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The association between organisational and workplace cultures, and patient outcomes: systematic review

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1 **The association between organisational and workplace cultures, and patient outcomes:**

2 **systematic review**

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21 **Keywords**

22 Health & safety; health policy; public health; quality in healthcare; clinical governance;

23 organisational development.

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ABSTRACT

Design and objectives: Every organisation has a unique culture. There is a widely-held view that a positive organisational culture is related to positive patient outcomes. Following the Preferred Reporting Items for Systematic Review and Meta-analysis Protocols (PRISMA-P), we systematically reviewed and synthesised the evidence on the extent to which organisational and workplace cultures are associated with patient outcomes across a range of healthcare settings.

Setting: A variety of healthcare facilities, including hospitals, general practices, pharmacies, military hospitals, aged care facilities, mental health and other healthcare contexts.

Participants: The articles included were heterogeneous in terms of participants. This was expected as we allowed scope for wide-ranging health contexts to be included in the review.

Primary and secondary outcome measures: Patient outcomes, inclusive of specific outcomes such as decubitus ulcer and pain level, as well as broader outcomes such as quality of care and patient experience.

Results: The search strategy identified 2,049 relevant articles. A review of abstracts using the inclusion criteria yielded 204 articles eligible for full-text review. Sixty-two articles were included in the final analysis. We assessed studies for risk of bias and quality of evidence. The majority of studies (84%) were from the North America or Europe, and conducted in hospital settings (89%). They were largely quantitative (94%) and cross-sectional (81%). The review identified four interventional studies, and no randomised controlled trials. We found that overall, organisational and workplace cultures were consistently associated with a wide range of patient outcomes such as reduced mortality rates, falls and hospital acquired infections and increased patient satisfaction.

49 **Conclusions:** Synthesised, although there was no level 1 evidence, our review found a

50 positive association held between culture and outcomes across multiple studies, settings and

51 countries. This supports the argument in favour of activities which promote positive cultures

52 in health care organisations to enhance care.

53

54 **ARTICLE SUMMARY: STRENGTHS AND LIMITATIONS OF THIS STUDY**

55 • The high volume of included studies provides a solid foundation for readers to

56 enhance their knowledge of organisational culture in healthcare.

57 • Most articles included in the final synthesis were rated as high quality, based on the

58 Quality Assessment Tool.

59 • The broad scope of the review, including a wide-ranging search strategy, provided an

60 overarching account of the research topic.

61 • Definitions and measurements of culture, climate, environment and patient outcomes

62 were highly variable across studies, which placed limits on the comparisons that could

63 be drawn.

64 • This review aimed to investigate the association between organisational and

65 workplace culture, and patient outcomes across a *variety of health settings*, however,

66 most included studies consisted of observational, cross-sectional studies conducted in

67 hospital environments.

68

69   **The association between organisational and workplace cultures, and patient**

70   **outcomes: systematic review**

71

72   **INTRODUCTION**

73   Amongst policymakers, managers and clinicians, culture is a much-discussed construct. The

74   discourse is often centred on normative considerations, proposing that an effective, functional

75   or productive culture is preferable to one that is ineffective, dysfunctional or even toxic. A

76   healthier organisational or workplace culture is believed to be related to positive patient

77   outcomes, such as reduced mortality and length of stay, increased quality of life and

78   decreased pain level.[1, 2] However, no review has been conducted to weigh the evidence for

79   such beliefs. We examined the extent to which this putative association between culture and

80   patient outcomes holds in healthcare settings.

81   Across the literature, culture has been defined through numerous models.[2-8] Based

82   on these works, we define culture as the sum of shared characteristics, values, thinking and

83   behaviours of people in organisations.[2] For this systematic review, culture is classified in

84   two ways. The first category concerns the overarching culture of an organisation, including

85   consistent practices, beliefs and attitudes, for example, within a whole hospital, general

86   practice group, aged care facility or other setting.[9, 10] The second category relates to more

87   localised cultural dimensions; workplace cultures, which are specific to group characteristics

88   of the organisation, for example those subcultures that manifest in wards, departments, or

89   within employee groups such as doctors, allied health professionals, or nurses.[6, 11, 12]

90

91   **Box 1: Definitions**

92 **Cohen's Kappa:** A statistic commonly used to measure interrater reliability; that is, the

93 extent to which individual rater's scores agree whilst accounting for chance agreement.[13]

94 **Complex adaptive systems (CAS):** A multi-dimensional enterprise displaying principles

95 such as self-organisation, emergent behaviour, and the capacity to evolve and adapt.[14]

96 **Organisational culture:** The values, behaviours, goals, attitudes and beliefs shared across an

97 entire organisation.[15]

98 **Patient outcomes:** The downstream consequences of patient care. These can be positive

99 (e.g., satisfaction with care, reduced length of stay) or negative (e.g., disability, hospital

100 acquired infection).[16]

101 **Quality of care:** Within a healthcare environment, there are many facets of quality of care.

102 Types of care that can be assessed include the technical and judgement skill provided by the

103 physician, and the interpersonal care received from healthcare professionals.[17]

104 **Quality of study:** The extent that the study design and the manner in which it is executed are

105 protective from bias and error.[18]

106 **Risk of bias:** The potential of a systematic deviation from facts; an error.[18]

107 **Workplace culture:** A specific type of sub-culture involving an identifiable grouping within

108 an organisation. In healthcare, such a 'workplace' may be a unit, ward or department, or a

109 professional group, e.g., medicine or nursing.[19]

110 **Work environment**: The structural, social and implicit characteristics of the context in

111 which work is done.[20] For the purposes of this review, only cultural elements of workplace

112 environment were considered e.g., cooperation and sense of cohesiveness between the work

113 team. Structural characteristics such as nurse to patient ratios, and employee characteristics

114 such education, were not included in our definition of work environment.

5

115

116   We aimed to investigate ways in which organisational and workplace cultures are

117   associated with patient outcomes across a range of healthcare settings. On the basis of the

118   foregoing,[2, 16, 21] we formulated a hypothesis: *positive organisational cultures are related*

119   *to positive patient outcomes and vice versa.* We anticipated that this would provide

120   information for those, such as policymakers, managers, clinicians, researchers, and patient

121   groups who seek to understand, shape or enhance healthcare cultures or subcultures. We

122   expected that such an analysis would provide insights into the evidence for culture and sub-

123   cultures, and recognise that cultures are deeply embedded in Complex Adaptive Systems

124   (CASs) which define health settings in terms of their interacting agents, capacity to evolve

125   and adapt, and emergent behaviours.[14, 22]

126

127   **METHODS**

128   The review was carried out in accordance with the Preferred Reporting Items for Systematic

129   Review and Meta-analysis Protocols (PRISMA-P) statement.[23] Our search strategy

130   consisted of terms pertaining to patient outcomes, inclusive of specific outcomes such as

131   decubitus ulcer and pain level, as well as broader terms such as quality of care and patient

132   experience; organisational and workplace culture; and healthcare. The review was undertaken

133   in accordance with a published study protocol, which provides more detailed information

134   regarding information sources, the search strategy, data items and data synthesis

135   (Supplementary file A. Published Protocol).[19]

136   A literature search of academic databases; CINAHL, EMBASE, Ovid MEDLINE,

137   Web of Science and PsycINFO was conducted in August 2016. Records and abstracts were

138   downloaded into an EndNote library and duplicates were removed. Pairs of authors (JH:GL;

6

139   KL:LT) reviewed 5% of records to ensure the article retention process was consistent.

140   Abstracts were assessed against the following inclusion criteria: English language, peer-

141   reviewed journal articles consisting of empirical research conducted in healthcare settings. A

142   broad definition of healthcare was adopted, encompassing settings including hospitals,

143   general practices, pharmacies, military hospitals, aged care facilities, mental health and other

144   healthcare settings. Articles were only included if they assessed the association between

145   organisational or workplace culture, and patient outcomes. Articles that measured safety

146   culture were included if other inclusion criteria were met, as safety culture is an important

147   component of organisational culture.

148   Discrepancies in article retention were discussed until a consensus was reached with

149   JB acting as arbitrator in cases of ambiguous study suitability. JH, KL, GL and LT assessed

150   the remaining abstracts against the inclusion criteria followed by a full-text analysis of

151   included articles. Papers evaluating 'hospital performance' were eligible for inclusion if the

152   measures concerned patient outcomes. Articles referring to measures of process interventions,

153   for example, 'adherence to guidelines' or 'medication administration error reporting' were

154   excluded if they did not measure patient outcomes. Articles that only measured healthcare

155   employees' *perceptions* of patient outcomes were excluded, as they were classified as a

156   process rather than outcome measure. Only associations relevant to the research question

157   were included in the analysis.

158   Included articles were summarised using a data extraction sheet[24] (Supplementary

159   File B. Data Extraction Sheet). Key information recorded included country, timeframe of data

160   collection, study type, aims, data collection methods, methodology, findings, and

161   implications. Bias of studies was assessed by JH and JB using a Risk of Bias Template

162   (Supplementary File C. Risk of Bias Template), adapted from the Cochrane Handbook for

163   Systematic Reviews, specifically the Cochrane Collaboration's tool for assessing risk of

7

164   bias.[25] The quality of articles was assessed by JH, GL, KL, and LT using Hawker et al.'s

165   (2002) Quality Assessment Tool.[26] Studies were analysed and synthesised according to

166   direction of association and categorisation of patient outcomes.

167

168   **RESULTS**

169   **Search strategy**

170   The results of the search strategy are outlined in Figure 1. A total of 2,049 relevant articles

171   were identified. The Cohen's Kappa for the 5% review of abstracts was 0.2966 (JH:GL) and

172   0.5032 (KL:LT). It is noted that Kappa Paradox 1 occurred in this instance, due to the

173   prevalence of excluded articles decreasing the Kappa value.[27, 28] This was taken into

174   account through calculating the prevalence-adjusted bias-adjusted Kappa (PABAK),

175   increasing the values to a strong (0.84) and moderate (0.76) level of agreement,

176   respectively.[13] Additionally, the prevalence index (PI) was calculated as 0.88 and 0.73 for

177   the pairs of reviewers.

178   Two hundred and four abstracts met the inclusion criteria based on the complete

179   review of abstracts. The full text content review of these included articles resulted in sixty-

180   two articles included in the final analysis. A comprehensive table of included articles was

181   generated by JH and edited by KL and LT (Supplementary File D. Summary of Included

182   Articles).

183

184   **[Insert Figure 1. Search strategy here]**

185

186   **Study characteristics**

8

187 A summary of included study characteristics is provided in Table 1. The majority of studies

188 employed quantitative methods. Only four studies comprised mixed methods, and no study

189 involved purely qualitative methods. Similarly, most studies were observational in nature,

190 with only four intervention studies identified in the final analysis. Of the observational

191 studies, most were classified as cross-sectional. Studies were more commonly conducted in a

192 hospital context, and a US setting. No studies yielding level one evidence, i.e., randomised

193 controlled trials, were identified. The data obtained from the review was heterogeneous, in

194 terms of participants and outcomes (clinically diverse) and in study design (methodologically

195 diverse).[29] Across the studies, organisational and workplace culture, climate, and

196 environment, were defined and measured in a non-standardised way. For example, some

197 studies focussed on broader hospital culture,[30-38] while others assessed staff attitudes and

198 values,[39-42] or safety climate.[43-53] The concept of patient outcomes was also diverse in

199 nature, comprising a variety of specific and broader outcomes and conditions. Due to the

200 heterogeneity of definitions, tools, and variables, quantitative meta-analysis of data was

201 therefore of no value.[54]

202

203 **Table 1. Descriptive Characteristics of Included Studies**

	Number (%)
Method	
Quantitative	58 (93.6)
Qualitative	0 (0.0)
Mixed	4 (6.5)
Study design	
Intervention	4 (6.5)
Observational	58 (93.6)
Cross-sectional	50 (80.7)
Longitudinal	10 (16.1)
Level of Evidence	
Level 1	0 (0.0)
Other	62 (100.0)

9

Setting	
Hospital	55 (88.7)
Aged care	4 (6.5)
Other	3 (4.8)
Country	
USA	36 (58.1)
Europe	11 (17.7)
Canada	5 (8.1)
Asia	4 (6.5)
Australia	2 (3.2)
Middle East	2 (3.2)
UK	2 (3.2)

204

205 **Risk of bias**

206 The Cochrane Collaboration's tool for assessing risk of bias is designed for use in clinical

207 trials. Our final collection of articles did not contain data from clinical trials, and therefore,

208 the tool was deemed an inappropriate method in which to assess risk of bias. A new way of

209 assessing risk of bias was established (Supplementary File C) by adapting the Cochrane

210 Handbook for Systematic Reviews' definitions of bias to be applicable to quantitative and

211 qualitative non-intervention studies.[25] Applying this tool, it became apparent that all

212 included articles sustained a risk of bias. It is suggested that classification of articles by

213 quality, rather than exclusively by bias, is more appropriate for this class of review.

214

215 **Quality assessment**

216 Over 93% of included studies were observational (Table 1). The Cochrane Handbook for

217 Systematic Reviews suggests that observational studies rate as low quality in its Grades of

218 Recommendation, Assessment, Development and Evaluation (GRADE) approach to

219 assessing the quality of articles.[55] Hawker et al.'s (2002) Quality Assessment Tool[26] was

220 deemed more suitable for this review as it is designed to evaluate studies covering a variety

221 of research paradigms. The tool developers (Hawker et al., 2002) gave detailed descriptions

10

222   of what constituted a "good" (4 points), "fair" (3 points), "poor" (2 points) or "very poor" (1

223   point) article in each of the following nine categories: abstract and title; introduction and

224   aims; method and data; sampling; data analysis; ethics and bias; findings/results;

225   transferability/generalisability; and, implications and usefulness, allowing for a potential

226   maximum score of 36. Hawker et al. (2002) did not suggest cut-offs for classifying the total

227   quality rating of the article, but this has been proposed by other researchers using the Quality

228   Assessment Tool.[26] For example, the rule of thumb developed by Lorenc et al. (2014)

229   suggests the following quality grading system: "high quality" (30-36 points), "medium

230   quality" (24-29 points), and "low quality" (9-24 points).[56] This recommendation was

231   modified in the current systematic review where "low quality" was classified as 9-23 points

232   to reduce ambiguity. Quality scores ranged from 17-36 across the 62 included studies. Full

233   details on quality scores are provided in Table 2. Articles were classified as either high,

234   medium or low quality based on these cut-off values. Quality scores are reported in

235   Supplementary File D.

236

237   **Table 2. Methodological Rigour and Quality of Included Articles**

Quality classification*	Points scored on the Hawker et al. (2002) Quality Assessment Tool*	Number of articles classified in each section
High quality	30-36	39
Medium quality	24-29	21
Low quality	9-23	2

238   *adapted from cut-off values determined by Lorenc et al., 2014.[56]

239

240   **Overall findings**

241   We found that organisational and workplace cultures were correlated with patient outcomes

242   in over 90% of studies. The majority (74.2%) of associations were classified as 'positive',

11

243 comprising of exclusively positive associations (48.4%), or a mixture of positive associations

244 and no associations (25.8%) (Figure 2).

245

246 **[Insert Figure 2: Categorisation of direction of studies (number of studies) here]**

247

248 Specifically, culture was positively associated with system-related patient outcomes

249 such as mortality rates,[47, 48, 57-63] failure to rescue,[57, 59, 64], readmission rates,[44,

250 51, 65, 66] and adverse events/medication errors[32, 49, 50, 67-70]; wellbeing outcomes

251 including, patient satisfaction,[31, 33, 35, 37, 40, 41, 71-80] quality of life,[81] and patient

252 mood[81]; and clinical outcomes such as pressure ulcers[32, 46, 82-85] falls,[30, 32, 46, 70,

253 83, 86] hospital acquired infections,[32, 39, 43, 84, 87-89] depressive symptoms,[90]

254 pulmonary embolism/deep vein thrombosis[46], incontinence,[85] symptom burden at the

255 end of life,[60] and physical and mental health status[52] (Figure 3). Table 3 summarises all

256 associations by outcome type.

257 Articles showing no significant associations accounted for 8.06% of studies.

258 Indeterminate or results comprising both positive and negative associations, made up 19.4%

259 of the research. There were no studies presenting 'negative' associations (exclusively

260 negative associations, or negative associations and no associations).

261

262 **[Insert Figure 3: Key associations between culture and patient outcomes here]**

263

264 **Table 3. Associations by type of outcome**

	System-related patient outcomes	Wellbeing outcomes	Clinical outcomes

12

Exclusively positive associations	15 (24.2)	13 (21.0)	5 (8.1)
Positive associations and no associations	8 (12.9)	6 (9.7)	8 (12.9)
No associations	2 (3.2)	3 (4.8)	1 (1.6)
Negative associations and no associations	0 (0.0)	0 (0.0)	0 (0.0)
Exclusively negative associations	0 (0.0)	0 (0.0)	0 (0.0)
Indeterminate or mixed results	8 (12.9)	4 (6.5)	5 (8.1)

265

266 **Positive associations**

267 Almost three in four (74.2%) studies reported exclusively positive associations, or a mixture

268 of positive associations and no associations, between culture and patient outcomes. For

269 example, hospital-based cross-sectional studies found patient mortality rates were nearly 48%

270 lower in hospitals with better work environments,[62] and surgical mortality rates were more

271 than 60% higher in hospitals with poor work environments.[91] Some studies moved beyond

272 'better' and 'poor' environments by evaluating *types* of culture positively associated with

273 patient outcomes. For example, a 'human relations' climate, focusing on flexibility and

274 supporting internal resources, and embracing values associated with belonging, trust, and

275 cohesion, was also related to enhanced patient satisfaction.[33]

276 Organisational and workplace cultures were also positively associated with patient

277 outcomes in contexts other than hospitals. A study of aged-care found that residents in

278 facilities with less effective staff cohesion were at significantly greater risk of pressure ulcers

279 and incontinence, compared with residents in facilities with more effective cohesion.[85]

280 Depressive symptoms in residents were associated with two dimensions of organisational

281 culture (proficiency and resistance), and three dimensions of climate (stress, engagement, and

282 functionality).[90] Companionate love culture (that is, feelings of affection, caring and

13

283   compassion) in aged-care facilities was positively correlated with patient mood, quality of

284   life, satisfaction and fewer trips to the emergency room.[81] A single study of a community

285   mental health organisation concluded that positive (i.e., supportive and cohesive)

286   organisational culture and climate were strong predictors of physical and mental health status

287   improvements over time, but not changes in quality of life.[52] These findings collectively

288   indicate the importance of a positive organisational and workplace culture for a wide variety

289   of patient outcomes, across settings.

290   A small group of studies reported a combination of positive associations and no

291   associations between culture and patient outcomes. One study found no correlation between

292   culture or climate and risk-adjusted outcomes, however, teamwork, communication and

293   collaboration was associated with risk-adjusted morbidity.[47] Another study reported that

294   nurses' perceptions of work environment were significantly related to patient hospitalisation

295   rates, but not with patient satisfaction.[92] Studies that reported mixed positive and no-

296   association results have also been reported in aged care[50, 81] and mental health

297   services.[52]

298

299   **No associations**

300   Not all studies reported associations between culture and patient outcomes. A primary care-

301   based cross-sectional study found no significant associations between team culture and

302   HbA1c level, systolic blood pressure and total cholesterol levels in diabetes mellitus type II

303   patients.[42] Other studies found no association between organisational or workplace culture

304   or climate, and patient satisfaction,[45] performance indexes,[34] prescription errors, rates of

305   adverse events, and patient mortality rates.[93]

306

14

Indeterminate studies

308 Over 17% of included articles reported indeterminate or mixed results. 'Indeterminate' was

309 used in cases where the classification of cultures as positive or negative could not be

310 discerned. For example, higher scores on group culture measures, that is those that

311 emphasised teamwork, cohesiveness and participation, were associated with significantly

312 lower rates of survival without major morbidity, whereas in one study, higher scores on

313 hierarchical culture measures were associated with higher rates of survival without major

314 morbidity.[63] 'Mixed' refers to both positive and negative associations presented in the one

315 study. A study reported that ICUs in which nurses perceived the organisational climate as

316 positive had higher rates of central line associated bloodstream infections (CLBSI), but were

317 39% less likely to develop a catheter-associated urinary tract infection (CAUTI).[84] In

318 another study, patient falls with injury were positively related to a developmental culture,

319 characterised by dynamic and innovative environments that value individual initiatives and

320 growth, and negatively related to group culture, which is characterised by warm, caring

321 environments that value tradition and loyalty.[30]

322

Intervention studies

324 Our review included four intervention studies. A systematic review on culture and

325 performance (rather than outcomes) completed five years prior, included only two

326 interventions, indicating growing researcher attention in this area.[2] A study in rural/small

327 hospitals which implemented 12 nurse-friendly criteria to create a positive work environment

328 observed positive changes in nurses' perception of their work environment and improvements

329 in quality of care in participating hospitals post-intervention.[83] A hospital-based

330 intervention study to change organisational culture on frequency of staff handwashing did not

15

331 improve rates of methicillin-resistant Staphylococcus aureus (MRSA) in two hospitals, but

332 rates of vancomycin-resistant enterococci (VRE) were significantly reduced in the

333 intervention hospital during implementation.[87] A prominent interventional study, the UK

334 Safer Patients Initiative, indicated that while there was a small improvement in staff attitudes

335 to organisational climate in intervention hospitals, the intervention had no significant effect

336 on patient safety outcomes, measured by the proportion of prescription errors, rates of

337 adverse events, and mortality rates.[93] The fourth intervention study was based in a single

338 hospital in Sweden. The study found that patients' perceptions of work environment were a

339 significant predictor of patients' satisfaction with quality of care.[71]

340

341 **DISCUSSION**

342 We synthesised a large literature with diverse variables which attempted to measure or study

343 healthcare cultures, or intervene to create enhanced organisational and workplace cultures,

344 across multiple healthcare settings, mostly hospitals, in a range of countries, chiefly north

345 America, Europe and Australasia. The complexity of the synthesising task should not be

346 underestimated in reviews of this kind (see also Greenhalgh's work synthesising research on

347 diffusion of innovation [94]). The studies we report on undertook work on settings best

348 described as CASs, in which the healthcare system is defined as a layered web of agents

349 interacting dynamically across space and time, producing emergent outcomes.[14, 22] CASs

350 are hard to change, and resist simple, linear improvement strategies. The studies themselves

351 involved nuanced choices in types of measures, multiple mechanisms for studying or

352 intervening, and variable ways of reporting their methods and results.

353   Despite the challenges in combining and assessing disparate research, we found

354 confirmatory evidence for previous work[2, 16, 21], which suggested that there were positive

16

355   linkages between cultures in healthcare settings and patient outcomes. In short, healthcare

356   organisational cultures are related to patient outcomes in the way people have generally

357   assumed they are, and in the direction our hypothesis suggested. Thus, we found

358   confirmatory evidence supporting our hypothesis.

359

360   **Study strengths and weaknesses**

361   The number of included articles in this review was relatively high, providing comprehensive

362   coverage of the research topic. An overarching account of the association between

363   organisational and workplace culture and patient outcomes was made possible by having a

364   broad scope of review, including multiple types of healthcare settings, and considering

365   patient outcomes as both an all-encompassing concept as well as considering more specific

366   outcomes. However, the broad scope of the review poses a challenge, as there were inherent

367   limitations whereby terms such as 'culture', 'climate' and 'environment' were inconsistently

368   defined or measured. The heterogeneity of data complicated attempts to draw comparisons

369   across studies, and conclusions. Nevertheless, we rigorously assessed bias and study quality,

370   and the study results point in the same direction.

371   Although this review set out to assess the association between organisational and

372   workplace culture and patient outcomes across a variety of health settings, most studies were

373   conducted in a hospital environment. We propose that more research is needed in other

374   healthcare settings such as aged and community care. Only four studies employed

375   interventional designs in testing out chosen associations. More rigorous intervention studies

376   aimed at promoting change in organisational culture could provide valuable information on

377   how improvements in organisational culture can affect outcomes for patients.

378

17

CONCLUSION

380 Studies examining culture are common. Fewer explore linkages between cultures and patient

381 outcomes. There are no RCTs, and few intervention studies with strong designs are reported.

382 The trend for most studies is to find that positive cultures are related to better outcomes for

383 patients. Better quality studies, and those outside of hospitals, would provide confirming or

384 disconfirming evidence for our synthesis.

385

Competing Interests

394 The authors declare no conflicts of interest.

395

399

Data Sharing Statement

18

401   No additional data available.

402

403   **Authors' Contributions**

404   JB led the study and provided a conceptualisation of the topic to the team, and acted as an

405   arbitrator and advisor where necessary. JH, KL, GL and LT did the abstract and full-text

406   reviews of the articles. All authors contributed to the writing of the drafts, and agree with the

407   final version.

408

409   **Amendments**

410   Any minor adjustments to the protocol have been documented in this systematic review.

19

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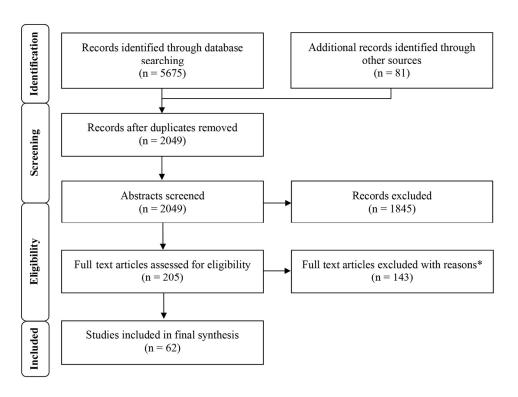
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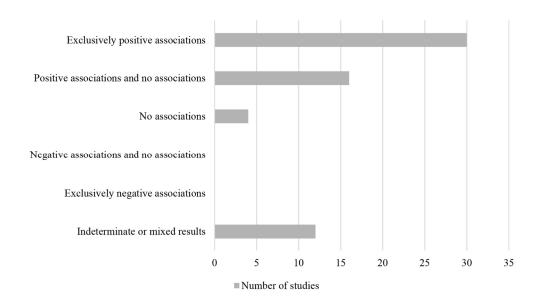
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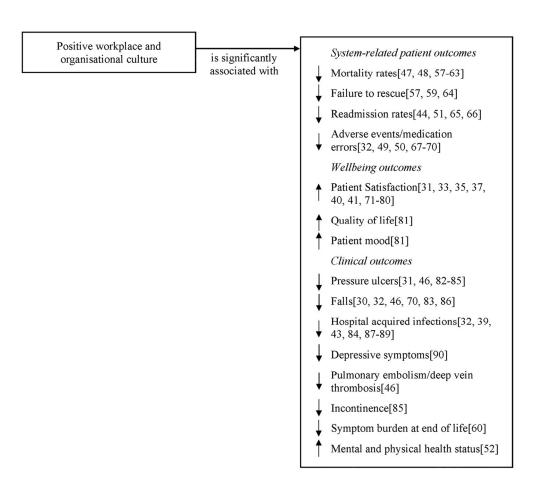673   629. doi: 10.1111/j.0887-378X.2004.00325.x.

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Identification

Records identified through database searching
(n = 5675)

Additional records identified through other sources
(n = 81)

Screening

Records after duplicates removed
(n = 2049)

Abstracts screened
(n = 2049)

Records excluded
(n = 1845)

Eligibility

Full text articles assessed for eligibility
(n = 205)

Full text articles excluded with reasons*
(n = 143)

Included

Studies included in final synthesis
(n = 62)

Search strategy

147x108mm (300 x 300 DPI)

Categorisation of direction of studies (number of studies)

175x99mm (300 x 300 DPI)

| Positive workplace and organisational culture | → is significantly associated with | *System-related patient outcomes*
↓ Mortality rates[47, 48, 57-63]
↓ Failure to rescue[57, 59, 64]
↓ Readmission rates[44, 51, 65, 66]
↓ Adverse events/medication errors[32, 49, 50, 67-70]
Wellbeing outcomes
↑ Patient Satisfaction[31, 33, 35, 37, 40, 41, 71-80]
↑ Quality of life[81]
↑ Patient mood[81]
Clinical outcomes
↓ Pressure ulcers[31, 46, 82-85]
↓ Falls[30, 32, 46, 70, 83, 86]
↓ Hospital acquired infections[32, 39, 43, 84, 87-89]
↓ Depressive symptoms[90]
↓ Pulmonary embolism/deep vein thrombosis[46]
↓ Incontinence[85]
↓ Symptom burden at end of life[60]
↑ Mental and physical health status[52] |

Key associations between culture and patient outcomes

122x108mm (300 x 300 DPI)

Supplementary file A. Published Protocol

See separate PDF attached

Supplementary File B. Data Extraction Sheet

Parameters	Detail	Reviewer entry
Endnote ref #		
Reference	*Authors, year, article title, journal name, vol, issue, page numbers (use Harvard Ref Style)*	
Location	*Country*	
Language	*English only*	
Time frame	*Period of data collection*	
Study type	*e.g., qualitative, mixed methods, intervention study*	
Study primary aim	*e.g., test performance of organisations with different cultures; test an intervention*	
Study secondary aims	*e.g., identify factors associated with organisational culture*	
Exclude?	*Circle include or exclude, + reason if excluded*	1. Other languages 2. Not peer reviewed literature 3. Not healthcare setting 4. Not primary empirical research 5. Does not include organisational culture and/or patient outcomes
Data	*Total N of organisation participants (e.g. three hospitals)*	
	Type of organisation participant (e.g. teaching hospital)	
	Data types and sources used to performance and/or outcomes	
	Methodological/statistical approach to identifying performance and/or outcomes	
Methods	*Methods used to study organisational or workplace culture or climate, and patient outcomes– summarise content of tools (e.g., interview questions/topics, surveys) used where possible*	

	Participants (e.g., nurses)	
	Data analysis methods (e.g., statistical or quantitative method)	
Findings	Quantitative results	
	Qualitative results/ contextual factors most important for explaining relationship between culture and patient outcomes. Include example quotes	
Implications	Recommendations for healthcare made based on the findings	

Note. Table adapted from Taylor N, Clay-Williams R, Hogden E, Braithwaite J, Groene O. High performing hospitals: a qualitative systematic review of associated factors and practical strategies for improvement. BMC Health Serv Res. 2015;15(1):244.

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Supplementary File C. Risk of Bias Template

Type of Bias	Description	Example in Intervention Studies	Example of an Equivalent Scenario in Included Studies
Selection bias	The bias that occurs when groups are not randomised and thus comparisons cannot be made	Systematic differences in baseline characteristics between the groups, leading to biases when comparing results after an intervention; randomised groups being used	That the context of the study was a convenience or purposive sample, or was not the most appropriate context for the study
Performance bias	When study participants or researchers have knowledge of the study or its aims	Systematic differences in the care provided between the groups, or exposure to other confounding variables that influence results; can be minimised through double blinding (and reporting on its effectiveness)	Performance of the nurses or health professionals altering due to knowledge that patient outcomes are being measured
Detection bias	Systematic differences in results due to the assessor's knowledge of study or group allocation	Differences in how outcomes are determined between groups; can be prevented through blinding of researchers	Researchers interpreting the results have knowledge of the aims and hypotheses of the study, and the results are altered accordingly
Attrition bias	The incompleteness of data due to participants withdrawing from the study	Systematic differences in withdrawals of groups from studies, leading to incomplete outcome data	The rate of non-participation e.g., in survey responses, the dropout rates between nurses and doctors
Reporting bias	Selective reporting of outcomes	Difference in the probability of reporting significant verses insignificant findings	Significant findings more likely to be published than less important results
Other bias	Any other important concerns regarding the study	Biases that are found in a particular study setting	Bias due to issues not otherwise outlined here

Note. Table descriptions derived from Higgins J, Altman D, Sterne J. Chapter 8. Assessing risk of bias in included studies. In: Higgins J, Green S, eds. *Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0*: The Cochrane Collaboration; 2011. Examples are the authors', based on included studies.

Supplementary File D. Summary of Included Articles

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
Aiken et al., 2008	Analyse the net effects of nurse practice environments on nurse and patient outcomes after accounting for nurse staffing and education	Quantitative, cross-sectional study	**Work environment**: Practice Environment Scale of the Nursing Work Index (PES-NWI); six survey measures assessing job satisfaction, burnout, and intent to leave job within the next year; three questions assessing nurses' perceptions of quality of care **Patient outcome(s)**: 30-day mortality rates from discharge abstract data	232,342 patients; 10,184 nurses Data collected April 1998-November 1999	168 hospitals; USA	Care environment, along with nurses' education levels and nurse staffing, contributed to failure to rescue and mortality rates. Poorer environment had higher rates of mortality and failure-to-rescue Surgical mortality rates were more than 60% higher in hospitals with a poor work environment	High
Aiken et al., 2011	Determine the conditions under which the impact of hospital nurse staffing, nurse education, and work environment are associated with patient	Quantitative, cross-sectional study	**Work environment**: Practice Environment Scale of the Nursing Work Index (PES-NWI) **Patient outcome(s)**: Patient deaths within 30 days of hospital admission and failure to rescue from the American Hospital Association (AHA) Annual	1,262,120 patients, 39,038 nurses Data collected 2005-2006	665 hospitals; USA	Lowering the patient-to-nurse ratios significantly improved patient outcomes in hospitals with good work environments, somewhat improved patient outcomes in hospitals with average work environments, and had no effect on patient	Medium

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	outcomes		Survey			outcomes in hospitals with poor work environments	
Aiken et al., 2013	Determine the association between the use of agency-employed supplemental registered nurses (SRNs) to staff hospitals and patient mortality and failure to rescue	Quantitative, cross-sectional study	**Work environment**: Hospital use of SRNs; Practice Environment Scale of the Nursing Work Index (PES-NWI); nurse staffing metrics; nurse education metrics **Patient outcome(s)**: 30-day inpatient mortality and failure to rescue obtained from annual patient discharge summaries	40,356 registered nurses Data collected 2005-2006	665 hospitals; USA	Before controlling for nurse and hospital characteristics, higher proportions of SRNs nurses in hospitals were associated with higher mortality and failure to rescue This relationship became insignificant when work environments were taken into account Hospitals with higher proportions of supplemental registered nurses had significantly worse work environments	Medium
Ancarani et al., 2009	Analyse the relation between different organisational	Quantitative, cross-sectional study	**Organisation climate**: Interviews based on the Competing Value Framework	1,018 patients; 625 medical staff (470 nurses and 155 physicians)	47 wards across seven hospitals; Italy	An organisational model climate accentuating openness, change and innovation and a model emphasising cohesion	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	climate models and patient satisfaction		**Patient outcome(s)**: Interviews based on SERVQUAL instrument, measuring consumer expectations and perceptions of a service	Data collected November 2007-May 2009		and workers' morale were positively related to patient satisfaction, whereas a model based on managerial control where negatively associated with patient satisfaction Ward organisational climate significantly positively affected patient perceptions of the quality of care	
Ancarani et al., 2011	Test a model in which the ward manager's orientation towards a given organisational climate contributes to determine the climate perceived by medical and nursing staff. Test whether	Quantitative, cross-sectional study	**Organisational climate**: Organizational Climate Measure (OCM) **Patient outcome(s)**: Questionnaire based on the SERVQUAL instrument, measuring consumer expectations and perceptions of a service	57 managers; 621 nurses; 277 physicians; 1,598 patients. Data collected 2007-2009	57 wards across 10 hospitals; Italy	Ward managers' Human Relations climate orientation is positively related to patient satisfaction	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	this, in turn, has an impact on patient satisfaction						
Ansmann et al., 2014	Identify associations between hospital structures, physicians' social resources as well as job demands and control and patients perceived support from physicians	Quantitative, cross-sectional study	**Work environment:** Social capital measured by a six-item scale developed by Pfaff et al., 2004; Social support from colleagues measured using an adaptation of the original Caplan scales by Udris and Riemann; Job Content Questionnaire; Leadership survey measuring surgery volume and the number of hospitals constituting the breast cancer centre **Patient outcome(s)**: Three item questionnaire designed by authors assessing patients' perceptions of the support provided by physicians to help them cope with their illness and treatment	348 physicians; 108 leadership positions; 1,844 patients Physician survey November 2010-March 2011 Leadership survey July-September 2010	35 breast cancer centre hospitals; Germany	Patients felt better supported by their physicians in hospitals with high social capital, a high percentage of permanently employed physicians, and less physically strained physicians	High
Arnetz and	Develop a	Quantitative,	**Work environment**:	1,834 patients	One hospital,	Perceived work	Medium

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Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
Arnetz, 1996	reliable and valid instrument, to determine the predictors of patients' ratings of quality and to measure patient satisfaction at two points in time to determine whether patient ratings change following a quality improvement initiative	interventional study	Questionnaire assessing patients' perceptions of quality of care and staff work environment **Patient outcome(s)**: Questionnaire assessing overall patient satisfaction with pain treatment	(1994); 2,499 patients (1995); unspecified numbers of hospital staff Data collected August 1994- November 1995	Sweden	environment was a significant predictor for a positive overall patient quality grade	
Ausserhofer et al., 2013	Explore the relationship between patient safety climate and patient outcomes in	Quantitative, cross-sectional study	**Work environment**: Safety Organizing Scale; Practice Environment Scale of the Nursing Work Index (PES-NWI); Basel Extent of Rationing of Nursing Care (BERNCA-R);	1,633 RNs; 997 patients Data collected October 2009- June 2010	132 surgical, medical and mixed surgical-medical units across 35 acute care hospitals; Switzerland	Patient safety climate was not found to be a significant predictor of patient satisfaction	High

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Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	Swiss acute care hospitals, adjusting for major organisational variables		nurse staffing level and skill mix items from the RN4CAST study nurse questionnaire **Patient outcome(s)**: Patient satisfaction item from the Hospital Consumer Assessment of Healthcare Providers and Systems				
Barsade and O'Neill, 2014	Examine the influence of a culture of compassionate love, on outcomes for employees, residents in a long-term care setting, and their families	Quantitative, longitudinal study	**Organisational culture:** Culture of Companionate Love Scale **Patient outcome(s)**: Questionnaires measuring mood, satisfaction and quality of life; medical database records of weight gain, emergency room transfers, and pressure ulcers	185 employees (certified nursing assistants, nurses, social workers, physicians, food service workers, and employees and other employees); 108 residents; 42 family members of residents Duration not specified	13 units across three long-term care residential sites; USA	There was a significant positive association between companionate love culture, patient mood, quality of life, satisfaction, and fewer trips to the emergency room There was no significant association between compassionate love culture and weight gain or lower incidence of pressure ulcers	Medium
Benning et al., 2011	Evaluation of the first phase	Mixed methods,	**Organisational culture:** Semi-structured interviews	Interviews: 60 senior/strategic	Four hospitals participating in	There was a small improvement in staff	High

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Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	of the Health Foundation's Safer Patients Initiative (SPI): organisational intervention that focused on improving the reliability of specific frontline care processes in designated clinical specialties and promoting organisational and cultural change	interventional study	investigating understanding of and enthusiasm for the SPI1; NHS Staff Survey **Patient outcome(s)**: Errors and adverse events from case notes; mortality rates; patient satisfaction based on the National NHS Acute Inpatient Survey in England	staff; 47 ward staff Survey: 3,397 staff in hospitals enrolled in the intervention; 15,300 staff in control hospitals Case notes: 1,237 patients Data collected 2005-2006	the first phase of the SPI and 18 control hospitals; United Kingdom	attitudes to organisational climate in intervention hospitals On a range of other measures and outcomes related to patient safety, there was no additive effect attributable to the SPI Survey of patients showed no significant differences apart from an increase in perception of cleanliness in favour of intervention hospitals	
Borg et al., 2015	Establish the applicability of the Hofstede survey tool to measure and quantify organisational culture in healthcare	Quantitative, cross-sectional study	**Organisational culture:** Hofstede Survey Tool **Patient outcome(s)**: Methicillin resistant Staphylococcus aureus (MRSA) prevalence identified from blood cultures	135 doctors and nurses Data collected July-August 2012	Intensive care departments of seven tertiary care hospitals; four European countries	Hospitals with a history of consistently low prevalence of MRSA exhibited high scores for change facilitation and change readiness, together with perceptions of trust.	Low

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	settings, and attempt to evaluate any associations between Infection Prevention and Control (IPC) outcomes and organisational culture scores					Hospitals with high prevalence of MRSA exhibited low scores for change readiness and change facilitation, but high scores for job security	
Bosch et al., 2008	Test the introduction of the diabetes passport and assess to what extent important aspects of restructured care such as multidisciplinary teamwork and different types of organisational culture are associated with	Quantitative, cross-sectional study	**Team climate:** Team Climate Inventory **Organisational culture:** Competing Values Framework **Patient outcome(s):** Measures of quality of diabetes care and clinical patient characteristics from medical records and self-report	752 patients with Diabetes mellitus type II; 83 Dutch health care professionals Data collected during 2003-2004	30 primary care practices; The Netherlands	None of the selected clinical patient outcomes demonstrated significant associations with team climate or culture.	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	high quality diabetes care in small office-based general practices						
Bradley et al., 2012	Identify hospital strategies associated with lower RSMR (risk standardised mortality rates)	Quantitative, cross-sectional study	**Organisational environment:** Questionnaire assessing the use of hospital strategies **Patient outcome(s)**: 30-day hospital RSMR based on hospital discharges	Unspecified number of patients hospitalised with acute myocardial infarction Data collected July 2005-June 2008	533 acute care hospitals; USA	Key aspects of organisational environment (measured through hospital strategies) including effective communication and collaboration among groups, broad staff (cardiologist and pharmacist) presence and expertise, and a culture of creative problem solving and learning amongst cardiologists, were statistically associated with lower RSMRs	Medium
Brewer, 2006	Test the transtheoretical integration model (TIM) which proposes relationships	Quantitative, cross-sectional study	**Organisational culture:** Questionnaire measuring two hospital culture variables (group culture and developmental culture) through staff	411 hospital employees (nurse and multi-disciplinary team members)	Four acute care hospitals; USA	A group-type culture (affiliation among all levels of hospital staff) was inversely related to patient falls with injury	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	among team-based phenomena and patient safety and resource-use outcome variables. TIM consists of Work Group Design, Hospital Culture, Positive Intrateam Process, Negative Intrateam Process, and Organisational Effectiveness		members' perceptions of hospital culture, work group design, and positive and negative team processes **Patient outcome(s)**: Administrative quality reports recording patient falls with injury; financial reports measuring patient care unit expenses and length of stay	Duration not specified		Developmental culture (innovation and risk taking) was positively related to patient falls with injury and total expenses per patient day	
Carthon et al., 2015	Examine the relationship between missing nursing care and hospital readmissions	Quantitative, cross-sectional study	**Work environment**: Practice Environment Scale of the Nursing Work Index (PES-NWI) **Patient outcome(s)**: All-cause readmission	20,605 bedside nurses; 160,930 patients with heart failure Data collected 2005-2006	419 acute care hospitals; USA	Before adjusting for patient and hospital characteristics, patients were more likely to experience a readmission when nursing care activities were more	Medium

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
			within 30 days of discharge from an index admission for heart failure			frequently missed (exception: pain management and timely medication administration) Once adjusting for work environment, the effects of missing essential nursing was no longer a significant predictor of readmissions	
Cassie and Cassie, 2012	Examine the effect of organisational culture and climate on depressive symptoms among nursing home residents	Quantitative, cross-sectional study	**Organisational culture**: Organizational Social Context Scale **Patient outcome(s)**: Minimum Data Set (Depression Rating Scale (DRS); Cognitive Performance Scale (CPS); Activities of Daily Living - Long Form (ADL-L))	1,114 employees; 5,497 residents Data collected Jan 2007-May 2008	23 nursing homes; USA	Depressive symptoms were associated with two dimensions of organisational culture (proficiency and resistance), and three dimensions of climate (stress, engagement, and functionality)	High
Chang and Mark, 2011	Investigate whether learning climate moderates the relationship	Quantitative, cross-sectional study	**Work environment**: Questionnaires assessing work dynamics and communication with physicians	2,744 patients; 4,954 nurses Data collected 2003-2004	279 nursing units across 146 hospitals; USA	Significant negative relationship between learning climate and medication errors (the more positive the	Medium

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	between error producing conditions and medication errors		**Learning climate:** Error Orientation Scale **Patient outcome(s)**: Medication error obtained from incident reports			learning environment was, the fewer medication errors occurred). However, there was no significant difference when the learning culture was average compared to when it was good Communication and experience were not associated with medication errors significantly Work dynamics was not significantly associated with medication errors, regardless of learning climate	
Cho et al., 2015	Examine the effects of nurse staffing, work environment, and education on patient	Quantitative, cross-sectional study	**Work environment:** Practice Environment Scale of the Nursing Work Index (PES-NWI) **Patient outcome(s)**:	1,024 staff; 76,036 surgical patients Data was collected January-	14 teaching hospitals; South Korea	Patient mortality was nearly 48% lower in hospitals with better nurse work environments compared to hospitals with mixed or poor nurse	

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Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	mortality		Patient discharge data recording patient characteristics and 30-day mortality rates	December 2008		work environments	
Coustasse et al., 2008	Analyse organisational culture in a community hospital in Texas to measure organisational culture change and its impact on patient satisfaction	Mixed methods, longitudinal case study	**Organisational culture**: Two sets of open-ended semi-structured interviews assessing organisational culture **Patient outcome(s)**: Patient satisfaction scores and percentiles from Inpatient and Outpatient care areas	Semi-structured interviews: 162 Hospital staff Culture interview: 29 members of the executive team Surveys: 600 staff employees Field experiment data collected January 2003-December 2003 Patient satisfaction data collected January 1998-December 2003	One community hospital; USA	The shared vision of one subculture within the hospital was associated with increased patient satisfaction	Medium
Davenport et al., 2007	Measure the impact of	Quantitative, cross-	**Organisational climate**: Safety Attitudes	6,083 attending and resident	44 Veterans Affairs and eight	The OCSF measures of teamwork climate, safety	High

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Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	organisational climate safety factors (OCSFs) on risk-adjusted surgical morbidity and mortality	sectional survey	Questionnaire (SAQ) **Patient outcome(s)**: Risk-adjusted morbidity and mortality outcomes derived using the National Surgical Quality Improvement Program (NSQIP) dataset and models	doctors, nurses, and other providers Models derived from data on more than 100,000 patients Data collected July 2003-September 2004	academic medical centres; USA	climate, working conditions, recognition of stress effects, job satisfaction, and burnout were not correlated with risk-adjusted morbidity and mortality Reported levels of positive communication/collaboration with attending and resident doctors correlated with lower risk-adjusted morbidity	
Dubois C-A et al., 2013	Examine the associations of four distinct nursing care organisational models with patient safety outcomes	Quantitative, cross sectional study	**Organisational culture:** Four category variable representing nursing care organisational models **Patient outcome(s):** Patient records reporting medication errors, falls, pneumonia, urinary tract infections, unjustified restraints and pressure ulcers	2,699 patients Data collected in a 30-day period, undocumented timeframe	11 hospitals; Canada	After controlling for patient characteristics, patient risk of experiencing one or more events and of experience an event with consequences was significantly lower in the innovative professional and basic models compared to the adaptive functional and basic functional models	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
						The lowest rates of negative outcomes were seen in the innovative professional model, characterised by richer staff skill mix, higher staffing intensity, and an environment with greater support of professional practice and investments in innovation	
Duffield et al., 2011	What are the relationships among patient outcomes (OPSN (Outcomes Potentially Sensitive to Nursing) [consisting of 11 patient outcomes], falls, and medication errors), nurse	Quantitative, longitudinal and concurrent cross-sectional study	**Work environment:** The Area Health Services database; NWI-R; Nurse questionnaire measuring perceptions about the work environment and quality of care on the unit; Environmental Complexity Scale **Patient outcome(s):** The Health Information Exchange (HIE) database; patient discharge data	Longitudinal study: 10,132,246 (4,964,924 matched to wards) ward stay records, 10,963,806 (2,675,428 matched to wards) nurse roster and payroll records Data collected from 2000-2006	Longitudinal study: Patient data from 80 hospitals; nursing staff data from 27 hospitals; Australia Cross-sectional study: 19 hospitals; Australia	Increased medication errors were associated with more nurses experiencing a threat of violence and tasks delayed Time-based medication errors were associated with perceptions of physical violence, emotional abuse, the amount of additional time needed for patient care per shift, higher	Medium

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	skill mix, nursing workload, and the nursing work environment			Cross-sectional study: 5,885 patient records, 22,497 patient-days, 13,442 nurse shifts Data collected from 2004-2005		turnover of patients, and the proportion of patients waiting for a care facility	
Estabrooks et al., 2011	Assess the relative effects and importance of nursing education and skill mix, continuity of care, and quality of the work environment on 30-day mortality rate of patients (after adjusting for institutional factors and	Quantitative, cross-sectional study	**Work environment**: Questionnaire assessing nursing skill mix, use of casual and temporary nurses, quality of care, job satisfaction, and educational preparation **Patient outcome(s)**: Discharge abstracts reporting patient information (age, sex, vital status at discharge, and comorbid conditions, and primary diagnosis)	18,142 patients; 6,526 nurses Data collected April 1998-March 1999	49 acute care hospitals; Canada	Factors associated with a lower patient mortality rate included high nurse education levels, richer skill mix, better nurse-physician relationship, less casual and temporary employment	High

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Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	patient characteristics)						
Estabrooks et al., 2015	Examine the influence of organisational context on symptom burden and to compare symptom burden in the last year of life between nursing home residents with and without dementia	Quantitative, longitudinal study	**Organisational environment:** In-person interviews using the Alberta Content Tool **Patient outcome(s)**: Resident Assessment Instrument-Minimum Data Set	3,647 residents (2,635 with dementia and 1,012 without); 1381 front-line care Organisational environment data collected July 2009-June 2010 Patient outcomes data collected 2008-2012	36 nursing homes (including both high and low care facilities); Canada	Symptom burden at end of life differs between low- and high-context facilities Residents of high-context facilities had longer average length of stay, more unstable health and aggressive and challenging behaviour, and higher prevalence of dementia and delirium, compared to low-context facilities The prevalence of dyspnea, pain, urinary tract infections, cancer diagnosis and use of antipsychotics without a diagnosis of psychosis was lower in high-context facilities	High
Fan et al., 2016	Evaluate the association	Quantitative, cross-	**Safety culture:** Hospital Survey on Patient Safety	1,926 personnel from surgical	Seven hospitals; USA	Ten of the 12 safety culture dimensions were	Medium

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	between safety culture and surgical site infection (SSI)	sectional study	Culture (HSOPS) **Patient outcome(s)**: Postoperative colon surgery SSI data reported by hospitals	units Safety culture data collected November 2012-December 2013 SSI data collected January-December 2013		associated with colon SSI rate (perceptions of patient safety, teamwork across units, organisational learning, feedback and communication about error, management support for patient safety, teamwork within units, communication openness, supervisor/manager expectations and actions promoting safety, non-punitive response to error and frequency of events reported)	
Fedorowsky et al., 2015	Assess the association between organisational culture and health care workers' attitudes, knowledge, practices, and	Quantitative, cross-sectional study	**Organisational culture:** Questionnaire assessing staff engagement, overwhelmed/stress-chaos, hospital leadership, health care workers' knowledge, attitudes, and practices regarding CRE prevention	268 health care workers (registered/academic nurses, practical nurses/auxiliary staff, physicians, and paramedical staff, e.g., radiology	One Post-acute care facility (PACF) and one acute care hospital (ACH); Israel	The organisational culture factor known as staff engagement was negatively correlated with CRE acquisition rate Overwhelmed/stress-chaos was positively correlated with CRE acquisitions	Medium

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Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	CRE (Carbapenem-Resistant Enterobacteriaceae) acquisition rates		**Patient outcome(s)**: CRE acquisition rates from the Israeli National Infection Prevention Center	technicians and physiotherapists) Organisational culture questionnaire distributed in January-February 2013 CRE acquisition rates obtained from January-December 2013 records		Hospital leadership showed no significant correlation with CRE acquisition in either contexts	
Gardner et al., 2007	Examine the relationships between staff nurses' perceptions of dialysis work environments, nurses' intentions to leave their current jobs, nurse turnover, patient	Quantitative, cross-sectional study	**Work environment**: Practice Environment Scale of the Nursing Work Index (PES-NWI) **Patient outcome(s)**: Dialysis facility patient satisfaction survey; Number of patient hospitalisations	199 nurses Duration not specified	56 dialysis facilities; USA	Negative overall ratings of the dialysis work environment were significantly related to hospitalisations for patients on dialysis greater than 90 days PES-NWI scores were not significantly related to patient satisfaction scores	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	satisfaction, and patient hospitalisation rates						
Greenslade and Jimmieson, 2011	Test the model that service climate would increase the effort and performance of nursing groups and, in turn, increase patient satisfaction	Qualitative, cross-sectional study	**Organisational climate:** Global Service Climate Scale; questionnaire measuring the effort exerted on specific tasks and effort intensity for contextual performance; Technical Care Scale; Job-Task Support Scale **Patient outcome(s):** Questionnaire assessing patient satisfaction	156 nurses; 39 nurse unit managers (NUMs); 171 patients Data collected May 2007	Two hospitals; Australia	Patient satisfaction was positively associated with nurses' perception that there was a positive service climate Perceptions of service climate were associated with task and contextual effort, suggesting that a positive climate motivates nurses to provide quality patient care. Nurses felt that they exerted more effort towards providing technical care than towards performing extra-role tasks for patients	High
Hallowell et al., 2016	Examine the association of the neonatal intensive care	Quantitative, longitudinal study	**Work environment:** Practice Environment Scale of the Nursing Work Index (PES-NWI); nursing metrics	5,614 nurses; 6,997 patients (very low weight birth infants)	97 neonatal intensive care units; USA	Better nurse work environments and better educated nurses in US NICUs were associated	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	unit (NICU) work environment, staffing levels, level of nurse education, lactation consultant availability, and nurse-reported breastfeeding support with very low birth weight (VLBW) infant receipt of human milk at discharge		e.g., staffing, education, and experience **Patient outcome(s)**: Rate of very low birth weight infants discharged on "any human milk" from hospitalisation records	Data collected 2008		with a higher provision of human milk for VLBW infants In NICUs where more infants receive breastfeeding support from nurses, more VLBW infants received human milk at the point of discharge to home	
Hansen et al., 2011	Define the relationship between hospital safety climate and readmission rates within 30 days following discharge	Quantitative, cross-sectional study	**Organisational culture:** Patient Safety Climate in Healthcare Organizations (PSCHO) **Patient outcome(s)**: Risk-standardised hospital readmission rates from Centers for Medicare and Medicaid Services (CMS)	36,375 employees (frontline staff, nurses, physicians and senior managers) Survey data collected July 2006-May 2007 Admission rate	67 acute care hospitals; USA	There was a significant positive association between lower safety climate and higher readmission rates for acute myocardial infarction (AMI) and heart failure (HF), but not pneumonia. Perceptions of frontline staff associated with	High

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Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
				data collected 2008		readmission rates but not those of senior management Physician and nurse perceptions of safety climate were associated with AMI and HF readmission rates, respectively, but senior management perceptions were not	
Kelly et al., 2014	Determine the extent to which variation in ICU nursing characteristics —staffing, work environment, education, and experience—is associated with mortality. A secondary result of this would be illuminating strategies to	Quantitative, cross-sectional study	**Organisational environment:** Two databases**:** University of Pennsylvania Multi-State Nursing Care and Patient Safety Study and the American Hospital Association (AHA) Annual Survey Critical care nurses' reports; the Practice Environment Scale of the Nursing Work Index (PES-NWI)	55,159 older adults on mechanical ventilation; 3,193 critical care nurses Data collected 2006-2008	303 adult acute care hospitals; USA	Patients in critical care units with better nurse work environments experienced lower odds of 30-day mortality than those in worse nurse work environments	High

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Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	improve patient outcomes		**Patient outcome(s)**: The Medicare Provider Analysis and Review (MedPAR) database reporting 30-day mortality				
Kutney-Lee et al., 2009	Examine the contribution of nurses' work environments to patient satisfaction using national Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) data	Quantitative, cross-sectional study	**Work environment:** Practice Environment Scale of the Nursing Work Index (PES-NWI) **Patient outcome(s)**: HCAHPS	20,984 resident nurses Data collected 2006-2009	430 acute care hospitals; USA	The nurse work environment was significantly related to all HCAHPS patient satisfaction measures Patient-to-nurse workloads were significantly associated with patients' ratings and recommendation of the hospital to others, and with their satisfaction with the receipt of discharge information	Medium
Kutney-Lee et al., 2015	Compare changes over time in surgical patient outcomes, nurse-reported quality, and nurse outcomes	Quantitative, longitudinal study	**Work environment:** A binary variable measuring Magnetic status; Pennsylvania Registered Nurse Survey; Multi-State Nursing Care and Patient Safety Survey; The	20,984 staff nurses; unspecified number of patients Data collected 2007	136 hospitals (11 emerging Magnets and 125 non-Magnets); USA	Emerging Magnet hospitals demonstrated markedly greater improvements over time on the PES-NWI overall score and all five subscales compared to hospitals	Medium

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Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	in a sample of hospitals that attained Magnet recognition between 1999 and 2007 with hospitals that remained non-Magnet		American Hospital Association (AHA) Annual Survey; Practice Environment Scale of the Nursing Work Index (PES-NWI) **Patient outcome(s)**: Pennsylvania Health Care Cost Containment Council (PHC4) administrative discharge abstract files and death record files measuring 30-day surgical mortality and failure-to-rescue (FTR)			that remained non-Magnet Emerging Magnet hospitals experienced significantly greater improvement 30-day surgical mortality and failure to rescue rates over time, compared to non-Magnetic hospitals	
Larson et al., 2000	Assess the impact of an intervention to change organisational culture on frequency of staff handwashing (as measured by counting devices	Quantitative, interventional study	**Organisational culture**: Handwashing frequency rates estimated from records of activation of soap dispensers in study units **Patient outcome(s)**: Rates of nosocomial infections with MRSA and VRE. Data collected by infection control staff in each	All staff in adult medical intensive care unit (MICU) and a neonatal intensive care unit (NICU) Duration not specified	Two hospitals (one intervention hospital, once comparison hospital); USA	Over a period of eight months, 860,567 soap dispensings were recorded, with significant improvements in the study hospital after six months of follow-up. There were no significant differences in rates of MRSA between the two hospitals, but rates of VRE were significantly	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	inserted into soap dispensers on four critical care units) and nosocomial infections associated with methicillin-resistant Staphylococcus aureus (MRSA) and vancomycin-resistant enterococci (VRE)		hospital.			reduced in the intervention hospital during implementation	
Ma and Park, 2015	Examine the effects of work environment on patient outcomes at the unit level while adjusting for the influence on hospital-level organisational factors such as	Quantitative, cross-sectional study	**Work environment**: Practice Environment Scale of the Nursing Work Index (PES-NWI) **Patient outcome(s)**: Hospital-acquired pressure ulcer rates from the National Database of Nursing Quality Indicators (NDNQI)	33,845 registered nurses Data collected 2013	373 hospitals; USA	Units in Magnet hospitals had lower rates of pressure ulcers and better work environments Hospital Magnet status and work environments were significantly associated with pressure ulcer rates after controlling for unit level	High

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Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	Magnet status					covariates	
Ma et al., 2015	Determine the relationships between hospital nursing factors—nurse work environment, nurse staffing, and nurse education—and 30-day readmissions among Medicare patients undergoing general, orthopaedic, and vascular surgery	Quantitative, cross-sectional study	**Work environment:** Two databases**:** University of Pennsylvania Multi-State Nursing Care and Patient Safety Study and the American Hospital Association (AHA) Annual Survey **Patient outcome(s)**: Medicare Provider and Analysis Review File (MedPAR) measuring 30-day readmission rates	220,914 Medicare surgical patients; 25,082 nurses Data collected July 2006-June 2007	258 hospitals; USA	Patients cared for in hospitals with better nurse work environments had lower odds of readmission, independent of nurse staffing levels. Administrative support to nursing practice and nurse-physician relations were two main attributes of the work environment that were associated with readmissions	High
Maben et al., 2012	Examine the links between staff experience of work and patient experience of	Mixed-methods, cross-sectional study	**Organisational climate**: Questionnaire assessing organisational and local climate **Patient outcome(s)**:	Survey: 66 staff; 26 patients Interview: 18 staff; 18 patients and carers	A dedicated service for older people situated in a large acute teaching hospital;	Patients experienced more varied and unpredictable nursing care on those wards with a poor local work climate for staff	Medium

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Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	care in a 'Medicine for Older People' (MfOP) service in England		Patient Evaluation of Emotional Care During Hospitalisation (PEECH); short-form Picker Instrument; additional items from the longer UK NHS National Patient Survey	Data collected January 2010-August 2010	England	Emotional labour involved in being a patient was greater in poor care climates where the quality of care was unpredictable and patient experience variable	
Mahl et al., 2015	Evaluate the association of perceived organisational culture and quality improvement with the outcomes of infants admitted to level III NICUs in Canada	Quantitative, combined cross-sectional and longitudinal study	**Organisational culture**: Quality Improvement Implementation Survey (QIIS) **Patient outcome(s)**: Survival without major morbidity from patient records	1,133 health care professional; 1,028 extremely pre-term infants Data collected April 2008-March 2009	18 neonatal ICUs; Canada	Higher group culture scores were associated with significantly lower rates of survival without major morbidity Higher hierarchical culture and higher quality improvement scores were associated with higher rates of survival without major morbidity	High
Mardon et al., 2010	Examine relationships between the Agency for Healthcare Research and	Quantitative, cross-sectional study	**Safety culture:** The Agency for Healthcare Research and Quality (AHRQ) Hospital Survey on Patient Safety Culture (HSOPS)	56,480 hospital employees Data collected 2004-2006	179 hospitals; USA	Hospitals with higher patient safety culture scores tended to have lower rates of documented adverse events:	High

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Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	Quality's (AHRQ) Hospital Survey of Patient Safety Culture and rates of in-hospital complications and adverse events as measured by the AHRQ Patient Safety Indicators (PSIs)		**Patient outcome(s)**: Selected AHRQ Patient Safety Indicators (PSI)			12/15 HSOPS variables were negatively correlated with PSIs. After controlling for hospital characteristics, seven HSOPS (frequency of events reported, handoffs and transitions, organisational learning—continuous improvement, staffing, teamwork across units, teamwork within units, HSOP composite average) remained statistically correlated with PSIs	
McHugh and Ma, 2013	Understand how the nursing care environment affects readmissions	Quantitative, cross-sectional study	**Work environment:** Practice Environment Scale of the Nursing Work Index (PES-NWI); nurse staffing levels; nurse educational attainment **Patient outcome(s):** Data on index admissions and readmissions obtained from state discharge abstract databases	375,681 patients; 20,585 nurses Data collected 2006	412 hospitals; USA	Care in a hospital with a good versus poor work environment was associated with 7% lower odds of 30-day readmission for heart failure patients, 6% lower odds for acute myocardial infarction patients and 10% lower odds for pneumonia patients	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
						The odds of readmission was 4% lower for heart failure, 3% lower for acute myocardial infarction and 6% lower for pneumonia patients cared for in a hospital with a mixed versus poor work environment	
Meraviglia et al., 2008	Assist rural or small hospitals (average daily census < 100) with implementing 12 nurse friendly criteria into the policies and practices of the hospital to create a positive work environment	Quantitative, interventional study	**Work environment**: Nursing Work Index-Revised (NWI-R) **Patient outcome(s)**: Hospital reported prevalence of pressure ulcers, patient falls, and hospital-acquired pneumonia and urinary tract infections	1,150 nurses Duration not specified	30 hospitals; USA	There were positive changes in the nurses' perception of their work environment (indicating that that the intervention successfully improved organisational culture) Quality of care improved at participating hospitals, as measured by the nurse-sensitive quality indicators (QI)	Medium
Morris A et al., 2007	Examine the effects of organisational	Quantitative, longitudinal study	**Organisational culture and climate:** Questionnaire assessing	424 Patients with chronic mental illness; 274	14 Community Mental Health Organizations	Organisational culture and climate were strong predictors of perceived	High

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Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	culture and climate, as well as individual characteristics, on outcomes of care for adults with severe mental illness		organisational culture and climate **Patient outcome(s)**: Quality of Life (QOL) index; SF-36; Medicaid claims data; Clinician diagnoses using the DSM IV	administrators and health workers Data collected over three years; collection dates not specified	(CMHOs); USA	improvements in physical and mental health status over time, but were not associated with changes in QOL	
Nasirpour et al., 2010	Determine the relationship of Centralisation and organisational culture and performance indexes in Teaching Hospitals affiliated to Tehran University of Medical Sciences	Quantitative, cross-sectional study	**Organisational culture**: Robbin's organizational culture questionnaire **Patient outcome(s)**: Performance indexes (average length of stay, inpatient bed occupancy ratio, rate of admissions per active bed, net death rate and ratio of surgical operations to inpatients)	441 personnel Data collected 2007	13 hospitals; Iran	No significant correlation was observed between organisational culture and hospital performance indexes	Low
Nowinski et al., 2007	Monitor changes in organisational culture,	Quantitative, longitudinal study	**Organisational culture**: Culture and Quality Questionnaire (CQQ)	621 employees at Baseline and 471 employees at Time 2	Three hospitals; USA	Several strong correlations were found between changes in culture score and	Medium

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Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	continuous quality improvement (QI), maturity and QI indicators overtime		**Patient outcome(s)**: Press Ganey patient satisfaction survey; multiple standard quality indicators	Data collected March 2003-March 2006		changes in quality indicators at the three facilities. Appropriate discharge of patients with chest pain was negatively correlated with developmental culture; use of antibiotics within four hours of admission was positively associated with rational culture and quality management and negatively related to group culture and human resource utilisation; and patient satisfaction was positively correlated with group culture and negatively correlated with rational culture	
Prezerakos et al., 2015	Investigate the correlation between haemodialysis work environment	Quantitative, cross-sectional study	**Work environment**: Practice Environment Scale of the Nursing Work Index (PES-NWI)

Patient outcome(s): | 133 nurses

Data collected June-July 2012 | 11 hospital-based dialysis units; Greece | Hypotension, venous needle disconnection and patient falls were associated with non-favourable work environment | High |

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Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	and patients' outcomes		Questionnaire assessing how often selected errors and adverse events have occurred under the nursing care during the previous three months			Hypoglycaemia, medication error and catheter-associated infections were not associated with work environment	
Purdy et al., 2010	Determine impact of the work environment on patient care	Quantitative, cross-sectional study	**Work environment:** Work Effectiveness Questionnaire (CWEQ-II); Work Group Characteristics Measure; Psychological Empowerment Questionnaire (PEQ) **Patient outcome(s):** Patient falls and nurse assessed risks, measured using an instrument developed by Sochalski (2001); Nursing Care Quality Questionnaire (PSNCQQ); Therapeutic Self-care Questionnaire-Acute Care Version	679 nurses; 1,005 patients Duration not specified	61 medical and surgical units across 21 hospitals; Canada	Structural empowerment, mediated through group processes, significantly impacted a variety of patient outcomes including nurse-assessed quality and risk as well as an objective measure of patient falls although no significant effect was found for variables assessed using the patient's perspective	High
Saame et al., 2011	Outline the relationships	Quantitative, cross-	**Organisational culture:** Organisational Values	456 medical and non-medical	One hospital (including two	Clinics with high patient satisfaction did not score	Medium

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	between organisational culture and patient satisfaction	sectional study	Questionnaire (OVQ) **Patient outcome(s)**: Patient satisfaction ratings	professionals Data collected October 2005-February 2006	clinics with high patient satisfaction and four with low); Estonia	more than clinics with low patient satisfaction in terms of the Human Relations type Clinics with high patient satisfaction were less oriented towards Rational Goal type values than clinics with low patient satisfaction	
Scotti et al., 2007	Examine how a high-involvement approach to the work environment of healthcare employees may lead to exceptional service quality, satisfied patients, and ultimately to loyal customers	Mixed-methods cross-sectional study	**Work climate**: Questionnaire assessing human resource practices, customer orientation and employee-perceived service quality based on pre-existing Veterans' Affairs Questionnaire **Patient outcome(s)**: Questionnaire assessing customer perceived quality and customer satisfaction based on pre-existing Veterans Health Administration	59,464 employees; 212,874 respondents Data collected 2001	113 Veterans Health Administration ambulatory care centres; USA	High-performance work systems are linked to employee perceptions of their ability to deliver high-quality customer service, both directly and through their perceptions of customer orientation Employee perceptions of customer service are linked to customer perceptions of high-quality service	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
			Questionnaire			Perceived service quality is linked with customer satisfaction	
Shortell et al., 1995	Examine the relationships between organisational culture, quality improvement processes and selected patient outcomes	Quantitative, cross-sectional study	**Organisational culture**: 20-item questionnaire developed by Zammuto and Krakower (1991) assessing group culture, developmental culture, hierarchical culture, and rational culture scales **Patient outcome(s)**: A patient outcome impact scale assessing improved patient outcomes, reduced errors and inappropriate treatment, increased patient satisfaction, and improved continuity of patient care	Continuous quality improvement and total quality management: an unspecified number of CEOs and person in charge of quality assessment Organisational culture: 7,337 hospital staff Implementation: Approximately 50 respondents from per hospital Duration not specified	61 hospitals; USA	A participative, flexible, risk-taking organisational culture was significantly related to quality improvement implementation Quality improvement implementation was significantly associated with greater perceived patient outcomes and human resource development, but not financial outcomes	Medium
Shortell et al., 2000	Test impact of total quality management	Quantitative, longitudinal study	**Organisational culture:** Previously validated 20-item questionnaire	3,045 patients; an average of 54 staff per hospital	16 nongovernment al, not-for-profit,	A supportive group culture was significantly associated with shorter	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	(TQM) and organisational culture on a comprehensive set of endpoints of care for coronary artery bypass graft surgery (CABG)		developed by Zammuto and Krakower (1991) **Patient outcome(s)**: CABG care endpoints (mortality, adverse outcome, clinical efficiency); Patient satisfaction questionnaire consisting of Patient Judgment System 24-item (PJS-24) questionnaire, 'returning to home issues' items, and 'the needs of heart patients' items	Data collected 1995-1996	short-term-care general service hospitals engaged in TQM interventions; USA	postoperative intubation times, and higher patient physical and mental functional health status scores six months after CABG, but also with longer operating room times There was little effect of organisational culture on multiple end-points of care for CABG patients	
Singer et al., 2009	Study the relationship between safety climate and safety performance using Patient Safety Indicators (PSIs)	Quantitative, cross-sectional study	**Safety climate**: Patient Safety Climate in Healthcare Organizations (PSCHO) 2004 **Patient outcome(s)**: The Medicare Provider Analysis and Review (MEDPAR) File from 2005	18,223 hospital staff Data collected 2004-2005	91 hospitals; USA	Higher levels of safety climate were associated with higher safety performance Hospitals in which personnel reported more problems with fear of shame and blame had significantly greater risk of experiencing PSIs Perceptions of higher	High

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Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
						safety climate overall among frontline personnel were associated with a relative increase in the risk of experiencing PSIs, but safety climate perceptions overall among senior managers were not	
Stone et al., 2007	Examine effects of a comprehensive set of working conditions on elderly patient safety outcomes in intensive care units	Quantitative, cross-sectional study	**Organisational climate:** Perceptions of Nurse Work Environment Scale; administrative processes derived from monthly payroll data; monthly total ICU patient census data; Bureau of Labor Statistics regional estimates of RN salary **Patient outcome(s):** Central line associated bloodstream infection (CLBSI), ventilator associated pneumonia (VAP), and catheter-associated	15,846 patients; 1,095 nurses Data collected 2002	51 adult intensive care units across 31 hospitals; USA	Units with higher staffing had lower incidence of CLBSI, VAP, 30-day mortality, and decubiti Increased overtime was associated with higher rates of CAUTI and decubiti, but slightly lower rates of CLBSI The effects of organisational climate on patient safety outcomes were inconsistent. Patients admitted to ICUs in which the nurses' perceived a more	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
			urinary tract infection (CAUTI) derived from Nosocomial Infections Surveillance's (NNIS) system of infection surveillance; 30-day mortality and decubiti were determined using Medicare files			positive organisational climate had slightly higher odds of developing a CLBSI, but were 39% less likely to develop a CAUTI	
Taylor et al., 2012	Investigate the extent to which organisational characteristics (working conditions and safety climate) predict injuries for patients and nurses	Quantitative, cross-sectional study	**Safety climate**: Safety Attitudes Questionnaire (SAQ); unit turnover rates; registered nursing hours per day data obtained from Human Resources **Patient outcome(s)**: Patient injuries (falls, pressure ulcers, and pulmonary embolism/deep vein thrombosis) from administrative discharge data and Patient Safety Net software	723 nurses; 28,876 patient discharges Data collected: Safety climate: 2004 Injury outcomes: 2005	A trauma centre with Magnet nursing status; USA	Safety culture was significantly associated with patient outcomes e.g., falls, decubitus ulcers and PE/DVT Working conditions were significantly associated with patient and nurse injury	High
Tei-Tominaga and Sato, 2016	Examine the effect of nurses' work environment	Quantitative, cross-sectional study	**Work environment:** Japanese version of the Practice Environment Scale of the Nursing Work Index	425 nurses; 379 inpatients Data collected	Four hospitals; Japan	Hospitals in Japan with a work environment that nurses perceive to be similar to the work	High

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Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	with characteristics that are similar to those of Magnet hospitals on patient satisfaction in Japan		(PES-NWI) **Patient outcome(s)**: Questionnaire assessing information about hospitalisation (number of hospitalisations, duration of hospitalisation, having operative treatment), and patient satisfaction	August 2011		environment in Magnet hospitals were associated with patient satisfaction Specifically, collegial nurse-physician relations was associated with low patient satisfaction, however this association was weak, and diminished when hospital characteristics were considered in the analysis	
Temkin-Greener et al., 2010	Examine the association between nursing home (NH) work environment attributes such as teams, consistent assignment and staff cohesion, and the risk of pressure ulcers and incontinence	Quantitative, cross-sectional study	**Work environment:** Questionnaire purpose designed for the study assessing staff cohesion, presence of teams and consistent assignment **Patient outcome(s)**: Pressure ulcer and incontinence from the Minimum Data Set	46,044 residents; 7,418 workers Data collected June 2006-July 2007	162 long-term care nursing homes; USA	Residents in facilities with worse staff cohesion had significantly greater odds of pressure ulcers and incontinence, compared with residents in facilities with better cohesion scores Residents in facilities with greater penetration of self-managed teams had lower risk of pressure ulcers, but not	High

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Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
						of incontinence Prevalence of consistent assignment was not significantly associated with pressure ulcers or incontinence	
Tervo-Heikkinen et al., 2008	Assess the interrelationships between nurses' work environment and nursing outcomes	Quantitative, cross-sectional study	**Work environment**: Registered Nurse Working Conditions Barometry Index-revised (RN-WCBI-R); items from the Nurse Work Index-revised (NWI-R) **Patient outcome(s)**: Total satisfaction indicator from the Humane Caring Scale-revised	664 registered nurses (RN); 1,730 patients Data collected during 2005	34 acute care inpatient hospital wards across four hospitals; Finland	Professional nursing standards staffing adequacy, and nursing respect and relationships were found to be important predictors of patient satisfaction	High
Tzeng et al., 2002	Investigate the relationship among staff nurses' assessment of organisational culture and general inpatient	Quantitative, cross-sectional study	**Organisational culture**: Nurse Assessment Survey (NAS) **Patient outcome(s)**: Nursing Services Inpatient Satisfaction Survey (NSISS)	520 registered nurses; 345 patients Duration not specified	13 medical/ surgical adult units; two adult psychiatric units; two gynaecology/obs tetric units; USA	Strength of culture had indirect positive effects (through nurse satisfaction) on patient satisfaction	Medium

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	satisfaction with nursing care						
Virtanen et al., 2009	Examine the association between work hours, work stress, and collaboration among the ward personnel, and the risk of hospital-associated infection among patients	Quantitative, cross-sectional study	**Organisational climate**: Questionnaire measuring mean working hours, work stress (job strain and effort-reward imbalance), and collaboration (communication, justice in the distribution of work, support from supervisor, and quality of the collaboration between supervisors in the ward) **Patient outcome(s)**: Hospital-associated infection derived from medical records and infection surveillance records	1,092 patients; 1,159 staff Data collected March 2004-June 2004	Six hospitals; Finland	Long working hours among staff, high work stress, and problems in collaboration between personnel were related to infection among patients High effort-reward imbalance, low trust between ward members, injustice in the distribution of work, and poor collaboration between supervisors were all related to approximately a 2-fold infection risk among patients	High
Warren et al., 2007	Explore the association between health care employees' perceptions of	Quantitative, cross-sectional study	**Organisational climate:** All Employee Survey (AES) comprising questions from the National Institute for Occupational Safety and Health	74,662 employees of the VHA Data collected 2001	141 VHA facilities; USA	There was a relationship between some patient outcomes and organisational culture Patient satisfaction	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	their organisations and objective measures of system performance (including employee and patient outcomes).		(NIOSH) Instrument and the Organizational Assessment Survey (OAS); Bureau of Labor Statistics Survey of Employment; Federal Aviation Administration Instrument **Patient outcome(s)**: AES measuring attitudinal outcomes, and health and safety outcomes; Administrative Veterans Health Administration (VHA) Data Sets			demonstrated the strongest connection with organisational climate. Inpatient and outpatient satisfaction was strongly related to increased levels of support, and increased inpatient satisfaction is also associated with higher levels of Professional Demands	
Weinberg et al., 2013	Examine the benefits of a high-performance work environment (HPWE) for employees, patients, and hospitals	Quantitative, cross-sectional study	**Work environment:** Questionnaire based on Revised Nursing Work Index, Picker Hospital Employee Survey; variety of tools from other workplace settings, with particular focus on research on high-performance work systems and teams	16,459 discharge records; 2,920 patient surveys; 1,527 staff surveys Duration not specified	45 units across nine hospitals and seven health systems; USA	HPWE was significantly associated with patients' experience and safety. HPWE was related to lower odds that a patient will experience an adverse outcome during the hospital stay	High

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Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
			Patient outcome(s): Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS); discharge data				
You et al., 2013	Evaluate the link between nurse resources and nurse and patient outcomes	Quantitative, cross-sectional study	**Work environment:** Four of the five subscales of the Practice Environment Scale of the Nursing Work Index (PES-NWI) **Patient outcome(s)**: Adapted version of the Consumer Assessment of Healthcare Providers and Systems (CAHPS) Hospital Survey	9,688 staff (nurses in particular); 5,786 patients Duration not specified	181 hospitals; China	Patients in hospitals with better work environments were more likely to rate their hospital highly, to be satisfied with nursing communications, and to recommend their hospitals Higher patient-to-nurse ratios were unrelated to patient outcomes Higher percentages of baccalaureate nurses were strongly related to better patient outcomes	High
Zhou P, 2011	Determine whether perceptions of organisational	Quantitative, cross-sectional study	**Organisational culture:** Employee questionnaire measuring organisational culture	3,437 staff; 8,276 patients Data collected	87 hospitals; China	Culture emphasising social responsibility was negatively associated with length of stay	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	culture among employees of public hospitals in China are associated with hospital performance		**Patient outcome(s)**: Hospital questionnaire assessing performance outcomes such as LOS, outpatient visits per year, bed days per year, patient satisfaction; patient survey measuring satisfaction with medical care	June-October 2009		Hospitals with culture emphasising cost control had higher rates of outpatient visits and BDPPPD, as well as lower levels of patient satisfaction Hospitals in which employees perceived the culture as customer-focused had longer length of stays but lower patient satisfaction	

PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1, 4
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	4
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	6-7
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	6
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	6-7
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	6
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	6, full search strategy in protocol paper
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	6-7
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	6-7
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	6-7
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	7-8

PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	4-5
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	N/A

Page 1 of 2

Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	7
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	N/A
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	8
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	8-10
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	10
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	10-15
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	N/A
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	10
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	N/A
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	16-17
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	17
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	17-18
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	18

PRISMA 2009 Checklist

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Page 2 of 2

The association between organisational and workplace cultures, and patient outcomes: systematic review

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1 **The association between organisational and workplace cultures, and patient outcomes:**

2 **systematic review**

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21 **Keywords**

22 Health & safety; health policy; public health; quality in healthcare; clinical governance;

23 organisational development.

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26   **ABSTRACT**

27   **Design and objectives:** Every organisation has a unique culture. There is a widely-held view

28   that a positive organisational culture is related to positive patient outcomes. Following the

29   Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) statement,

30   we systematically reviewed and synthesised the evidence on the extent to which

31   organisational and workplace cultures are associated with patient outcomes.

32   **Setting:** A variety of healthcare facilities, including hospitals, general practices, pharmacies,

33   military hospitals, aged care facilities, mental health and other healthcare contexts.

34   **Participants**: The articles included were heterogeneous in terms of participants. This was

35   expected as we allowed scope for wide-ranging health contexts to be included in the review.

36   **Primary and secondary outcome measures**: Patient outcomes, inclusive of specific

37   outcomes such as pain level, as well as broader outcomes such as patient experience.

38   **Results:** The search strategy identified 2,049 relevant articles. A review of abstracts using the

39   inclusion criteria yielded 204 articles eligible for full-text review. Sixty-two articles were

40   included in the final analysis. We assessed studies for risk of bias and quality of evidence.

41   The majority of studies (84%) were from the North America or Europe, and conducted in

42   hospital settings (89%). They were largely quantitative (94%) and cross-sectional (81%). The

43   review identified four interventional studies, and no randomised controlled trials, but many

44   good quality social science studies. We found that overall, positive organisational and

45   workplace cultures were consistently associated with a wide range of patient outcomes such

46   as reduced mortality rates, falls and hospital acquired infections, and increased patient

47   satisfaction.

48   **Conclusions:** Synthesised, although there was no level 1 evidence, our review found a

49   consistently positive association held between culture and outcomes across multiple studies,

2

50 settings and countries. This supports the argument in favour of activities which promote

51 positive cultures in order to enhance outcomes in health care organisations.

52

53 **ARTICLE SUMMARY: STRENGTHS AND LIMITATIONS OF THIS STUDY**

54 • This review found a consistent association between organisational and workplace

55   culture, and patient outcomes across a variety of health settings; most included studies

56   consisted of observational, cross-sectional studies conducted in hospitals.

57 • The high volume of included studies provides a solid foundation for readers to

58   enhance their knowledge of organisational culture in healthcare.

59 • Most articles included in the final synthesis were rated as high quality, based on the

60   Quality Assessment Tool.

61 • The broad scope of the review, including a wide-ranging search strategy, provided an

62   overarching account of the research topic.

63 • Definitions and measurements of culture, environment and patient outcomes were

64   highly variable across studies, which placed limits on the comparisons that could be

65   drawn.

66

3

67   **The association between organisational and workplace cultures, and patient**

68   **outcomes: systematic review**

69

70   **INTRODUCTION**

71   Amongst policymakers, managers and clinicians, culture is a much-discussed construct. The

72   discourse is often centred on normative considerations, proposing that an effective, functional

73   or productive culture is preferable to one that is ineffective, dysfunctional or even toxic.[1, 2]

74   A healthier organisational or workplace culture is believed to be related to positive patient

75   outcomes, such as reduced mortality and length of stay, increased quality of life and

76   decreased pain level.[3, 4] However, no review has been conducted to weigh the evidence for

77   such beliefs. We examined the extent to which this putative association between culture and

78   patient outcomes holds in healthcare settings.

79   Across the literature, culture has been defined in numerous ways.[4-10] Famously,

80   Kroeber and Kluckhohn found 164 definitions of culture in 1952. Since then there are most

81   likely many more variations and definitional stances on the culture theme.[11] It is not easy

82   to synthesise these different perspectives, but most experts would agree that culture signifies

83   features of institutional life which are shared across a workplace or organisation, between the

84   members, such as their cognitive beliefs, assumptions and attitudes; and their activities, such

85   as their behaviours, practices and interactions. These shared ways of thinking and behaving

86   become normalised, and reflect what comes to be seen as legitimate and acceptable within the

87   workplace or organisation. The cultural expressions also become taken for granted by

88   members of the workplace or organisation. They are the normative, social and cognitive

89   'glue' which bind people within the culture together; culture, then, is 'the way people think

90   around here' and 'the way things are done around here'.

4

91   Based on these conceptualisations, we define culture in a summarised way, as the sum

92   of jointly-held characteristics, values, thinking and behaviours of people in workplaces or

93   organisations[4] (for a list of key terms and definitions, see Box 1). For this systematic

94   review, culture is classified in two ways. The first category concerns the *overarching culture*

95   *of an organisation*, including consistent practices, beliefs and attitudes, for example, within a

96   whole hospital, general practice group, aged care facility or other institutional setting.[12, 13]

97   The second category relates to more localised cultural dimensions; *workplace cultures*, which

98   are specific to group characteristics of the organisation, for example those identifiable sub-

99   cultures that manifest in wards, departments, or within employee groups such as doctors,

100   allied health professionals, or nurses.[8, 14, 15]

101   These definitions arise from, and are underpinned by, much conceptual work which

102   has enriched the idea of culture and the way it manifests. Theoretically, there are multiple

103   stances taken in conceptualising culture. One way is to think of culture as a composite, and

104   enduring but relatively static phenomenon; a sort of concrete, tangible, matter-of-fact

105   organisational variable. Here, it is a noun: *the* culture. Another way is to think of it as

106   dynamic, emergent, longitudinal phenomenon, more a verb than a noun. This distinction is a

107   deep one, springing from a social science perspective which asks whether phenomenon of

108   this kind are a *being-realism* or a *becoming-realism*.[16]

109   Yet another theoretical distinction lies in whether culture is better understood with

110   reference to shared *meanings* or shared *practices*. Scholars including Martin (2002)[17] and

111   Alvesson (2002)[18] see that culture can be construed and understood theoretically in many

112   different ways depending on the observers' interests, ideologies and interpretative or

113   reflexive stance. All in all, theoretically we take the view that culture is a composite, complex

114   construct which changes dynamically over time, but there are enduring behavioural and

115   cognitive patterns to its manifestations *in situ*.[7, 19]

5

116

Box 1: Definitions

Cohen's Kappa: A statistic commonly used to measure interrater reliability; that is, the extent to which individual raters' scores agree with each other whilst accounting for chance agreement.[20]

Climate: Employees' perception of an organisational or workplace culture.[21] Climate and culture are terms often used interchangeably in the literature, without clear cut boundaries.[21] For this purpose of this review, the concept of climate is encompassed in the definition of culture.

Environment: The structural, social and implicit characteristics of the context in which work is done.[22] For the purposes of this review, only cultural elements of workplace or organisational environment were considered, e.g., cooperation and sense of cohesiveness between the work team. Structural characteristics such as nurse to patient ratios, and employee characteristics such as education, were not included in our definition of work environment.

Organisational culture: The values, behaviours, goals, attitudes, practices, and beliefs shared across an entire organisation.[23]

Patient outcomes: The downstream consequences of patient care. These can be positive (e.g., satisfaction with care, reduced length of stay) or negative (e.g., disability, hospital acquired infection).[21]

Quality of care: Within a healthcare environment, there are many facets of quality of care. Types of care that can be assessed include the technical and judgement skill provided by the physician, and the interpersonal care received from healthcare professionals.[24]

6

139 **Quality of study:** The extent that the study design and the manner in which it is executed are

140 protective from bias and error.[25]

141 **Risk of bias:** The potential for a systematic deviation from facts; an error.[25]

142 **Workplace culture:** A specific type of sub-culture involving an identifiable grouping within

143 an organisation. In healthcare, such a 'workplace' may be a unit, ward or department, or a

144 professional group, e.g., medicine or nursing.[26]

145

146   In this review, we aimed to investigate ways in which organisational and workplace

147 cultures are associated with patient outcomes across a range of healthcare settings. On the

148 basis of the foregoing,[4, 21, 27] we formulated a hypothesis: *positive organisational and*

149 *workplace cultures are related to positive patient outcomes and negative organisational and*

150 *workplace cultures are related to negative patient outcomes.* By positive we mean a

151 cohesive, supportive, collaborative, inclusive culture, and by negative, we mean the converse.

152 We anticipated that this review would provide information for those, such as policymakers,

153 managers, clinicians, researchers, and patient groups who seek to understand, shape or

154 enhance healthcare cultures or sub-cultures. We expected that such an analysis would provide

155 insights into the evidence for culture and sub-cultures, and recognise that cultures are deeply

156 embedded in systems and settings in terms of their interacting agents, capacity to evolve and

157 adapt, and emergent behaviours.[28, 29]

158

159 **METHODS**

160 The review was carried out in accordance with the Preferred Reporting Items for Systematic

161 Review and Meta-analyses (PRISMA) statement.[30] A literature search of academic

162 databases CINAHL, EMBASE, Ovid MEDLINE, Web of Science and PsycINFO, of studies

7

163   published since the inception of the databases, was conducted in August 2016. The search

164   strategy consisted of terms pertaining to patient outcomes, inclusive of specific outcomes

165   such as decubitus ulcer and pain level, as well as broader terms such as quality of care and

166   patient experience (see Table 1 for the search strategy, using Ovid MEDLINE as an

167   example). The review was undertaken in accordance with a published study protocol, which

168   provides more detailed information regarding information sources, the search strategy, data

169   items and data synthesis (Supplementary file A. Published Protocol).[26]

170

171   **Table 1: Database search strategy: Ovid MEDLINE**

Constructs	Search terms
Organisational culture/ workplace culture	work culture OR work place OR workplace OR work site OR worksite OR organi$ation* culture OR service culture OR corporate culture OR work climate OR organi$ation* climate OR service climate OR corporate climate OR work ethos OR organi$ation* ethos OR service ethos OR corporate ethos OR work environment OR organi$ation* environment OR service environment OR corporate environment
AND	
Patient outcomes	patient outcome* OR patient satisfaction OR health outcome* OR patient experience* OR mortality OR length of stay OR pain level OR cost of care OR functional abilit* OR patient knowledge OR quality of life OR impairment* OR disabilit* OR readmission rate* OR adverse event* OR medication error* OR patient fall* OR infection* OR decubitus ulcer*
AND	
Health care	health organi$ation* OR hospital* OR health facilit* OR acute care OR primary care OR health OR healthcare OR health care OR health-care

172

173   Records and abstracts resulting from the database search were downloaded into an

174   EndNote library and duplicates were removed. Pairs of authors (JH:GL; KL:LT) reviewed

175   5% of records to ensure the article retention process was consistent. Abstracts were assessed

8

176   against the following inclusion criteria: English language, peer-reviewed journal articles

177   consisting of empirical research conducted in healthcare settings. A broad definition of

178   healthcare was adopted, encompassing settings including hospitals, general practices,

179   pharmacies, military hospitals, aged care facilities, mental health and other healthcare

180   settings. Articles were only included if they assessed the association between organisational

181   or workplace culture, and patient outcomes. Articles that measured safety culture were

182   included if other inclusion criteria were met, as safety culture is an important component of

183   organisational culture.

184   Discrepancies in article retention were discussed until a consensus was reached, with

185   JB acting as arbitrator in cases of ambiguous study suitability. JH, KL, GL and LT assessed

186   the remaining abstracts against the inclusion criteria followed by a full-text analysis of

187   included articles. Papers evaluating 'hospital performance' were eligible for inclusion if the

188   measures concerned patient outcomes. Articles referring to measures of process interventions,

189   for example, 'adherence to guidelines' or 'medication administration error reporting' were

190   excluded if they did not measure patient outcomes. Articles that only measured healthcare

191   employees' *perceptions* of patient outcomes were excluded, as they were classified as a

192   process rather than outcome measure. Only associations relevant to the hypothesis were

193   included in the analysis.

194   Included articles were summarised using a data extraction sheet (Supplementary File

195   B. Data Extraction Sheet).[31] Key information recorded included country, timeframe of data

196   collection, study type, aims, data collection methods, methodology, findings, and

197   implications. Bias of studies was assessed by JH and JB using a Risk of Bias Template

198   (Supplementary File C. Risk of Bias Template), adapted from the Cochrane Handbook for

199   Systematic Reviews, specifically the Cochrane Collaboration's tool for assessing risk of

200   bias.[32] The quality of articles was assessed by JH, GL, KL, and LT using Hawker et al.'s

9

201 (2002) Quality Assessment Tool.[33] Studies were analysed and synthesised according to

202 direction of association and categorisation of patient outcomes.

203

204 **RESULTS**

205 **Search strategy**

206 The results of the search strategy are outlined in Figure 1. A total of 2,049 relevant articles

207 were identified. The Cohen's Kappa for the 5% review of abstracts was 0.2966 (JH:GL) and

208 0.5032 (KL:LT). It is noted that Kappa Paradox 1 occurred in this instance, due to the

209 prevalence of excluded articles decreasing the Kappa value.[34, 35] This was taken into

210 account through calculating the prevalence-adjusted bias-adjusted Kappa (PABAK),

211 increasing the values to a strong (0.84) and moderate (0.76) level of agreement,

212 respectively.[20] Additionally, the prevalence index (PI) was calculated as 0.88 and 0.73 for

213 the pairs of reviewers.

214   Two hundred and four abstracts met the inclusion criteria based on the complete

215 review of abstracts. The full text content review of these included articles resulted in sixty-

216 two articles included in the final analysis. A comprehensive table of included articles was

217 generated by JH and edited by KL and LT (Supplementary File D. Summary of Included

218 Articles).

219

220 **[Insert Figure 1. Search strategy here]**

221

222 **Study characteristics**

223 A summary of included study characteristics is provided in Table 2. The majority of studies

224 employed quantitative methods. Only four studies comprised mixed methods, and no study

225 involved purely qualitative methods. Most studies were observational in nature, with only

226 four intervention studies identified in the final analysis. Of the observational studies, most

227 were classified as cross-sectional. Studies were more commonly conducted in a hospital

228 context, and a US setting. No studies yielding level one evidence, i.e., randomised controlled

229 trials, were identified. The data obtained from the review was heterogeneous, in terms of

230 participants and outcomes (clinically diverse), and in study design (methodologically

231 diverse).[36] Across the studies, organisational and workplace culture and environment were

232 defined and measured in a non-standardised way. For example, some studies focussed on

233 broader hospital culture,[37-45] while others assessed staff attitudes and values,[46-49] or

234 safety climate.[50-60] The concept of patient outcomes was also diverse in nature,

235 comprising a variety of specific and broader outcomes and conditions. Due to the

236 heterogeneity of definitions, tools, and variables, quantitative meta-analysis of data was of no

237 value.[61]

238

239 **Table 2. Descriptive characteristics of included studies**

	Number (%)
Method	
Quantitative	58 (93.6)
Qualitative	0 (0.0)
Mixed	4 (6.5)
Study design	
Intervention	4 (6.5)
Observational	58 (93.6)
Cross-sectional	50 (80.7)
Longitudinal	10 (16.1)
Level of Evidence	
Level 1	0 (0.0)
Other	62 (100.0)

11

Setting	
Hospital	55 (88.7)
Aged care	4 (6.5)
Other	3 (4.8)
Country	
USA	36 (58.1)
Europe	11 (17.7)
Canada	5 (8.1)
Asia	4 (6.5)
Australia	2 (3.2)
Middle East	2 (3.2)
UK	2 (3.2)

240

Risk of bias

242 The Cochrane Collaboration's tool for assessing risk of bias is designed for use in clinical

243 trials. Our final collection of articles did not contain data from clinical trials, and therefore,

244 the tool was deemed an inappropriate method by which to assess risk of bias. A new way of

245 assessing risk of bias was established (Supplementary File C) by adapting the Cochrane

246 Handbook for Systematic Reviews' definitions of bias for applicability to quantitative and

247 qualitative non-intervention studies.[32] Applying this tool, it was clear that all included

248 articles sustained a risk of bias. It is suggested that classification of articles by quality, rather

249 than exclusively by bias, is more appropriate for this class of review.

250

Quality assessment

252 Over 93% of included studies were observational (Table 2). The Cochrane Handbook for

253 Systematic Reviews suggests that observational studies rate as low quality in its Grades of

254 Recommendation, Assessment, Development and Evaluation (GRADE) approach to

255 assessing the quality of articles.[62] Hawker et al.'s (2002) Quality Assessment Tool[33] was

256 deemed more suitable for this review as it is designed to evaluate studies covering a variety

257 of research paradigms. The tool developers (Hawker et al., 2002) gave detailed descriptions

12

258 of what constituted a "good" (4 points), "fair" (3 points), "poor" (2 points) or "very poor" (1

259 point) article in each of the following nine categories: abstract and title; introduction and

260 aims; method and data; sampling; data analysis; ethics and bias; findings/results;

261 transferability/generalisability; and, implications and usefulness, allowing for a potential

262 maximum score of 36. Hawker et al. (2002) did not suggest cut-offs for classifying the total

263 quality rating of the article, but this has been proposed by other researchers using the Quality

264 Assessment Tool.[33] For example, the rule of thumb developed by Lorenc et al. (2014)

265 suggests the following quality grading system: "high quality" (30-36 points), "medium

266 quality" (24-29 points), and "low quality" (9-24 points).[63] This recommendation was

267 modified in the current systematic review where "low quality" was classified as 9-23 points

268 to reduce ambiguity. Quality scores ranged from 17-36 across the 62 included studies. Full

269 details on quality scores are provided in Table 3. Articles were classified as either high,

270 medium or low quality based on these cut-off values. Quality scores are reported in

271 Supplementary File D.

272

273 **Table 3. Methodological rigour and quality of included articles**

Quality classification*	Points scored on the Hawker et al. (2002) Quality Assessment Tool*	Number of articles classified in each section
High quality	30-36	39
Medium quality	24-29	21
Low quality	9-23	2

274 *adapted from cut-off values determined by Lorenc et al., 2014.[63]

275

276 **Overall findings**

277 We found that organisational and workplace cultures were correlated with patient outcomes

278 in over 90% of studies. The majority (74.2%) of associations were classified as 'positive',

13

279 comprising of exclusively positive associations (48.4%), or a mixture of positive associations

280 and no associations in articles reporting multiple studies (25.8%) (Figure 2).

281

282 **[Insert Figure 2: Categorisation of direction of studies (number of studies) here]**

283

284   Culture was positively associated with a range of system-related patient outcomes.

285 These comprised four broad, systems-based outcomes: mortality rates,[54, 55, 64-70] failure

286 to rescue,[64, 66, 71] readmission rates,[51, 58, 72, 73] and adverse events/medication

287 errors.[39, 56, 57, 74-77] They also included wellbeing outcomes, notably, patient

288 satisfaction,[38, 40, 42, 44, 47, 48, 78-87] quality of life,[88] and patient mood.[88] More

289 specific clinical outcomes related to culture were pressure ulcers,[39, 53, 89-92] falls,[37, 39,

290 53, 77, 90, 93] hospital acquired infections,[39, 46, 50, 91, 94-96] depressive symptoms,[97]

291 pulmonary embolism/deep vein thrombosis,[53] incontinence,[92] symptom burden at the

292 end of life,[67] and physical and mental health status[59] (Figure 3). Table 4 summarises all

293 associations by outcome type. It should be noted that one of the articles that measured

294 hospital acquired infections as the outcome was low quality according to the Quality

295 Assessment Tool, and only a handful were interventional or had a control group. However,

296 this is not of primary importance in light of the plethora of higher-quality studies yielding a

297 positive result.

298   Articles showing no significant associations accounted for 8.1% of studies.

299 Indeterminate or results comprising both positive and negative associations, made up 19.4%

300 of the research. There were no studies presenting 'negative' associations (exclusively

301 negative associations, or negative associations and no associations).

302

14

303   **[Insert Figure 3: Key associations between culture and patient outcomes here]**

304

305   **Table 4. Associations by type of outcome**

	System-related patient outcomes	**Wellbeing outcomes**	**Clinical outcomes**
Exclusively positive associations	15 (24.2)	13 (21.0)	5 (8.1)
Positive associations and no associations	8 (12.9)	6 (9.7)	8 (12.9)
No associations	2 (3.2)	3 (4.8)	1 (1.6)
Negative associations and no associations	0 (0.0)	0 (0.0)	0 (0.0)
Exclusively negative associations	0 (0.0)	0 (0.0)	0 (0.0)
Indeterminate or mixed results	8 (12.9)	4 (6.5)	5 (8.1)

306

307   **Positive associations**

308   Almost three in four (74.2%) studies reported exclusively positive associations, or a mixture

309   of positive associations and no associations, between culture and patient outcomes. For

310   example, hospital-based cross-sectional studies found patient mortality rates were nearly 48%

311   lower in hospitals with better work environments,[69] and surgical mortality rates were more

312   than 60% higher in hospitals with poor work environments.[98] Some studies moved beyond

313   'better' and 'poor' environments by evaluating *types* of culture positively associated with

314   patient outcomes. For example, a 'human relations'-type culture was also related to enhanced

315   patient satisfaction.[40] Human relations involved focusing on flexibility and supporting

316   internal resources, and embracing values associated with belonging, trust, and cohesion.

317   Organisational and workplace cultures were also positively associated with patient

318   outcomes in contexts other than hospitals. A study of aged-care found that residents in

15

319 facilities with less effective staff cohesion were at significantly greater risk of pressure ulcers

320 and incontinence, compared with residents in facilities with more effective cohesion.[92]

321 Depressive symptoms in residents were associated with two dimensions of organisational

322 culture (proficiency and resistance), and three dimensions of climate (stress, engagement, and

323 functionality).[97] Companionate love culture (that is, feelings of affection, caring and

324 compassion) in aged-care facilities was positively correlated with patient mood, quality of

325 life, satisfaction and fewer trips to the emergency room.[88] A single study of a community

326 mental health organisation concluded that a positive organisational culture was a strong

327 predictor of physical and mental health status improvements over time, but not changes in

328 quality of life.[59] These findings collectively indicate the importance of a positive

329 organisational and workplace culture for a wide variety of patient outcomes, across multiple

330 settings.

331   A small group of articles reported a combination of positive associations and no

332 associations between culture and patient outcomes. One paper found no correlation between

333 culture or climate and risk-adjusted outcomes, however, teamwork, communication and

334 collaboration was associated with risk-adjusted morbidity.[54] Another paper found that

335 nurses' perceptions of work environment were significantly related to patient hospitalisation

336 rates, but not with patient satisfaction.[99] Studies that reported mixed positive and no-

337 association results have also been reported in aged care[57, 88] and mental health

338 services.[59]

339

No associations

341 Not all studies reported associations between culture and patient outcomes. A primary care-

342 based cross-sectional study found no significant associations between team culture and

16

343   HbA1c level, systolic blood pressure and total cholesterol levels in diabetes mellitus type II

344   patients.[49] Other studies, one of which was ranked as low-quality, found no association

345   between organisational or workplace culture and patient satisfaction,[52] performance

346   indexes,[41] prescription errors, rates of adverse events, and patient mortality rates.[100]

347

348   **Indeterminate studies**

349   Over 17% of included articles reported indeterminate or mixed results. The 'indeterminate'

350   category was used in cases where the classification of cultures as positive or negative could

351   not be discerned. For example, higher scores on group culture measures, that is those that

352   emphasised teamwork, cohesiveness and participation, were associated with significantly

353   lower rates of survival without major morbidity, whereas in one study, higher scores on

354   hierarchical culture measures were associated with higher rates of survival without major

355   morbidity.[70] 'Mixed' refers to both positive and negative associations presented in the one

356   paper. A study reported that ICUs in which nurses perceived the culture as positive had

357   higher rates of central line associated bloodstream infections (CLBSI), but were 39% less

358   likely to develop a catheter-associated urinary tract infection (CAUTI).[91] In another study

359   with a relatively small sample size, patient falls with injury were positively related to a

360   developmental culture. A developmental culture was one characterised by dynamic and

361   innovative environments that value individual initiatives and growth. Patient falls with injury

362   were negatively related to group culture, characterised by warm, caring environments that

363   value tradition and loyalty.[37]

364

365   **Intervention studies**

17

366 Our review included four intervention studies. A systematic review on culture and

367 performance (rather than outcomes) completed in 2011, included only two interventions.[4]

368 A study in rural/small hospitals which implemented 12 nurse-friendly criteria to create a

369 positive work environment observed positive changes in nurses' perception of their work

370 environment and improvements in quality of care in participating hospitals post-

371 intervention.[90] A hospital-based intervention study to change organisational culture on

372 frequency of staff handwashing did not improve rates of methicillin-resistant Staphylococcus

373 aureus (MRSA) in two hospitals, but rates of vancomycin-resistant enterococci (VRE) were

374 significantly reduced in the intervention hospital during implementation.[94] A prominent

375 interventional study, the UK Safer Patients Initiative, indicated that while there was a small

376 improvement in staff attitudes to organisational climate in intervention hospitals, the

377 intervention had no significant effect on patient safety outcomes, measured by the proportion

378 of prescription errors, rates of adverse events, and mortality rates.[100] The fourth

379 intervention study was based in a single hospital in Sweden. The study found that patients'

380 perceptions of work environment were a significant predictor of patients' satisfaction with

381 quality of care.[78]

382

383 **DISCUSSION**

384 We synthesised a large literature with diverse variables which attempted to measure or study

385 healthcare cultures, or intervene to create enhanced organisational and workplace cultures.

386 Research was conducted across multiple healthcare settings, mostly hospitals, in a range of

387 countries, chiefly north America, Europe and Australasia. The complexity of the synthesising

388 task should not be underestimated in reviews of this kind (see also Greenhalgh's work

389 synthesising research on diffusion of innovation[101]). The studies we report on undertook

390 work in complex systems and settings in which care is provided by a layered web of agents

18

391   interacting dynamically across space and time, producing emergent outcomes.[28, 29]

392   Cultures in such settings are hard to change, and resist simple, linear improvement strategies.

393   The studies themselves involved nuanced choices in types of measures, multiple mechanisms

394   for studying culture or intervening to improve it, and variable ways of reporting their

395   methods and results.

396   Despite the challenges in combining and assessing disparate research, we found

397   confirmatory evidence for previous work,[4, 21, 27] which suggested that there were positive

398   linkages between cultures in healthcare settings and patient outcomes. In short, healthcare

399   organisational and workplace cultures are related to patient outcomes in the way people have

400   generally assumed they are, and in the positive direction our hypothesis suggested. Thus, we

401   found sufficient evidence to support our hypothesis that there are ubiquitous links between

402   our two culture types across multiple studies. In summary, positive cultures are consistently

403   linked in many studies to better patient outcomes.

404

405   **Study strengths and weaknesses**

406   The number of included articles in this review compared to systematic reviews on other

407   topics was relatively high, providing comprehensive coverage of the research topic. An

408   overarching account of the association between organisational and workplace culture and

409   patient outcomes was made possible by having a broad scope of review, including multiple

410   types of healthcare settings, and considering patient outcomes as both an all-encompassing

411   concept as well as considering more specific outcomes. However, the broad scope poses a

412   challenge, as there were inherent limitations whereby our core term, culture, was

413   inconsistently defined or measured in the studies we reviewed. The heterogeneity of data

414   complicated attempts to draw precise comparisons across studies, and conclusions.

19

415 Nevertheless, we rigorously assessed bias and study quality, and the study results point in the

416 same direction. It is important to note, notwithstanding our consistent result, that this review

417 might be limited by the inherent risk of bias across studies, such as publication bias whereby

418 studies reporting significant results may be viewed more favourably for publication than

419 those that do not.

420 Both types of culture—organisational, and workplace culture—were considered in

421 this review. As Figure 2 shows, the majority of studies used hybrid measures of culture in

422 which both organisational culture and workplace culture were examined, or the type of

423 culture assessed was not clearly defined. Therefore, conclusions could not be drawn on

424 whether organisational or workplace culture, taken individually, were more strongly

425 associated to positive patient outcomes.

426 Our review aimed to consider and discuss articles across a variety of health settings,

427 but most included studies were conducted in a hospital environment. We propose that more

428 research is needed in other healthcare settings such as aged and community care. Only four

429 studies employed interventional designs in testing out chosen associations, but many studies

430 are high quality social science articles. More rigorous intervention studies aimed at

431 promoting change in organisational culture could provide valuable information on how

432 improvements in organisational culture can affect outcomes for patients.

433

434 **CONCLUSION**

435 Studies examining culture are common. Fewer explore linkages between cultures and patient

436 outcomes. There are no RCTs, and few intervention studies with strong designs are reported.

437 The consistent trend for most studies is to find that positive cultures are related to better

20

438   outcomes for patients. Better quality studies, and those outside of hospitals, would provide

439   confirming or disconfirming evidence for our synthesis.

440

457   **Data Sharing Statement**

458   No additional data available.

459

21

460   **Authors' Contributions**

461   JB led the study and provided a conceptualisation of the topic to the team, and acted as an

462   arbitrator and advisor where necessary. JH, KL, GL and LT did the abstract and full-text

463   reviews of the articles. All authors contributed to the writing of the drafts, and agree with the

464   final version.

465

466   **Amendments**

467   Any minor adjustments to the protocol have been documented in this systematic review.

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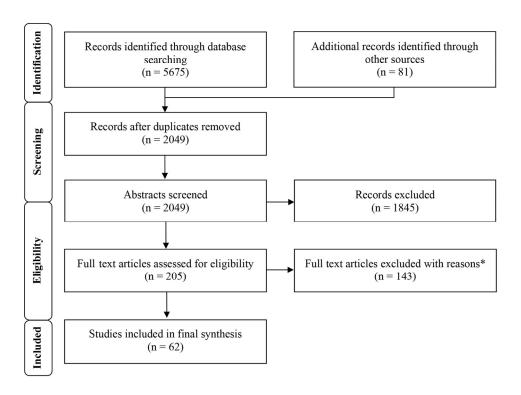
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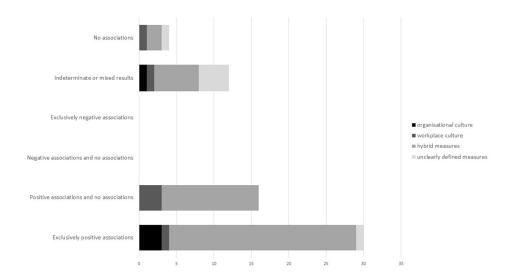712   *Nurs Scholarsh* 2015;47(6):565-73.

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Identification

Records identified through database searching
(n = 5675)

Additional records identified through other sources
(n = 81)

Screening

Records after duplicates removed
(n = 2049)

Abstracts screened
(n = 2049)

Records excluded
(n = 1845)

Eligibility

Full text articles assessed for eligibility
(n = 205)

Full text articles excluded with reasons*
(n = 143)

Included

Studies included in final synthesis
(n = 62)

Search strategy

147x108mm (300 x 300 DPI)

Categorisation of direction of studies (number of studies)

108x60mm (300 x 300 DPI)

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| Positive workplace and organisational culture | → is significantly associated with → | *System-related patient outcomes* ↓ Mortality rates[54, 55, 64-70] ↓ Failure to rescue[64, 66, 71] ↓ Readmission rates[51, 58, 72, 73] ↓ Adverse events/medication errors[39, 56, 57, 74-77] *Wellbeing outcomes* ↑ Patient Satisfaction[38, 40, 42, 44, 47, 48, 78-87] ↑ Quality of life[88] ↑ Patient mood[88] *Clinical outcomes* ↓ Pressure ulcers[39, 53, 89-92] ↓ Falls[37, 39, 53, 77, 90, 93] ↓ Hospital acquired infections[39, 46, 50, 91, 94-96] ↓ Depressive symptoms[97] ↓ Pulmonary embolism/deep vein thrombosis[53] ↓ Incontinence[92] ↓ Symptom burden at end of life[67] ↑ Mental and physical health status[59] |

Key associations between culture and patient outcomes here

189x195mm (300 x 300 DPI)

Open Access

Protocol

BMJ Open | Association between organisational and workplace cultures, and patient outcomes: systematic review protocol

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ABSTRACT

Introduction: Despite widespread interest in the topic, no current synthesis of research is available analysing the linkages between organisational or workplace cultures on the one hand, and patient outcomes on the other. This protocol proposes a systematic review to analyse and synthesise the literature to date on this topic. The resulting review will discuss characteristics of included studies in terms of the type of healthcare settings researched, the measurements of organisational and workplace culture, patient outcomes measured and the influence of these cultures on patient outcomes.

Methods and analysis: A systematic review will be conducted aiming to examine the associations between organisational and workplace cultures, and patient outcomes, guided by the Preferred Reporting Items for Systematic review and Meta-Analysis Protocols (PRISMA-P) statement. An English language search of abstracts will be executed using the following academic databases: CINAHL, EMBASE, Ovid MEDLINE, Web of Science and PsycINFO. The review will include relevant peer-reviewed articles from randomised controlled trials (RCTs), non-RCTs, controlled before and after studies, interrupted time series studies, cross-sectional analyses, qualitative studies and mixed-method studies. Multiple researchers will be involved in assessing the quality of articles for inclusion in the review. This protocol documents a detailed search strategy, including terms and inclusion criteria, which will form the basis of the subsequent systematic review.

Ethics and dissemination: Ethics approval is not required as no primary data will be collected. Results will be disseminated through a peer-reviewed publication and conference presentations.

Strengths and limitations of this study

- We lack adequate understanding of how cultural characteristics in healthcare organisations and workplaces are related to patient outcomes.
- Organisational and workplace cultures are hard to define, making inclusion criteria subjective.
- The review will include studies ranging from randomised controlled trials to mixed-method studies.
- We will follow the Preferred Reporting Items for Systematic review and Meta-Analysis Protocols (PRISMA-P), Grading of Recommendations Assessment, Development and Evaluation (GRADE) framework and COCHRANE tools for assessing the risk of bias.

as they concern patient outcomes, which can range from morbidity, to acquired infections, to quality of life, to mortality.[2 3] Despite these potential consequences, we do not know with sufficient confidence about the association between organisational and workplace cultures, and patient outcomes, in healthcare environments. Enhanced knowledge of this association is necessary in order to understand how to improve health systems. Past research highlights this knowledge gap[1 4] and has laid the foundation for the proposed systematic review.

Cultures and subcultures

Culture has been described in many ways in the literature, ranging from simple definitions to complex models.[4–7] Simply put, culture is a way of holistically understanding the summed characteristics of organisational behaviour, thinking and attitudes.[8 9] A predominant model of culture is the iceberg model, which refers to culture as a two-part phenomenon.[10] Above the waterline are observable workplace behaviours and practices, while below the waterline lie the foundational group beliefs, attitudes, values and philosophies of the workplace.[10] By way of

INTRODUCTION
Rationale

A positive and productive culture, within workplaces and across the wider organisation, is believed to be an important factor in determining the quality of clinical and organisational outputs and outcomes.[1] In healthcare settings, the possible downstream effects of culture are particularly important

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comparison, Schein's 2004 tripartite model of culture includes visible organisational structures and underlying assumptions of culture. Schein's model also comprises a third level, equivalent to an 'at the waterline' level, which encompasses beliefs and values, as observed in rhetoric and anchored in behaviour.[9 11]

In organisational culture, behavioural patterns, beliefs and assumptions are shared throughout a setting.[4] Subcultures can have many bases, including occupational, gender or racial distinctions.[12 13] Within this healthcare setting, there are also workplace-specific cultures, which are explicit examples of subcultures.[14] Gallego et al[15] reported that cultural differences manifest between different service types. For example, in that study, community nursing and breast screening units had a more favourable safety attitudes culture compared with mental health wards. Such differentiated, localised workplace cultures can be analysed in terms of their similarities or their differences across the broader healthcare organisation.[9 14]

While there are always definitional challenges with complex social constructs,[16] this protocol adopts a pluralist perspective; recognising that distinguishable workplace cultures are components of a wider organisational culture.[14] Therefore, this review protocol considers *organisational* culture and *workplace* culture as researchable, index concepts.

Past reviews

Previous reviews have focused on the influence of organisational *climate* on patient outcomes, which MacDavitt et al[2] define as "employees' perception of the organizational culture". In differentiating between organizational culture and climate, and focusing on the latter, MacDavitt et al[2] present a broad-based understanding of organisational climate mapped to the tip of the iceberg in Braithwaite's[10] model.[2] This protocol will complement and expand on MacDavitt et al's[2] review by encompassing articles on culture and climate.

Other reviews have been restrictive in their inclusion criteria, leading to a narrow understanding of the association between organisational and workplace cultures, and patient outcomes. Parmelli et al's[4] systematic review focused on the effects of culture change *interventions* on patient outcomes and healthcare performance. Owing to this limited focus, only two relevant studies were included in that systematic review.[4] On the other hand, Willis et al[17] used a realist review method to examine relationships between interventions and sustained culture change. Separate review work has yielded results with limited generalisability by focusing on prespecified healthcare environmental variables, such as nursing culture[18–20] or surgical procedures.[21] Other work by the 'Deepening our Understanding of Quality improvement in Europe' (DUQuE) team examined relationships between organisational-level culture and quality management systems.[22] In contrast, other reviews have chosen a wider inclusion criteria, encompassing how organisational

culture broadly affected healthcare performance.[5 23] Our protocol offers a middle-ground, by mapping culture to the specific concept of patient outcomes in various healthcare settings.

Patient outcomes

Turning to our other major construct, patient outcomes, in ways analogous to the manner in which culture has been treated, past research has been restrictive in the search terms included for reviews. MacDavitt et al[2] identified 12 articles measuring patient outcomes, but only 3 of these incorporated more than one specific element of patient outcomes. Of the studies included in Parmelli et al's[4] systematic review, one measured the frequency of handwashing practices and its association with the patient outcome of infection,[24] and the second measured vitality, life satisfaction and orientation to life.[25] Another example is Hesselink et al's 2013 paper which concentrated on the measurement of patient discharge.[1]

This norm of only reporting a small number of specific patient outcomes—in systematic reviews and in original research—means that only a limited understanding of the association between culture and patient outcomes has been achieved. Hence, the current study aims to encompass a mix of patient outcomes to provide a holistic understanding of the association of outcomes with organisational and workplace cultures.

Objectives

In this protocol, we widen the scope of past reviews; we aim to thoroughly investigate *the extent to which organisational and workplace cultures are associated with patient outcomes across a range of healthcare settings*. Our objective in this paper is to articulate the design of a systematic review aiming to evaluate and synthesise relevant literature on this topic. Ultimately, the outcome of the review will be to offer nuanced information for researchers, managers, health professionals, clinicians, healthcare decision-makers, health policymakers and patient groups interested in understanding how cultures and outcomes relate. We are mindful, however, of what Mannion and Davies[26] have recently had to say about this topic: "attempting to enact culture change to improve performance is a difficult, uncertain, and risky enterprise".

METHODS

Eligibility criteria

Participants

Participating healthcare facilities may include hospitals, acute and primary healthcare facilities, health organisations and other health delivery services. These facilities may be public or private, and situated in metropolitan or rural locations.

Indicators

This study will use indicators that measure aspects of organisational and workplace cultures, and patient

Table 1 Search strategy

Search term keyword	Related terms/synonyms	Alternative terms
Organisational, workplace culture	Work culture OR organization* culture OR service culture OR corporate culture OR work climate OR organization* climate OR service climate OR corporate climate OR work ethos OR organization* ethos OR service ethos OR corporate ethos OR work environment OR organization* environment OR service environment OR corporate environment	Organisation Work place Workplace Work site Worksite
AND Patient outcomes	Patient outcome* OR patient satisfaction OR health outcome* OR patient experience* OR mortality OR length of stay OR pain level OR cost of care OR functional abilit* OR patient knowledge OR quality of life OR impairment* OR disabilit* OR readmission rate* OR adverse event* OR medication error* OR patient fall* OR infection* OR decubitus ulcer*	
AND Healthcare	Health organization* OR hospital* OR health facilit* OR acute care OR primary care OR health	Organisation Healthcare Health care Health-care

*Is used to signify truncation.

outcomes. Approaches to measure and assess culture and outcomes vary widely, and therefore, it is expected that the mechanisms and tools used will be heterogeneous throughout the studies reviewed.

Comparisons between culture and patient outcomes
Comparisons may be made where feasible between cultures in similar types of health setting; for example, between acute hospitals that have comparable size, economic funding and patient–nurse ratios. Cultural comparisons are also envisaged between different types of health settings such as between metropolitan and rural environments.

Outcome measures
Patient outcome measures, as detailed in the search strategy (table 1), will include objective and quantifiable measurements. The inclusion of broad terms such as 'patient outcomes' and more specific terms such as 'patient falls' recognises that studies may focus on identifiable aspects of patient outcomes.

Report characteristics
Publications will be assessed against the following inclusion criteria: English language, peer-reviewed, primary empirical research articles, published in scholarly journals. Full texts must also be available. A date restriction will not be applied to the search. Studies will include randomised controlled trials (RCTs), non-RCTs, controlled before and after (CBA) studies, interrupted time series (ITS) studies, cross-sectional analysis, qualitative studies and mixed-method studies. We believe that these methods—provided that they include valid, rigorous, peer-reviewed research on patient outcomes—can provide useful information regarding the association between organisational and workplace cultures, and

patient outcomes. Grey literature will be excluded from this study as invariably such work falls outside our 'valid, rigorous, peer-reviewed' criteria.

Information sources
The search terms (table 1) will be entered into the following academic databases: CINAHL, EMBASE, Ovid MEDLINE, Web of Science and PsycINFO. Multiple search terms will be used to identify workplace and organisation cultures, patient outcomes and healthcare settings.

Study records
Data management
The initial search will be carried out by a two primary researchers (KL and JH) using the strategy indicated in table 1 and guided by the Preferred Reporting Items for Systematic review and Meta-Analysis Protocols (PRISMA-P) statement. KL and JH will also search the reference lists of identified reviews for other relevant articles, and experts in the field will be contacted for advice on potentially appropriate articles. Other researchers in the team will sample-test the strategy for fidelity. KL will import the data into an EndNote library and will delete duplicate entries. These will be checked for accuracy by a third researcher (LT).

Selection and data collection processes
The reviewers, JH, KL, GL and LT, will compare 5% of the EndNote library to ensure a consensus across article retention. Inter-rater agreement analysis will be conducted from these results. Any inconsistencies will be discussed and resolved by the research team in the light of the research question and inclusion criteria; JB will be the final arbitrator. These four researchers will then each independently review 25% of the remaining

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abstracts in line with the inclusion criteria, followed by a full-text review of included abstracts. Reasons for excluding studies will be recorded. Information extracted from included articles will comprise the healthcare context, aspects of culture measured, methodology, sample size, intervention (if applicable) and all reported patient outcomes.

Data items and definitions

This protocol is based on ambiguous concepts, with inconsistent expert consensus on their definitions. As such, we define the variables used in this systematic review protocol (box 1).

This systematic review protocol is founded on transparent assumptions. First, as MacDavitt et al[2] highlight, organisational culture and organisational climate are terms often used interchangeably in published literature, as the distinction between the terms is not clear-cut.[9 27] It can be argued that organisational climate is a subset of organisational culture, characterised by specific data collection tools and resources.[5] Organisational culture encompasses these data collection methods in addition to other techniques. We adopted this logic to establish a view that we would include the terms 'climate', 'culture' and 'environment' in the systematic review.

Outcomes and prioritisation

Prioritisation of the search strategy items will ultimately improve the way articles are presented in the review. Priority will be given to articles which include multiple patient outcomes and measures of culture. Prioritisation will also be given to articles that study organisational or workplace culture as a whole.

Risk of bias in individual studies

The review findings will be limited by the results of the search strategy and the potential inclusion of non-randomised studies. To assess the inherent risk of bias in individual studies, two researchers (JH and LT) will actively consult the Cochrane Handbook for Systematic Reviews, specifically the Cochrane Collaboration tool for assessing the risk of bias. JH and LT will independently

assess each study and classify them as 'high' or 'low' risk of bias. Any disagreements between the researchers will be resolved by discussion with a third and fourth researcher (KL, GL).

Data synthesis

Based on prior systematic reviews, it is not likely that the relevant articles will allow a quantitative meta-analysis of data.[2 4] However, if this does eventuate, a random-effects model will be used.[30] Heterogeneous data on patient outcomes will be analysed based on the nature of the variables, for example, a risk ratio for dichotomous outcomes, HR for time-to-event outcomes, rate ratio for counts or rates or standardised mean difference for continuous outcomes. A 95% CI will also be calculated and applied.[30]

Confidence in cumulative evidence

The strength of the studies will be assessed through the Grading of Recommendations Assessment, Development and Evaluation (GRADE) framework. To synthesise the research quality, we will assign each study on the GRADE rating scale for evidence quality (high, moderate, low, very low) and we will, as appropriate, provide Evidence Profile (EP) and Summary of Finding (SOF) Tables.

CONCLUSION

Organisational and workplace cultures are important concepts. Many policymakers, managers and clinicians conduct projects and initiatives aimed at influencing, shaping or altering their local cultures. We do not know the extent to which, and how, these strategies are related to downstream effects on patient outcomes. This review will inform future initiatives of this kind.

Box 1   Definitions of variables

Organisational culture: The sum total of the behaviours and practices, attitudes and beliefs, across the whole enterprise, for example, across an entire hospital[22 27]

Workplace culture: The more specific defining group characteristics within a component of an organisation, for example, intensive care unit, ward, department, section or professional grouping, for example, nursing or management[9 28]

Patient outcomes End results that consist of and can be used to measure the consequences of a patient's care, which can be positive or negative, and vary in severity.[29] Refer to table 1 for examples.

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Association between organisational and workplace cultures, and patient outcomes: systematic review protocol

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Supplementary File B. Data Extraction Sheet

Parameters	Detail	Reviewer entry
Endnote ref #		
Reference	*Authors, year, article title, journal name, vol, issue, page numbers (use Harvard Ref Style)*	
Location	*Country*	
Language	*English only*	
Time frame	*Period of data collection*	
Study type	*e.g., qualitative, mixed methods, intervention study*	
Study primary aim	*e.g., test performance of organisations with different cultures; test an intervention*	
Study secondary aims	*e.g., identify factors associated with organisational culture*	
Exclude?	*Circle include or exclude, + reason if excluded*	1. Other languages 2. Not peer reviewed literature 3. Not healthcare setting 4. Not primary empirical research 5. Does not include organisational culture and/or patient outcomes
Data	*Total N of organisation participants (e.g. three hospitals)*	
	Type of organisation participant (e.g. teaching hospital)	
	Data types and sources used to performance and/or outcomes	
	Methodological/statistical approach to identifying performance and/or outcomes	
Methods	*Methods used to study organisational or workplace culture or climate, and patient outcomes– summarise content of tools (e.g., interview questions/topics, surveys) used where possible*	

	Participants (e.g., nurses)	
	Data analysis methods (e.g., statistical or quantitative method)	
Findings	*Quantitative results*	
	Qualitative results/ contextual factors most important for explaining relationship between culture and patient outcomes. Include example quotes	
Implications	*Recommendations for healthcare made based on the findings*	

Note. Table adapted from Taylor N, Clay-Williams R, Hogden E, Braithwaite J, Groene O. High performing hospitals: a qualitative systematic review of associated factors and practical strategies for improvement. *BMC Health Serv Res.* 2015;15(1):244.

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Supplementary File C. Risk of Bias Template

Type of Bias	Description	Example in Intervention Studies	Example of an Equivalent Scenario in Included Studies
Selection bias	The bias that occurs when groups are not randomised and thus comparisons cannot be made	Systematic differences in baseline characteristics between the groups, leading to biases when comparing results after an intervention; randomised groups being used	That the context of the study was a convenience or purposive sample, or was not the most appropriate context for the study
Performance bias	When study participants or researchers have knowledge of the study or its aims	Systematic differences in the care provided between the groups, or exposure to other confounding variables that influence results; can be minimised through double blinding (and reporting on its effectiveness)	Performance of the nurses or health professionals altering due to knowledge that patient outcomes are being measured
Detection bias	Systematic differences in results due to the assessor's knowledge of study or group allocation	Differences in how outcomes are determined between groups; can be prevented through blinding of researchers	Researchers interpreting the results have knowledge of the aims and hypotheses of the study, and the results are altered accordingly
Attrition bias	The incompleteness of data due to participants withdrawing from the study	Systematic differences in withdrawals of groups from studies, leading to incomplete outcome data	The rate of non-participation e.g., in survey responses, the dropout rates between nurses and doctors
Reporting bias	Selective reporting of outcomes	Difference in the probability of reporting significant verses insignificant findings	Significant findings more likely to be published than less important results
Other bias	Any other important concerns regarding the study	Biases that are found in a particular study setting	Bias due to issues not otherwise outlined here

Note. Table descriptions derived from Higgins J, Altman D, Sterne J. Chapter 8. Assessing risk of bias in included studies. In: Higgins J, Green S, eds. *Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0*: The Cochrane Collaboration; 2011. Examples are the authors', based on included studies.

Supplementary File D. Summary of Included Articles

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
Aiken et al., 2008	Analyse the net effects of nurse practice environments on nurse and patient outcomes after accounting for nurse staffing and education	Quantitative, cross-sectional study	**Work environment**: Practice Environment Scale of the Nursing Work Index (PES-NWI); six survey measures assessing job satisfaction, burnout, and intent to leave job within the next year; three questions assessing nurses' perceptions of quality of care **Patient outcome(s)**: 30-day mortality rates from discharge abstract data	232,342 patients; 10,184 nurses Data collected April 1998-November 1999	168 hospitals; USA	Care environment, along with nurses' education levels and nurse staffing, contributed to failure to rescue and mortality rates. Poorer environment had higher rates of mortality and failure-to-rescue Surgical mortality rates were more than 60% higher in hospitals with a poor work environment	High
Aiken et al., 2011	Determine the conditions under which the impact of hospital nurse staffing, nurse education, and work environment are associated	Quantitative, cross-sectional study	**Work environment**: Practice Environment Scale of the Nursing Work Index (PES-NWI) **Patient outcome(s)**: Patient deaths within 30 days of hospital admission and failure to rescue from the American Hospital	1,262,120 patients, 39,038 nurses Data collected 2005-2006	665 hospitals; USA	Lowering the patient-to-nurse ratios significantly improved patient outcomes in hospitals with good work environments, somewhat improved patient outcomes in hospitals with average work environments, and had no effect on patient	Medium

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	with patient outcomes		Association (AHA) Annual Survey			outcomes in hospitals with poor work environments	
Aiken et al., 2013	Determine the association between the use of agency-employed supplemental registered nurses (SRNs) to staff hospitals and patient mortality and failure to rescue	Quantitative, cross-sectional study	**Work environment**: Hospital use of SRNs; Practice Environment Scale of the Nursing Work Index (PES-NWI); nurse staffing metrics; nurse education metrics **Patient outcome(s)**: 30-day inpatient mortality and failure to rescue obtained from annual patient discharge summaries	40,356 registered nurses Data collected 2005-2006	665 hospitals; USA	Before controlling for nurse and hospital characteristics, higher proportions of SRNs nurses in hospitals were associated with higher mortality and failure to rescue This relationship became insignificant when work environments were taken into account Hospitals with higher proportions of supplemental registered nurses had significantly worse work environments	Medium
Ancarani et al., 2009	Analyse the relation between different organisational	Quantitative, cross-sectional study	**Organisation climate**: Interviews based on the Competing Value Framework	1,018 patients; 625 medical staff (470 nurses and 155 physicians)	47 wards across seven hospitals; Italy	An organisational model climate accentuating openness, change and innovation and a model emphasising cohesion	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	climate models and patient satisfaction		**Patient outcome(s)**: Interviews based on SERVQUAL instrument, measuring consumer expectations and perceptions of a service	Data collected November 2007-May 2009		and workers' morale were positively related to patient satisfaction, whereas a model based on managerial control where negatively associated with patient satisfaction Ward organisational climate significantly positively affected patient perceptions of the quality of care	
Ancarani et al., 2011	Test a model in which the ward manager's orientation towards a given organisational climate contributes to determine the climate perceived by medical and nursing staff.	Quantitative, cross-sectional study	**Organisational climate**: Organizational Climate Measure (OCM) **Patient outcome(s)**: Questionnaire based on the SERVQUAL instrument, measuring consumer expectations and perceptions of a service	57 managers; 621 nurses; 277 physicians; 1,598 patients. Data collected 2007-2009	57 wards across 10 hospitals; Italy	Ward managers' Human Relations climate orientation is positively related to patient satisfaction	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	Test whether this, in turn, has an impact on patient satisfaction						
Ansmann et al., 2014	Identify associations between hospital structures, physicians' social resources as well as job demands and control and patients perceived support from physicians	Quantitative, cross-sectional study	**Work environment:** Social capital measured by a six-item scale developed by Pfaff et al., 2004; Social support from colleagues measured using an adaptation of the original Caplan scales by Udris and Riemann; Job Content Questionnaire; Leadership survey measuring surgery volume and the number of hospitals constituting the breast cancer centre

Patient outcome(s): Three item questionnaire designed by authors assessing patients' perceptions of the support provided by physicians to help them cope with their illness and treatment | 348 physicians; 108 leadership positions; 1,844 patients

Physician survey November 2010-March 2011

Leadership survey July-September 2010 | 35 breast cancer centre hospitals; Germany | Patients felt better supported by their physicians in hospitals with high social capital, a high percentage of permanently employed physicians, and less physically strained physicians | High |

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
Arnetz and Arnetz, 1996	Develop a reliable and valid instrument, to determine the predictors of patients' ratings of quality and to measure patient satisfaction at two points in time to determine whether patient ratings change following a quality improvement initiative	Quantitative, interventional study	**Work environment**: Questionnaire assessing patients' perceptions of quality of care and staff work environment **Patient outcome(s)**: Questionnaire assessing overall patient satisfaction with pain treatment	1,834 patients (1994); 2,499 patients (1995); unspecified numbers of hospital staff Data collected August 1994-November 1995	One hospital, Sweden	Perceived work environment was a significant predictor for a positive overall patient quality grade	Medium
Ausserhofer et al., 2013	Explore the relationship between patient safety climate and patient	Quantitative, cross-sectional study	**Work environment**: Safety Organizing Scale; Practice Environment Scale of the Nursing Work Index (PES-NWI); Basel Extent of Rationing of	1,633 RNs; 997 patients Data collected October 2009-June 2010	132 surgical, medical and mixed surgical-medical units across 35 acute	Patient safety climate was not found to be a significant predictor of patient satisfaction	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	outcomes in Swiss acute care hospitals, adjusting for major organisational variables		Nursing Care (BERNCA-R); nurse staffing level and skill mix items from the RN4CAST study nurse questionnaire **Patient outcome(s)**: Patient satisfaction item from the Hospital Consumer Assessment of Healthcare Providers and Systems		care hospitals; Switzerland		
Barsade and O'Neill, 2014	Examine the influence of a culture of compassionate love, on outcomes for employees, residents in a long-term care setting, and their families	Quantitative, longitudinal study	**Organisational culture:** Culture of Companionate Love Scale **Patient outcome(s)**: Questionnaires measuring mood, satisfaction and quality of life; medical database records of weight gain, emergency room transfers, and pressure ulcers	185 employees (certified nursing assistants, nurses, social workers, physicians, food service workers, and employees and other employees); 108 residents; 42 family members of residents Duration not specified	13 units across three long-term care residential sites; USA	There was a significant positive association between companionate love culture, patient mood, quality of life, satisfaction, and fewer trips to the emergency room There was no significant association between compassionate love culture and weight gain or lower incidence of pressure ulcers	Medium

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
Benning et al., 2011	Evaluation of the first phase of the Health Foundation's Safer Patients Initiative (SPI): organisational intervention that focused on improving the reliability of specific frontline care processes in designated clinical specialties and promoting organisational and cultural change	Mixed methods, interventional study	**Organisational culture:** Semi-structured interviews investigating understanding of and enthusiasm for the SPI1; NHS Staff Survey **Patient outcome(s):** Errors and adverse events from case notes; mortality rates; patient satisfaction based on the National NHS Acute Inpatient Survey in England	Interviews: 60 senior/strategic staff; 47 ward staff Survey: 3,397 staff in hospitals enrolled in the intervention; 15,300 staff in control hospitals Case notes: 1,237 patients Data collected 2005-2006	Four hospitals participating in the first phase of the SPI and 18 control hospitals; United Kingdom	There was a small improvement in staff attitudes to organisational climate in intervention hospitals On a range of other measures and outcomes related to patient safety, there was no additive effect attributable to the SPI Survey of patients showed no significant differences apart from an increase in perception of cleanliness in favour of intervention hospitals	High
Borg et al., 2015	Establish the applicability of the Hofstede survey tool to measure and quantify organisational	Quantitative, cross-sectional study	**Organisational culture:** Hofstede Survey Tool **Patient outcome(s):** Methicillin resistant Staphylococcus aureus (MRSA) prevalence	135 doctors and nurses Data collected July-August 2012	Intensive care departments of seven tertiary care hospitals; four European countries	Hospitals with a history of consistently low prevalence of MRSA exhibited high scores for change facilitation and change readiness,	Low

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	culture in healthcare settings, and attempt to evaluate any associations between Infection Prevention and Control (IPC) outcomes and organisational culture scores		identified from blood cultures			together with perceptions of trust. Hospitals with high prevalence of MRSA exhibited low scores for change readiness and change facilitation, but high scores for job security	
Bosch et al., 2008	Test the introduction of the diabetes passport and assess to what extent important aspects of restructured care such as multidisciplinary teamwork and different types of organisational	Quantitative, cross-sectional study	**Team climate:** Team Climate Inventory **Organisational culture:** Competing Values Framework **Patient outcome(s):** Measures of quality of diabetes care and clinical patient characteristics from medical records and self-report	752 patients with Diabetes mellitus type II; 83 Dutch health care professionals Data collected during 2003-2004	30 primary care practices; The Netherlands	None of the selected clinical patient outcomes demonstrated significant associations with team climate or culture.	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	culture are associated with high quality diabetes care in small office-based general practices						
Bradley et al., 2012	Identify hospital strategies associated with lower RSMR (risk standardised mortality rates)	Quantitative, cross-sectional study	**Organisational environment:** Questionnaire assessing the use of hospital strategies **Patient outcome(s):** 30-day hospital RSMR based on hospital discharges	Unspecified number of patients hospitalised with acute myocardial infarction Data collected July 2005-June 2008	533 acute care hospitals; USA	Key aspects of organisational environment (measured through hospital strategies) including effective communication and collaboration among groups, broad staff (cardiologist and pharmacist) presence and expertise, and a culture of creative problem solving and learning amongst cardiologists, were statistically associated with lower RSMRs	Medium
Brewer, 2006	Test the transtheoretical integration model (TIM)	Quantitative, cross-sectional study	**Organisational culture:** Questionnaire measuring two hospital culture variables (group culture	411 hospital employees (nurse and multi-	Four acute care hospitals; USA	A group-type culture (affiliation among all levels of hospital staff)	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	which proposes relationships among team-based phenomena and patient safety and resource-use outcome variables. TIM consists of Work Group Design, Hospital Culture, Positive Intrateam Process, Negative Intrateam Process, and Organisational Effectiveness		and developmental culture) through staff members' perceptions of hospital culture, work group design, and positive and negative team processes **Patient outcome(s)**: Administrative quality reports recording patient falls with injury; financial reports measuring patient care unit expenses and length of stay	disciplinary team members) Duration not specified		was inversely related to patient falls with injury Developmental culture (innovation and risk taking) was positively related to patient falls with injury and total expenses per patient day	
Carthon et al., 2015	Examine the relationship between missing nursing care and	Quantitative, cross-sectional study	**Work environment**: Practice Environment Scale of the Nursing Work Index (PES-NWI)	20,605 bedside nurses; 160,930 patients with heart failure	419 acute care hospitals; USA	Before adjusting for patient and hospital characteristics, patients were more likely to experience a	Medium

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	hospital readmissions		**Patient outcome(s)**: All-cause readmission within 30 days of discharge from an index admission for heart failure	Data collected 2005-2006		readmission when nursing care activities were more frequently missed (exception: pain management and timely medication administration) Once adjusting for work environment, the effects of missing essential nursing was no longer a significant predictor of readmissions	
Cassie and Cassie, 2012	Examine the effect of organisational culture and climate on depressive symptoms among nursing home residents	Quantitative, cross-sectional study	**Organisational culture**: Organizational Social Context Scale **Patient outcome(s)**: Minimum Data Set (Depression Rating Scale (DRS); Cognitive Performance Scale (CPS); Activities of Daily Living - Long Form (ADL-L))	1,114 employees; 5,497 residents Data collected Jan 2007-May 2008	23 nursing homes; USA	Depressive symptoms were associated with two dimensions of organisational culture (proficiency and resistance), and three dimensions of climate (stress, engagement, and functionality)	High
Chang and Mark, 2011	Investigate whether learning	Quantitative, cross-	**Work environment**: Questionnaires assessing work dynamics and	2,744 patients; 4,954 nurses	279 nursing units across 146 hospitals; USA	Significant negative relationship between learning climate and	Medium

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	climate moderates the relationship between error producing conditions and medication errors	sectional study	communication with physicians **Learning climate:** Error Orientation Scale **Patient outcome(s):** Medication error obtained from incident reports	Data collected 2003-2004		medication errors (the more positive the learning environment was, the fewer medication errors occurred). However, there was no significant difference when the learning culture was average compared to when it was good Communication and experience were not associated with medication errors significantly Work dynamics was not significantly associated with medication errors, regardless of learning climate	
Cho et al., 2015	Examine the effects of nurse staffing, work environment,	Quantitative, cross-sectional study	**Work environment:** Practice Environment Scale of the Nursing Work Index (PES-NWI)	1,024 staff; 76,036 surgical patients	14 teaching hospitals; South Korea	Patient mortality was nearly 48% lower in hospitals with better nurse work	

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	and education on patient mortality		**Patient outcome(s)**: Patient discharge data recording patient characteristics and 30-day mortality rates	Data was collected January-December 2008		environments compared to hospitals with mixed or poor nurse work environments	
Coustasse et al., 2008	Analyse organisational culture in a community hospital in Texas to measure organisational culture change and its impact on patient satisfaction	Mixed methods, longitudinal case study	**Organisational culture**: Two sets of open-ended semi-structured interviews assessing organisational culture **Patient outcome(s)**: Patient satisfaction scores and percentiles from Inpatient and Outpatient care areas	Semi-structured interviews: 162 Hospital staff Culture interview: 29 members of the executive team Surveys: 600 staff employees Field experiment data collected January 2003-December 2003 Patient satisfaction data collected January 1998-December 2003	One community hospital; USA	The shared vision of one subculture within the hospital was associated with increased patient satisfaction	Medium

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
Davenport et al., 2007	Measure the impact of organisational climate safety factors (OCSFs) on risk-adjusted surgical morbidity and mortality	Quantitative, cross-sectional survey	**Organisational climate**: Safety Attitudes Questionnaire (SAQ) **Patient outcome(s)**: Risk-adjusted morbidity and mortality outcomes derived using the National Surgical Quality Improvement Program (NSQIP) dataset and models	6,083 attending and resident doctors, nurses, and other providers Models derived from data on more than 100,000 patients Data collected July 2003-September 2004	44 Veterans Affairs and eight academic medical centres; USA	The OCSF measures of teamwork climate, safety climate, working conditions, recognition of stress effects, job satisfaction, and burnout were not correlated with risk-adjusted morbidity and mortality Reported levels of positive communication/collaboration with attending and resident doctors correlated with lower risk-adjusted morbidity	High
Dubois C-A et al., 2013	Examine the associations of four distinct nursing care organisational models with patient safety outcomes	Quantitative, cross sectional study	**Organisational culture:** Four category variable representing nursing care organisational models **Patient outcome(s):** Patient records reporting medication errors, falls, pneumonia, urinary tract infections, unjustified	2,699 patients Data collected in a 30-day period, undocumented timeframe	11 hospitals; Canada	After controlling for patient characteristics, patient risk of experiencing one or more events and of experience an event with consequences was significantly lower in the innovative professional and basic models compared to the	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
			restraints and pressure ulcers			adaptive functional and basic functional models The lowest rates of negative outcomes were seen in the innovative professional model, characterised by richer staff skill mix, higher staffing intensity, and an environment with greater support of professional practice and investments in innovation	
Duffield et al., 2011	What are the relationships among patient outcomes (OPSN (Outcomes Potentially Sensitive to Nursing) [consisting of 11 patient outcomes], falls, and	Quantitative, longitudinal and concurrent cross-sectional study	**Work environment:** The Area Health Services database; NWI-R; Nurse questionnaire measuring perceptions about the work environment and quality of care on the unit; Environmental Complexity Scale **Patient outcome(s)**: The Health Information	Longitudinal study: 10,132,246 (4,964,924 matched to wards) ward stay records, 10,963,806 (2,675,428 matched to wards) nurse roster and payroll records	Longitudinal study: Patient data from 80 hospitals; nursing staff data from 27 hospitals; Australia Cross-sectional study: 19 hospitals; Australia	Increased medication errors were associated with more nurses experiencing a threat of violence and tasks delayed Time-based medication errors were associated with perceptions of physical violence, emotional abuse, the amount of additional	Medium

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	medication errors), nurse skill mix, nursing workload, and the nursing work environment		Exchange (HIE) database; patient discharge data	Data collected from 2000-2006 Cross-sectional study: 5,885 patient records, 22,497 patient-days, 13,442 nurse shifts Data collected from 2004-2005		time needed for patient care per shift, higher turnover of patients, and the proportion of patients waiting for a care facility	
Estabrooks et al., 2011	Assess the relative effects and importance of nursing education and skill mix, continuity of care, and quality of the work environment on 30-day mortality rate of patients	Quantitative, cross-sectional study	**Work environment**: Questionnaire assessing nursing skill mix, use of casual and temporary nurses, quality of care, job satisfaction, and educational preparation **Patient outcome(s)**: Discharge abstracts reporting patient information (age, sex, vital status at discharge, and comorbid	18,142 patients; 6,526 nurses Data collected April 1998-March 1999	49 acute care hospitals; Canada	Factors associated with a lower patient mortality rate included high nurse education levels, richer skill mix, better nurse-physician relationship, less casual and temporary employment	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	(after adjusting for institutional factors and patient characteristics)		conditions, and primary diagnosis)				
Estabrooks et al., 2015	Examine the influence of organisational context on symptom burden and to compare symptom burden in the last year of life between nursing home residents with and without dementia	Quantitative, longitudinal study	**Organisational environment:** In-person interviews using the Alberta Content Tool **Patient outcome(s):** Resident Assessment Instrument-Minimum Data Set	3,647 residents (2,635 with dementia and 1,012 without); 1381 front-line care Organisational environment data collected July 2009-June 2010 Patient outcomes data collected 2008-2012	36 nursing homes (including both high and low care facilities); Canada	Symptom burden at end of life differs between low- and high-context facilities Residents of high-context facilities had longer average length of stay, more unstable health and aggressive and challenging behaviour, and higher prevalence of dementia and delirium, compared to low-context facilities The prevalence of dyspnea, pain, urinary tract infections, cancer diagnosis and use of antipsychotics without a diagnosis of psychosis was lower in high-	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
						context facilities	
Fan et al., 2016	Evaluate the association between safety culture and surgical site infection (SSI)	Quantitative, cross-sectional study	**Safety culture:** Hospital Survey on Patient Safety Culture (HSOPS) **Patient outcome(s):** Postoperative colon surgery SSI data reported by hospitals	1,926 personnel from surgical units Safety culture data collected November 2012-December 2013 SSI data collected January-December 2013	Seven hospitals; USA	Ten of the 12 safety culture dimensions were associated with colon SSI rate (perceptions of patient safety, teamwork across units, organisational learning, feedback and communication about error, management support for patient safety, teamwork within units, communication openness, supervisor/manager expectations and actions promoting safety, non-punitive response to error and frequency of events reported)	Medium
Fedorowsky et al., 2015	Assess the association between organisational culture and health care workers'	Quantitative, cross-sectional study	**Organisational culture:** Questionnaire assessing staff engagement, overwhelmed/stress-chaos, hospital leadership, health care workers' knowledge, attitudes, and	268 health care workers (registered/academic nurses, practical nurses/auxiliary staff, physicians,	One Post-acute care facility (PACF) and one acute care hospital (ACH); Israel	The organisational culture factor known as staff engagement was negatively correlated with CRE acquisition rate	Medium

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	attitudes, knowledge, practices, and CRE (Carbapenem-Resistant Enterobacteriaceae) acquisition rates		practices regarding CRE prevention **Patient outcome(s)**: CRE acquisition rates from the Israeli National Infection Prevention Center	and paramedical staff, e.g., radiology technicians and physiotherapists) Organisational culture questionnaire distributed in January-February 2013 CRE acquisition rates obtained from January-December 2013 records		Overwhelmed/stress-chaos was positively correlated with CRE acquisitions Hospital leadership showed no significant correlation with CRE acquisition in either contexts	
Gardner et al., 2007	Examine the relationships between staff nurses' perceptions of dialysis work environments, nurses' intentions to leave their	Quantitative, cross-sectional study	**Work environment**: Practice Environment Scale of the Nursing Work Index (PES-NWI) **Patient outcome(s)**: Dialysis facility patient satisfaction survey; Number of patient hospitalisations	199 nurses Duration not specified	56 dialysis facilities; USA	Negative overall ratings of the dialysis work environment were significantly related to hospitalisations for patients on dialysis greater than 90 days PES-NWI scores were not significantly related to	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	current jobs, nurse turnover, patient satisfaction, and patient hospitalisation rates					patient satisfaction scores	
Greenslade and Jimmieson, 2011	Test the model that service climate would increase the effort and performance of nursing groups and, in turn, increase patient satisfaction	Qualitative, cross-sectional study	**Organisational climate:** Global Service Climate Scale; questionnaire measuring the effort exerted on specific tasks and effort intensity for contextual performance; Technical Care Scale; Job-Task Support Scale **Patient outcome(s):** Questionnaire assessing patient satisfaction	156 nurses; 39 nurse unit managers (NUMs); 171 patients Data collected May 2007	Two hospitals; Australia	Patient satisfaction was positively associated with nurses' perception that there was a positive service climate Perceptions of service climate were associated with task and contextual effort, suggesting that a positive climate motivates nurses to provide quality patient care. Nurses felt that they exerted more effort towards providing technical care than towards performing extra-role tasks for patients	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
Hallowell et al., 2016	Examine the association of the neonatal intensive care unit (NICU) work environment, staffing levels, level of nurse education, lactation consultant availability, and nurse-reported breastfeeding support with very low birth weight (VLBW) infant receipt of human milk at discharge	Quantitative, longitudinal study	**Work environment:** Practice Environment Scale of the Nursing Work Index (PES-NWI); nursing metrics e.g., staffing, education, and experience **Patient outcome(s)**: Rate of very low birth weight infants discharged on "any human milk" from hospitalisation records	5,614 nurses; 6,997 patients (very low weight birth infants) Data collected 2008	97 neonatal intensive care units; USA	Better nurse work environments and better educated nurses in US NICUs were associated with a higher provision of human milk for VLBW infants In NICUs where more infants receive breastfeeding support from nurses, more VLBW infants received human milk at the point of discharge to home	High
Hansen et al., 2011	Define the relationship between hospital safety climate and readmission rates within 30	Quantitative, cross-sectional study	**Organisational culture:** Patient Safety Climate in Healthcare Organizations (PSCHO) **Patient outcome(s)**: Risk-standardised hospital	36,375 employees (frontline staff, nurses, physicians and senior managers)	67 acute care hospitals; USA	There was a significant positive association between lower safety climate and higher readmission rates for acute myocardial infarction (AMI) and	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	days following discharge		readmission rates from Centers for Medicare and Medicaid Services (CMS)	Survey data collected July 2006-May 2007 Admission rate data collected 2008		heart failure (HF), but not pneumonia. Perceptions of frontline staff associated with readmission rates but not those of senior management Physician and nurse perceptions of safety climate were associated with AMI and HF readmission rates, respectively, but senior management perceptions were not	
Kelly et al., 2014	Determine the extent to which variation in ICU nursing characteristics—staffing, work environment, education, and experience—is associated with mortality. A	Quantitative, cross-sectional study	**Organisational environment:** Two databases: University of Pennsylvania Multi-State Nursing Care and Patient Safety Study and the American Hospital Association (AHA) Annual Survey	55,159 older adults on mechanical ventilation; 3,193 critical care nurses Data collected 2006-2008	303 adult acute care hospitals; USA	Patients in critical care units with better nurse work environments experienced lower odds of 30-day mortality than those in worse nurse work environments	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	secondary result of this would be illuminating strategies to improve patient outcomes		Critical care nurses' reports; the Practice Environment Scale of the Nursing Work Index (PES-NWI) **Patient outcome(s)**: The Medicare Provider Analysis and Review (MedPAR) database reporting 30-day mortality				
Kutney-Lee et al., 2009	Examine the contribution of nurses' work environments to patient satisfaction using national Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) data	Quantitative, cross-sectional study	**Work environment:** Practice Environment Scale of the Nursing Work Index (PES-NWI) **Patient outcome(s):** HCAHPS	20,984 resident nurses Data collected 2006-2009	430 acute care hospitals; USA	The nurse work environment was significantly related to all HCAHPS patient satisfaction measures Patient-to-nurse workloads were significantly associated with patients' ratings and recommendation of the hospital to others, and with their satisfaction with the receipt of discharge information	Medium

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
Kutney-Lee et al., 2015	Compare changes over time in surgical patient outcomes, nurse-reported quality, and nurse outcomes in a sample of hospitals that attained Magnet recognition between 1999 and 2007 with hospitals that remained non-Magnet	Quantitative, longitudinal study	**Work environment:** A binary variable measuring Magnetic status; Pennsylvania Registered Nurse Survey; Multi-State Nursing Care and Patient Safety Survey; The American Hospital Association (AHA) Annual Survey; Practice Environment Scale of the Nursing Work Index (PES-NWI) **Patient outcome(s):** Pennsylvania Health Care Cost Containment Council (PHC4) administrative discharge abstract files and death record files measuring 30-day surgical mortality and failure-to-rescue (FTR)	20,984 staff nurses; unspecified number of patients Data collected 2007	136 hospitals (11 emerging Magnets and 125 non-Magnets); USA	Emerging Magnet hospitals demonstrated markedly greater improvements over time on the PES-NWI overall score and all five subscales compared to hospitals that remained non-Magnet Emerging Magnet hospitals experienced significantly greater improvement 30-day surgical mortality and failure to rescue rates over time, compared to non-Magnetic hospitals	Medium
Larson et al., 2000	Assess the impact of an intervention to change	Quantitative, interventional study	**Organisational culture:** Handwashing frequency rates estimated from records of activation of	All staff in adult medical intensive care unit (MICU) and a neonatal	Two hospitals (one intervention hospital, once	Over a period of eight months, 860,567 soap dispensings were recorded, with	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	organisational culture on frequency of staff handwashing (as measured by counting devices inserted into soap dispensers on four critical care units) and nosocomial infections associated with methicillin-resistant Staphylococcus aureus (MRSA) and vancomycin-resistant enterococci (VRE)		soap dispensers in study units **Patient outcome(s)**: Rates of nosocomial infections with MRSA and VRE. Data collected by infection control staff in each hospital.	intensive care unit (NICU) Duration not specified	comparison hospital); USA	significant improvements in the study hospital after six months of follow-up. There were no significant differences in rates of MRSA between the two hospitals, but rates of VRE were significantly reduced in the intervention hospital during implementation	
Ma and Park, 2015	Examine the effects of work environment	Quantitative, cross-	**Work environment**: Practice Environment	33,845 registered nurses	373 hospitals; USA	Units in Magnet hospitals had lower rates of pressure ulcers and	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	on patient outcomes at the unit level while adjusting for the influence on hospital-level organisational factors such as Magnet status	sectional study	Scale of the Nursing Work Index (PES-NWI) **Patient outcome(s)**: Hospital-acquired pressure ulcer rates from the National Database of Nursing Quality Indicators (NDNQI)	Data collected 2013		better work environments Hospital Magnet status and work environments were significantly associated with pressure ulcer rates after controlling for unit level covariates	
Ma et al., 2015	Determine the relationships between hospital nursing factors—nurse work environment, nurse staffing, and nurse education—and 30-day readmissions among Medicare patients undergoing	Quantitative, cross-sectional study	**Work environment:** Two databases**:** University of Pennsylvania Multi-State Nursing Care and Patient Safety Study and the American Hospital Association (AHA) Annual Survey **Patient outcome(s)**: Medicare Provider and Analysis Review File (MedPAR) measuring 30-day readmission rates	220,914 Medicare surgical patients; 25,082 nurses Data collected July 2006-June 2007	258 hospitals; USA	Patients cared for in hospitals with better nurse work environments had lower odds of readmission, independent of nurse staffing levels. Administrative support to nursing practice and nurse-physician relations were two main attributes of the work environment that were associated with readmissions	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	general, orthopaedic, and vascular surgery						
Maben et al., 2012	Examine the links between staff experience of work and patient experience of care in a 'Medicine for Older People' (MfOP) service in England	Mixed-methods, cross-sectional study	**Organisational climate**: Questionnaire assessing organisational and local climate **Patient outcome(s)**: Patient Evaluation of Emotional Care During Hospitalisation (PEECH); short-form Picker Instrument; additional items from the longer UK NHS National Patient Survey	Survey: 66 staff; 26 patients Interview: 18 staff; 18 patients and carers Data collected January 2010-August 2010	A dedicated service for older people situated in a large acute teaching hospital; England	Patients experienced more varied and unpredictable nursing care on those wards with a poor local work climate for staff Emotional labour involved in being a patient was greater in poor care climates where the quality of care was unpredictable and patient experience variable	Medium
Mahl et al., 2015	Evaluate the association of perceived organisational culture and quality improvement with the outcomes of	Quantitative, combined cross-sectional and longitudinal study	**Organisational culture**: Quality Improvement Implementation Survey (QIIS) **Patient outcome(s)**: Survival without major morbidity from patient records	1,133 health care professional; 1,028 extremely pre-term infants Data collected April 2008-March 2009	18 neonatal ICUs; Canada	Higher group culture scores were associated with significantly lower rates of survival without major morbidity Higher hierarchical culture and higher quality improvement	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	infants admitted to level III NICUs in Canada					scores were associated with higher rates of survival without major morbidity	
Mardon et al., 2010	Examine relationships between the Agency for Healthcare Research and Quality's (AHRQ) Hospital Survey of Patient Safety Culture and rates of in-hospital complications and adverse events as measured by the AHRQ Patient Safety Indicators (PSIs)	Quantitative, cross-sectional study	**Safety culture:** The Agency for Healthcare Research and Quality (AHRQ) Hospital Survey on Patient Safety Culture (HSOPS) **Patient outcome(s)**: Selected AHRQ Patient Safety Indicators (PSI)	56,480 hospital employees Data collected 2004-2006	179 hospitals; USA	Hospitals with higher patient safety culture scores tended to have lower rates of documented adverse events: 12/15 HSOPS variables were negatively correlated with PSIs. After controlling for hospital characteristics, seven HSOPS (frequency of events reported, handoffs and transitions, organisational learning—continuous improvement, staffing, teamwork across units, teamwork within units, HSOP composite average) remained statistically correlated with PSIs	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
McHugh and Ma, 2013	Understand how the nursing care environment affects readmissions	Quantitative, cross-sectional study	**Work environment:** Practice Environment Scale of the Nursing Work Index (PES-NWI); nurse staffing levels; nurse educational attainment **Patient outcome(s):** Data on index admissions and readmissions obtained from state discharge abstract databases	375,681 patients; 20,585 nurses Data collected 2006	412 hospitals; USA	Care in a hospital with a good versus poor work environment was associated with 7% lower odds of 30-day readmission for heart failure patients, 6% lower odds for acute myocardial infarction patients and 10% lower odds for pneumonia patients The odds of readmission was 4% lower for heart failure, 3% lower for acute myocardial infarction and 6% lower for pneumonia patients cared for in a hospital with a mixed versus poor work environment	High
Meraviglia et al., 2008	Assist rural or small hospitals (average daily census < 100) with	Quantitative, interventional study	**Work environment:** Nursing Work Index-Revised (NWI-R)	1,150 nurses Duration not specified	30 hospitals; USA	There were positive changes in the nurses' perception of their work environment (indicating that that the	Medium

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	implementing 12 nurse friendly criteria into the policies and practices of the hospital to create a positive work environment		**Patient outcome(s)**: Hospital reported prevalence of pressure ulcers, patient falls, and hospital-acquired pneumonia and urinary tract infections			intervention successfully improved organisational culture) Quality of care improved at participating hospitals, as measured by the nurse-sensitive quality indicators (QI)	
Morris A et al., 2007	Examine the effects of organisational culture and climate, as well as individual characteristics, on outcomes of care for adults with severe mental illness	Quantitative, longitudinal study	**Organisational culture and climate:** Questionnaire assessing organisational culture and climate **Patient outcome(s)**: Quality of Life (QOL) index; SF-36; Medicaid claims data; Clinician diagnoses using the DSM IV	424 Patients with chronic mental illness; 274 administrators and health workers Data collected over three years; collection dates not specified	14 Community Mental Health Organizations (CMHOs); USA	Organisational culture and climate were strong predictors of perceived improvements in physical and mental health status over time, but were not associated with changes in QOL	High
Nasirpour et al., 2010	Determine the relationship of Centralisation and organisational culture and	Quantitative, cross-sectional study	**Organisational culture**: Robbin's organizational culture questionnaire	441 personnel Data collected 2007	13 hospitals; Iran	No significant correlation was observed between organisational culture and hospital performance indexes	Low

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	performance indexes in Teaching Hospitals affiliated to Tehran University of Medical Sciences		**Patient outcome(s)**: Performance indexes (average length of stay, inpatient bed occupancy ratio, rate of admissions per active bed, net death rate and ratio of surgical operations to inpatients)				
Nowinski et al., 2007	Monitor changes in organisational culture, continuous quality improvement (QI), maturity and QI indicators overtime	Quantitative, longitudinal study	**Organisational culture**: Culture and Quality Questionnaire (CQQ) **Patient outcome(s)**: Press Ganey patient satisfaction survey; multiple standard quality indicators	621 employees at Baseline and 471 employees at Time 2 Data collected March 2003- March 2006	Three hospitals; USA	Several strong correlations were found between changes in culture score and changes in quality indicators at the three facilities. Appropriate discharge of patients with chest pain was negatively correlated with developmental culture; use of antibiotics within four hours of admission was positively associated with rational culture and quality management and negatively related to group culture and	Medium

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
						human resource utilisation; and patient satisfaction was positively correlated with group culture and negatively correlated with rational culture	
Prezerakos et al., 2015	Investigate the correlation between haemodialysis work environment and patients' outcomes	Quantitative, cross-sectional study	**Work environment**: Practice Environment Scale of the Nursing Work Index (PES-NWI) **Patient outcome(s)**: Questionnaire assessing how often selected errors and adverse events have occurred under the nursing care during the previous three months	133 nurses Data collected June-July 2012	11 hospital-based dialysis units; Greece	Hypotension, venous needle disconnection and patient falls were associated with non-favourable work environment Hypoglycaemia, medication error and catheter-associated infections were not associated with work environment	High
Purdy et al., 2010	Determine impact of the work environment on patient care	Quantitative, cross-sectional study	**Work environment:** Work Effectiveness Questionnaire (CWEQ-II); Work Group Characteristics Measure; Psychological	679 nurses; 1,005 patients Duration not specified	61 medical and surgical units across 21 hospitals; Canada	Structural empowerment, mediated through group processes, significantly impacted a variety of patient outcomes including nurse-assessed	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
			Empowerment Questionnaire (PEQ) **Patient outcome(s)**: Patient falls and nurse assessed risks, measured using an instrument developed by Sochalski (2001); Nursing Care Quality Questionnaire (PSNCQQ); Therapeutic Self-care Questionnaire-Acute Care Version			quality and risk as well as an objective measure of patient falls although no significant effect was found for variables assessed using the patient's perspective	
Saame et al., 2011	Outline the relationships between organisational culture and patient satisfaction	Quantitative, cross-sectional study	**Organisational culture**: Organisational Values Questionnaire (OVQ) **Patient outcome(s)**: Patient satisfaction ratings	456 medical and non-medical professionals Data collected October 2005-February 2006	One hospital (including two clinics with high patient satisfaction and four with low); Estonia	Clinics with high patient satisfaction did not score more than clinics with low patient satisfaction in terms of the Human Relations type Clinics with high patient satisfaction were less oriented towards Rational Goal type values than clinics with low patient satisfaction	Medium

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
Scotti et al., 2007	Examine how a high-involvement approach to the work environment of healthcare employees may lead to exceptional service quality, satisfied patients, and ultimately to loyal customers	Mixed-methods cross-sectional study	**Work climate**: Questionnaire assessing human resource practices, customer orientation and employee-perceived service quality based on pre-existing Veterans' Affairs Questionnaire **Patient outcome(s)**: Questionnaire assessing customer perceived quality and customer satisfaction based on pre-existing Veterans Health Administration Questionnaire	59,464 employees; 212,874 respondents Data collected 2001	113 Veterans Health Administration ambulatory care centres; USA	High-performance work systems are linked to employee perceptions of their ability to deliver high-quality customer service, both directly and through their perceptions of customer orientation Employee perceptions of customer service are linked to customer perceptions of high-quality service Perceived service quality is linked with customer satisfaction	High
Shortell et al., 1995	Examine the relationships between organisational culture, quality improvement processes and selected	Quantitative, cross-sectional study	**Organisational culture**: 20-item questionnaire developed by Zammuto and Krakower (1991) assessing group culture, developmental culture, hierarchical culture, and rational culture scales	Continuous quality improvement and total quality management: an unspecified number of CEOs and person in	61 hospitals; USA	A participative, flexible, risk-taking organisational culture was significantly related to quality improvement implementation	Medium

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	patient outcomes		**Patient outcome(s)**: A patient outcome impact scale assessing improved patient outcomes, reduced errors and inappropriate treatment, increased patient satisfaction, and improved continuity of patient care	charge of quality assessment Organisational culture: 7,337 hospital staff Implementation: Approximately 50 respondents from per hospital Duration not specified		Quality improvement implementation was significantly associated with greater perceived patient outcomes and human resource development, but not financial outcomes	
Shortell et al., 2000	Test impact of total quality management (TQM) and organisational culture on a comprehensive set of endpoints of care for coronary artery bypass graft surgery (CABG)	Quantitative, longitudinal study	**Organisational culture:** Previously validated 20-item questionnaire developed by Zammuto and Krakower (1991) **Patient outcome(s)**: CABG care endpoints (mortality, adverse outcome, clinical efficiency); Patient satisfaction questionnaire consisting of Patient Judgment System 24-item (PJS-24) questionnaire,	3,045 patients; an average of 54 staff per hospital Data collected 1995-1996	16 nongovernmental, not-for-profit, short-term-care general service hospitals engaged in TQM interventions; USA	A supportive group culture was significantly associated with shorter postoperative intubation times, and higher patient physical and mental functional health status scores six months after CABG, but also with longer operating room times There was little effect of organisational culture on	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
			'returning to home issues' items, and 'the needs of heart patients' items			multiple end-points of care for CABG patients	
Singer et al., 2009	Study the relationship between safety climate and safety performance using Patient Safety Indicators (PSIs)	Quantitative, cross-sectional study	**Safety climate**: Patient Safety Climate in Healthcare Organizations (PSCHO) 2004 **Patient outcome(s)**: The Medicare Provider Analysis and Review (MEDPAR) File from 2005	18,223 hospital staff Data collected 2004-2005	91 hospitals; USA	Higher levels of safety climate were associated with higher safety performance Hospitals in which personnel reported more problems with fear of shame and blame had significantly greater risk of experiencing PSIs Perceptions of higher safety climate overall among frontline personnel were associated with a relative increase in the risk of experiencing PSIs, but safety climate perceptions overall among senior managers were not	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
Stone et al., 2007	Examine effects of a comprehensive set of working conditions on elderly patient safety outcomes in intensive care units	Quantitative, cross-sectional study	**Organisational climate**: Perceptions of Nurse Work Environment Scale; administrative processes derived from monthly payroll data; monthly total ICU patient census data; Bureau of Labor Statistics regional estimates of RN salary **Patient outcome(s)**: Central line associated bloodstream infection (CLBSI), ventilator associated pneumonia (VAP), and catheter-associated urinary tract infection (CAUTI) derived from Nosocomial Infections Surveillance's (NNIS) system of infection surveillance; 30-day mortality and decubiti were determined using Medicare files	15,846 patients; 1,095 nurses Data collected 2002	51 adult intensive care units across 31 hospitals; USA	Units with higher staffing had lower incidence of CLBSI, VAP, 30-day mortality, and decubiti Increased overtime was associated with higher rates of CAUTI and decubiti, but slightly lower rates of CLBSI The effects of organisational climate on patient safety outcomes were inconsistent. Patients admitted to ICUs in which the nurses' perceived a more positive organisational climate had slightly higher odds of developing a CLBSI, but were 39% less likely to develop a CAUTI	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
Taylor et al., 2012	Investigate the extent to which organisational characteristics (working conditions and safety climate) predict injuries for patients and nurses	Quantitative, cross-sectional study	**Safety climate**: Safety Attitudes Questionnaire (SAQ); unit turnover rates; registered nursing hours per day data obtained from Human Resources **Patient outcome(s)**: Patient injuries (falls, pressure ulcers, and pulmonary embolism/deep vein thrombosis) from administrative discharge data and Patient Safety Net software	723 nurses; 28,876 patient discharges Data collected: Safety climate: 2004 Injury outcomes: 2005	A trauma centre with Magnet nursing status; USA	Safety culture was significantly associated with patient outcomes e.g., falls, decubitus ulcers and PE/DVT Working conditions were significantly associated with patient and nurse injury	High
Tei-Tominaga and Sato, 2016	Examine the effect of nurses' work environment with characteristics that are similar to those of Magnet hospitals on patient	Quantitative, cross-sectional study	**Work environment:** Japanese version of the Practice Environment Scale of the Nursing Work Index (PES-NWI) **Patient outcome(s)**: Questionnaire assessing information about hospitalisation (number of hospitalisations, duration of hospitalisation, having	425 nurses; 379 inpatients Data collected August 2011	Four hospitals; Japan	Hospitals in Japan with a work environment that nurses perceive to be similar to the work environment in Magnet hospitals were associated with patient satisfaction Specifically, collegial nurse-physician relations was associated with low	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	satisfaction in Japan		operative treatment), and patient satisfaction			patient satisfaction, however this association was weak, and diminished when hospital characteristics were considered in the analysis	
Temkin-Greener et al., 2010	Examine the association between nursing home (NH) work environment attributes such as teams, consistent assignment and staff cohesion, and the risk of pressure ulcers and incontinence	Quantitative, cross-sectional study	**Work environment:** Questionnaire purpose designed for the study assessing staff cohesion, presence of teams and consistent assignment **Patient outcome(s):** Pressure ulcer and incontinence from the Minimum Data Set	46,044 residents; 7,418 workers Data collected June 2006-July 2007	162 long-term care nursing homes; USA	Residents in facilities with worse staff cohesion had significantly greater odds of pressure ulcers and incontinence, compared with residents in facilities with better cohesion scores Residents in facilities with greater penetration of self-managed teams had lower risk of pressure ulcers, but not of incontinence Prevalence of consistent assignment was not significantly associated	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
						with pressure ulcers or incontinence	
Tervo-Heikkinen et al., 2008	Assess the interrelationships between nurses' work environment and nursing outcomes	Quantitative, cross-sectional study	**Work environment**: Registered Nurse Working Conditions Barometry Index-revised (RN-WCBI-R); items from the Nurse Work Index-revised (NWI-R) **Patient outcome(s)**: Total satisfaction indicator from the Humane Caring Scale-revised	664 registered nurses (RN); 1,730 patients Data collected during 2005	34 acute care inpatient hospital wards across four hospitals; Finland	Professional nursing standards staffing adequacy, and nursing respect and relationships were found to be important predictors of patient satisfaction	High
Tzeng et al., 2002	Investigate the relationship among staff nurses' assessment of organisational culture and general inpatient satisfaction with nursing care	Quantitative, cross-sectional study	**Organisational culture**: Nurse Assessment Survey (NAS) **Patient outcome(s)**: Nursing Services Inpatient Satisfaction Survey (NSISS)	520 registered nurses; 345 patients Duration not specified	13 medical/ surgical adult units; two adult psychiatric units; two gynaecology/ob stetric units; USA	Strength of culture had indirect positive effects (through nurse satisfaction) on patient satisfaction	Medium
Virtanen et al., 2009	Examine the association	Quantitative, cross-	**Organisational climate**: Questionnaire measuring	1,092 patients; 1,159 staff	Six hospitals; Finland	Long working hours among staff, high work	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	between work hours, work stress, and collaboration among the ward personnel, and the risk of hospital-associated infection among patients	sectional study	mean working hours, work stress (job strain and effort-reward imbalance), and collaboration (communication, justice in the distribution of work, support from supervisor, and quality of the collaboration between supervisors in the ward) **Patient outcome(s)**: Hospital-associated infection derived from medical records and infection surveillance records	Data collected March 2004-June 2004		stress, and problems in collaboration between personnel were related to infection among patients High effort-reward imbalance, low trust between ward members, injustice in the distribution of work, and poor collaboration between supervisors were all related to approximately a 2-fold infection risk among patients	
Warren et al., 2007	Explore the association between health care employees' perceptions of their organisations and objective measures of	Quantitative, cross-sectional study	**Organisational climate:** All Employee Survey (AES) comprising questions from the National Institute for Occupational Safety and Health (NIOSH) Instrument and the Organizational Assessment Survey (OAS); Bureau of Labor Statistics Survey of Employment;	74,662 employees of the VHA Data collected 2001	141 VHA facilities; USA	There was a relationship between some patient outcomes and organisational culture Patient satisfaction demonstrated the strongest connection with organisational climate. Inpatient and outpatient satisfaction	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	system performance (including employee and patient outcomes).		Federal Aviation Administration Instrument **Patient outcome(s)**: AES measuring attitudinal outcomes, and health and safety outcomes; Administrative Veterans Health Administration (VHA) Data Sets			was strongly related to increased levels of support, and increased inpatient satisfaction is also associated with higher levels of Professional Demands	
Weinberg et al., 2013	Examine the benefits of a high-performance work environment (HPWE) for employees, patients, and hospitals	Quantitative, cross-sectional study	**Work environment:** Questionnaire based on Revised Nursing Work Index, Picker Hospital Employee Survey; variety of tools from other workplace settings, with particular focus on research on high-performance work systems and teams **Patient outcome(s)**: Hospital Consumer Assessment of Healthcare Providers and	16,459 discharge records; 2,920 patient surveys; 1,527 staff surveys Duration not specified	45 units across nine hospitals and seven health systems; USA	HPWE was significantly associated with patients' experience and safety. HPWE was related to lower odds that a patient will experience an adverse outcome during the hospital stay	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
			Systems (HCAHPS); discharge data				
You et al., 2013	Evaluate the link between nurse resources and nurse and patient outcomes	Quantitative, cross-sectional study	**Work environment:** Four of the five subscales of the Practice Environment Scale of the Nursing Work Index (PES-NWI) **Patient outcome(s):** Adapted version of the Consumer Assessment of Healthcare Providers and Systems (CAHPS) Hospital Survey	9,688 staff (nurses in particular); 5,786 patients Duration not specified	181 hospitals; China	Patients in hospitals with better work environments were more likely to rate their hospital highly, to be satisfied with nursing communications, and to recommend their hospitals Higher patient-to-nurse ratios were unrelated to patient outcomes Higher percentages of baccalaureate nurses were strongly related to better patient outcomes	High
Zhou P, 2011	Determine whether perceptions of organisational culture among employees of public hospitals in China are	Quantitative, cross-sectional study	**Organisational culture:** Employee questionnaire measuring organisational culture **Patient outcome(s):** Hospital questionnaire assessing performance	3,437 staff; 8,276 patients Data collected June-October 2009	87 hospitals; China	Culture emphasising social responsibility was negatively associated with length of stay Hospitals with culture emphasising cost control had higher rates of	High

Study	Study objective(s)	Study design	Measures	Participants; Duration	Context; Setting	Key findings	Quality rating
	associated with hospital performance		outcomes such as LOS, outpatient visits per year, bed days per year, patient satisfaction; patient survey measuring satisfaction with medical care			outpatient visits and BDPPPD, as well as lower levels of patient satisfaction Hospitals in which employees perceived the culture as customer-focused had longer length of stays but lower patient satisfaction	

PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1, 4
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	2-3
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	4-5
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	7-9
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	8
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	9
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	7-8
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	8
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	6-7
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	6-7
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	6-7
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	12
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	8-9
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	N/A

PRISMA 2009 Checklist

Page 1 of 2

Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	12
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	N/A
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	10
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	10-12
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	12
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	13-18
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	N/A
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	12
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	N/A
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	18-19
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	19-20
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	20
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	21

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Page 2 of 2