



High reliability organisations and collective mindfulness for improving healthcare safety management: a scoping review protocol of factors, measures and instruments

Manikam Pillay^a, Andrew Enya^b, Emmanuel Boateng^c

^aSchool of Health Sciences, University of Newcastle, AU (Manikam.Pillay@newcastle.edu.au) ORCID: 0000-0002-7010-277X, ^bSchool of Health Sciences, University of Newcastle, AU (Andrew.enya@newcastle.edu.au) ORCID: 0000-0002-2355-4239, ^cSchool of Health Sciences, University of Newcastle, AU (Emmanuel.bannorboateng@newcastle.edu.au) ORCID: 0000-0002-6434-0085

Article History

Received 29 May 2019
Accepted 18 June 2019
Published 30 June 2019

Keywords

Collective mindfulness
High-reliability organisations
PRISMA
Scoping review

DOI:

[10.2480/2184-0954_003.002_0002](https://doi.org/10.2480/2184-0954_003.002_0002)


ISSN:

2184-0954

Type:

Protocol

 Open Access

 Peer Reviewed

 CC BY

Abstract

A growing body of peer-reviewed studies demonstrate the importance of high-reliability organisations and collective mindfulness in improving healthcare safety. However, limited attention has been devoted to developing a common set of characteristics, dimensions, indicators and instruments for measuring collective mindfulness. This can limit its operationalisation and ability to benchmark. This protocol outlines the key procedures that will be used to conduct a scoping literature review, in order to summarise key definitions; identify theoretical underpinnings, dimensions, measures and instruments; and develop a theoretical model to advance research and practice. Specifically, a five-step process and the Preferred Reporting Instruments for Systematic and Meta-Analyses will be used to search, screen and select literature published in five electronic databases. Keywords will include a combination of 'high-reliability organisations', 'high-reliability theory' with 'health care', 'patient safety', 'medical errors', 'medical mistakes', 'medication error'. A double-blind process will be used for searching, screening and selection of abstracts and full-articles, and inter-observer agreement assessed using Cohen's kappa.

1. INTRODUCTION

Safety management is an important issue in the healthcare industry. The Australian government has identified this as one of the priorities industries for action under the Australian work health and safety strategy ([Safe Work Australia, 2012](#)). Currently the industry is the largest employer, accounting for thirteen percent of total employment, but sixteen percent of serious workers' compensation claims ([Safe Work Australia, 2018](#)). The Australian Institute of Health and Welfare ([2016](#)) has also identified safety as a key performance area of attention, with a focus on reducing human error and harm, which was one of the main areas identified by the Institute of Medicine (IOM) ([2000](#)). The report also highlighted that harm to patients was often the result of both system and individual level errors, and addressing these required more than the efforts of doctors and nurses ([Affare, Tolk, & Cantu, 2015](#)). The IOM referred to High reliability organisations (HROs) as a model the health care sector needed to emulate.

HROs are able to manage and sustain a nearly-error free operation despite operating in highly complex and uncertain environments where the consequences of errors can be catastrophic ([Enya, Dempsey, & Pillay, 2018](#); [Hopkins, 2009](#); [Lekka, 2011](#)). The term was first introduced in the 1980s by a group of the University of California, Berkeley researchers as an alternative to Normal Accident Theory (NAT) suggested to be the case of the nuclear disaster at Three Mile Island ([Perrow, 1981](#)).

The basic tenet of NAT was that accidents were inevitable in tightly-coupled complex technological systems because complexity yielded unexpected interactions leading to rapid escalation of multiple failures in ways that could not be foreseen by the designers nor comprehended and intervened in by operators. Perrow posited that accidents in these types of systems were normal and inevitable because they had become so complex and tightly-coupled such that a small event could trigger a series of cascading failures in many parts of the system, leading to an eventual disaster (Perrow, 1999). However, a group of Berkeley researcher's contended there were some organisations that could be deemed complex and tightly-coupled, but had achieved excellent safety and production goals (Hopkins, 2009). These authors argued that organisational accidents in such organisations were able to be prevented, controlled or managed effectively by implementing a number of organisational practices. These practices have since been associated with 'collective mindfulness'; a cognitive mindset that is characterised by pre-occupation with failure, reluctance to simplify, sensitivity to operations, commitment to resilience, and deference to expertise (Enya, Pillay, & Dempsey, 2018; Hopkins, 2009; Weick & Sutcliffe, 2011). Conceptually, HROs have been associated with the fourth age of safety, and collective mindfulness an advanced strategy for safety management (Pillay, 2014, 2015).

Early research on HROs concentrated on a few selected industries ranging from commercial airlines, air traffic control operations, nuclear power plants, amusement parks and wildfire management (Bourier, 2011; Hopkins, 2009). Over the last four decades HRO studies have escalated, with recent reviews examining its utility in construction (Enya, Dempsey, et al., 2018; Enya, Pillay, et al., 2018), major hazard facilities (Lekka, 2011) and healthcare (Tolk, Cantu, & Beruvides, 2013, 2015). These reviews suggests that most research in this area has been published from a qualitative perspective, generating a rich body of knowledge about HROs and the principles of collective mindfulness. However, limited attention has been devoted to developing a common set of characteristics, dimensions, indicators and instruments that can be used to measure collective mindfulness. This can limit its operationalisation and ability to benchmark health care safety management. The proposed review seeks to address this gap. Specific objectives will include:

- a. Identifying and reviewing quantitative research studies on HROs and collective mindfulness published from healthcare settings using a structured, scoping method
- b. Summarising definitions of HROs and collective mindfulness
- c. Identifying any theoretical underpinnings, dimensions, measures and instruments, and
- d. Developing a theoretical model to benchmark and advance research and practice.

2. METHODS

This research involves a scoping review, an approach which has been suggested to be useful for examining "emerging evidence when it was unclear what other, more specific questions can be posed and valuably addressed by more a more precise systematic review" (Munn et al., 2018, p. 2). Some authors have commented that scoping reviews do not assess the quality of studies included (Levac, Colquhoun, & O'Brien, 2010), so this review will include this additional step. The specific approach includes five main stages adapted from Khan, Kunz, Kleijnen, and Antes (2003), Tranfield, Denyer, and Smart (2003) and Hempel, Xenakis, and Danz (2016). These stages include:

- i. Framing the research question(s),
- ii. Searching and selecting relevant literature,
- iii. Quality assessment of included studies,
- iv. Data extraction, and
- v. Data synthesis.

Each of these steps is discussed below.

2.1. Framing the research question

A set of four, interrelated research questions were formulated to achieve the research objectives. These include:

1. How are HROs and Collective mindfulness conceptualised, defined and measured in the healthcare literature?
2. What attributes / factors have been used in quantitative studies of collective mindfulness?
3. What research instruments have been used to measure HRO and collective mindfulness quantitatively?
4. Which statistical tests have informed the quality (in terms of reliability and/or validity) of these studies?

In framing these questions, it was noted that previous authors such as Enya, Dempsey, et al. (2018); Enya, Pillay, et al. (2018) sought to address some of these, their research focussed on the construction industry. This review will focus on the healthcare sector, largely because it is one of the sectors that has been actively engaged in implementing HRO and collective mindfulness.

2.2. Searching and selecting relevant literature

Preferred Reporting Instruments for Systematic and Meta-analysis (PRISMA) guidelines (Liberati et al., 2009; Moher, Liberati, Tetzlaff, Altman, & The PRISMA Group, 2009) will be used for searching and selecting the relevant literature. Five electronic databases (CINAHL, EMBASE, MEDLINE, PsycINFO, and SCOPUS) will be searched, using the keywords / combinations shown in Table 1.

Table 1. Keywords to be researched

"High reliability organisations" "High reliability theory" Collective mindfulness"
"High reliability organisations" AND "health care" OR patient safety* OR medical errors* OR medical mistakes* OR medication error*
"High reliability theory" AND "health care" OR patient safety* OR medical errors* OR medical mistakes* OR medication error*
"Collective mindfulness" AND "health care" OR patient safety* OR medical errors* OR medical mistakes* OR medication error*

The selected articles will be collated in citation files using an EndNote referencing software, and any duplicates removed.

Next, the titles and abstracts will be screened by two reviewers, using a double blind process, based on an agreed inclusion and exclusion criteria.

2.2.1 Inclusion criteria

- All quantitative and mixed method studies.
- Studies published in English.
- Studies which used and/or described an instrument to assess HRO / collective mindfulness.
- Studies which covered and/or focussed on the psychometric properties of the research instrument as part of the development, testing.
- Published from 1 January 2000 to 30 April 2019.

2.2.2 Exclusion criteria

- Studies which used qualitative methods only will be excluded.
- Studies which focussed on non-health care settings will be excluded.
- Studies which focussed on other aspects of reliability will be excluded.
- Opinion papers, editorials, letters to the editor and short communications will be excluded
- Studies published prior to 2000 will be excluded.

Two reviewers will complete the title and abstract screening. Results will be compared and any disagreements will be resolved through discussions until consensus is reached, or in discussion with the senior reviewer. Interobserver agreement will be assessed using Cohen's kappa (Viera & Garrett, 2005).

A similar process will be applied to the full-text searching and selection of articles.

2.3. Quality assessment of included studies

Quality assessment of the selected articles will be assessed by two reviewers using an adapted version of a critical appraisal framework from Critical Appraisal Skills Program previously used by Gillman and Pillay (2017). The questions informing this assessment are presented in Table 2. The results of the assessment will be reported, but no articles will be excluded from the synthesis and reporting based on the assessment.

Table 2. Modified Critical Appraisal Skills Program Questions

1. Aim/s: Was the aim of the research clear?
2. Method: Was the research methodology used appropriate?
3. Design: Did the study design address the aims of the research?
4. Data: Did the data collected address the research aim?
5. Data analysis: Was the data analysis sufficiently rigorous?
6. Bias: Was any bias considered adequately?
7. Findings: Are the findings clearly stated?
8. Gap/s: Have gaps in the literature been clearly identified?
9. Acceptance: Can I accept these findings as true?
10. Value: Can I apply these findings to my own work?

In adapting these tools it was observed that previous systematic reviews (Tolk *et al.*, 2013, 2015) did not report on any risk of bias assessment completed, while Enya, Pillay, *et al.* (2018) used a similar approach as above. A coding scheme of 'yes', 'no' or 'limited' will be used.

2.4. Data extraction

Data extraction from all selected articles will be carried out by one researcher using a specifically designed Excel spreadsheet adapted from Newaz, Jefferies, Davis, and Pillay (2018). These will be cross-checked by two researchers. The following data will be extracted from each study:

- i. Full citation of the original article
- ii. Conceptualisation of HRO
- iii. Study design and sample size
- iv. Research instrument used
- v. Analytical approaches used
- vi. Key findings

2.5. Data Synthesis

A structured, narrative synthesis will be utilised, with the results presented with a summary of findings and assembled tables. Discussions will include the studies' characteristics and findings. Quantitative synthesis, including meta-analysis, will be undertaken if the final list of included studies is sufficiently homogeneous. The overall outcome will be used to provide a synthesised definition and linkages between HROs and collective mindfulness, psychometric variables and measures of collective mindfulness, the instrument used, analytical approaches used. The synthesis will include a theoretical model that can be used to advance quantitative research on collective mindfulness for benchmarking healthcare safety management.

2.6. Meta-biases

This parameter does not apply to the review to be carried out.

2.7. Confidence in cumulative evidence

This parameter does not apply to the review to be carried out.

2.8. Registration

The protocol has not been submitted for registration, consistent with previous reviews of research instruments published on safety culture (Halligan & Zecevic, 2011).

AUTHORS' CONTRIBUTIONS

MP conceptualized, drafted and finalized this protocol. All authors reviewed and provided comments, and approved on the first and revised submissions.

REFERENCES

- Affare, S. C., Tolk, J., & Cantu, J. (2015). *Analyzing healthcare tools practitioners use to implement HRO theory*. Proceedings of the IIE Annual Conference and Expo 2015.
- Australian Institute of Health and Welfare. (2016). Safety and quality in Australian hospitals *Australia's healthseries no. 15*. Canberra: Australian Institute of Health and Welfare.
- Bourier, M. (2011). *The legacy of the theory of high reliability organizations: An ethnographic endeavour*. (Sociograph - Working Paper no. 6 / 2011). Geneva.
- Enya, A., Dempsey, S., & Pillay, M. (2018). High reliability organisation principles of collective mindfulness: An opportunity to improve construction safety management. In P. M. Arezes (Ed.), *Advances in Safety Management and Human Factors* (Vol. 791, pp. 3-13). Cham: Springer International Publishing, AG.
- Enya, A., Pillay, M., & Dempsey, S. (2018). A systematic review on High reliability organisational theory as a safety management strategy in construction. *Safety*, 4(1), 6. doi: <https://doi.org/10.3390/safety4010006>
- Gillman, M., & Pillay, M. (2017). *An integrative literature review: What are the barriers that stop organisations from learning the lessons highlighted in serious incident investigations?* Proceedings of the AHFE 2017 International Conference on Safety Management and Human Factors, July 17–21, The Westin Bonaventure Hotel, Los Angeles, California, USA.
- Halligan, M., & Zecevic, A. (2011). Safety culture in healthcare: A review of concepts, dimensions, measures and progress. *BMJ Qual Saf*, 20(4), 338-343. doi: [10.1136/bmjqs.2010.040964](https://doi.org/10.1136/bmjqs.2010.040964)
- Hempel, S., Xenakis, L., & Danz, M. (2016). Systematic reviews for occupational safety and health questions: Resources for evidence synthesis. Santa Monica, California: RAND Corporation.
- Hopkins, A. (2009). *Learning From High Reliability Organisations*. Sydney: CCH Australia Limited.
- Institute of Medicine (IOM). (2000). To err is human: Building a safer health system. In L. T. Kohn, J. M. Corrigan, & M. S. Donaldson (Eds.), (pp. 312). Washington, DC: The National Academies Press.
- Khan, K. S., Kunz, R., Kleijnen, J., & Antes, G. (2003). Five steps to conducting a systematic review. *Journal of the Royal Society of Medicine*, 96, 118-121.
- Lekka, C. (2011). *High reliability organisations: A review of the literature*. London: Health and Safety Executive,.
- Levac, D., Colquhoun, H., & O'Brien, K. K. (2010). Scoping studies: Advancing the methodology. *Implementation Science*, 5(69). doi: [10.1186/1748-5908-5-69](https://doi.org/10.1186/1748-5908-5-69).
- Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C. D., Gotzsche, P. c., Ioannidis, J. P. A., . . . Moher, D. (2009). The PRISMA statement for reporting Systematic reviews and Meta-analyses of studies that evaluate health care interventions: Explanation and elaboration. *Annals of Internal Medicine*, 151(4), W1-W30.
- Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & The PRISMA Group. (2009). Re-print: preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Physical Therapy*, 89(9), 873-880.

- Munn, Z., Peters, M. D. J., Stern, C., Tufanaru, C., McArthur, A., & Aromataris, E. (2018). Systematic review or scoping review? Guidance for authors when choosing between a systematic or scoping review approach *BMC Medical Research Methodology*, 18(143). doi: <https://doi.org/10.1186/s12874-018-0611-x>
- Newaz, M. T., Jefferies, M., Davis, P., & Pillay, M. (2018). Developing a safety climate factor model in construction research and practice: A systematic review identifying future directions for research. *Engineering, Construction and Architectural Management*, 25(6), 738-757. doi:<https://doi.org/10.1108/ECAM-02-2017-0038>
- Perrow, C. (1981). Normal accident at Three mille island. *Society*, 18(5), 17-26.
- Perrow, C. (1999). Organizing to reduce the vulnerabilities of complexity. *Journal of Contingencies and Crisis Management*, 7(3), 15-155. <https://doi.org/10.1111/1468-5973.00108>
- Pillay, M. (2014). *Progressing zero harm: A review of theory and applications for advancing health and safety management in construction*. Proceedings of the CIB W099 International Health and Safety Conference Lund, Sweden.
- Pillay, M. (2015). Accident causation, prevention and safety management: a review of the state-of-the-art. *Procedia Manufacturing*, 3, 1838-1845. <https://doi.org/10.1016/j.promfg.2015.07.224>
- Safe Work Australia. (2012). *Australian Work Health and Safety Strategy 2012-2022*. Canberra: Safe Work Australia,.
- Safe Work Australia. (2018). *Priority industries snapshot: Health care and social assistance*. Canberra: Safe Work Australia,.
- Tolk, J. N., Cantu, J., & Beruvides, M. (2013). *High reliability organization research: Transforming theory into practice, A literature review for healthcare*. Proceedings of the American Society for Engineering Management International Annual Conference, Minneapolis, MN.
- Tolk, J. N., Cantu, J., & Beruvides, M. (2015). High reliability organization research: A literature review for healthcare. *Engineering Management Journal*, 27(4), 218-237. doi: <http://dx.doi.org/10.1080/10429247.2015.1105087>
- Tranfield, D., Denyer, D., & Smart, P. (2003). Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *British Journal of Management*, 14, 207-222. <https://doi.org/10.1111/1467-8551.00375>
- Viera, A. J., & Garrett, J. M. (2005). Understanding the interobserver agreement: The kappa statistic. *Family Medicine*, 37(5), 360-363.
- Weick, K. E., & Sutcliffe, K. M. (2011). *Managing the unexpected: Resilient performance in an age of uncertainty*: John Wiley & Sons.