 reviewed studies. There is potential that we omitted relevant items from this review, omitted or misclassified relevant findings from the sample, and/or misinterpreted one or more of the excerpts we selected for our analysis. Our decision to include all identified research with extractable, relevant findings resulted in inclusion of works of potentially varying methodological quality. Methodological quality assessments were based only on information contained within the reports, so it is possible that we placed lower confidence than was appropriate in some of our findings, in particular those derived from sources that were not journal articles, due to lack of detailed data processing or analysis information.

We noted some concerns with the CASP form above and are aware that there are multiple other assessment instruments such as COREQ (Tong et al., 2007), the Joanna Briggs Institute appraisal checklist (Joanna Briggs Institute, 2016) and the approach recommended by O'Brien et al., (2014), each of which likely has strengths and weaknesses. To our knowledge, although authors have described development of these assessment tools, no reports have been published describing assessment of the qualitative analogues of psychometric properties (i.e. credibility, trustworthiness; Flick, 2007) or other desirable attributes such as consistency, for these several quality assessment processes. We suggest that increased efforts toward assessing the assessment tools would help facilitate the process of qualitative research synthesis. Qualitative research synthesis in any discipline has not to date been conducted as frequently as meta-analysis of quantitative research. This could be in part due to the existence of multiple varied although sometimes overlapping qualitative integration procedures (e.g. Noblit and Hare, 1988; Paterson et al., 2001; Sandelowski and Barroso, 2007), lack of consistent presentation of findings among authors of qualitative research and the proportionately small number of available examples of published qualitative integrated studies.^a We

^a We conducted a search of multiple social science databases using multiple terms for qualitative meta-studies (e.g. meta-summary, meta-ethnography, etc.) while specifying no subject matter or discipline-specific keywords, and identified 3642 published articles, a portion of which reflected descriptions or directions rather than research studies. Using the same databases and the term meta-analysis, our search yielded 120,276 published articles, although again this included a number of articles about the process.

hope our contribution to available qualitative research synthesis helps illustrate the value of this work and encourages others to conduct similar studies.

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