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The Association Between Health Care Staff Engagement and Patient Safety Outcomes: A Systematic Review and Meta-Analysis

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Objectives: Despite decades of research, improving health care safety remains a global priority. Individual studies have demonstrated links between staff engagement and care quality, but until now, any relationship between engagement and patient safety outcomes has been more speculative. This systematic review and meta-analysis therefore assessed this relationship and explored if the way these variables were defined and measured had any differential effect.

Methods: After systematic searches of Medline, CINAHL, PsycInfo, Embase, Cochrane Library, and National Institute for Health Research Journals databases, narrative and random-effects meta-analyses were completed, with pooled effect sizes expressed as Pearson *r*.

Results: Fourteen studies met the inclusion criteria, 11 of which were suitable for meta-analysis. Meta-analyses indicated a small but consistent, statistically significant relationship between staff engagement and patient safety (all outcomes; 11 studies; $r = 0.22$; 95% confidence interval [CI], 0.07 to 0.36; $n = 30,490$) and 2 patient safety outcome categories: patient safety culture (7 studies; $r = 0.22$; 95% CI, 0.01 to 0.41; $n = 27,857$) and errors/adverse events (4 studies; $r = -0.20$; 95% CI, -0.26 to -0.13; $n = 2633$). The specific approach to conceptualizing engagement did not affect the strength of the findings.

Conclusions: This is the first review to demonstrate a significant relationship between engagement and both safety culture scores and errors/adverse events. Despite a limited and evolving evidence base, we cautiously conclude that increasing staff engagement could be an effective means of enhancing patient safety. Further research is needed to determine causality and clarify the nature of the staff engagement/patient safety relationship at individual and unit/workgroup levels.

Key Words: patient safety, health care staff, engagement, patient outcomes

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Improving health care safety is a global priority,¹ having been identified as an issue approaching epidemic proportions.² Despite major technological advances, modern-day health care delivery remains a human endeavor³ and health care safety primarily a function of human behavior and performance.²

Evidence outside health care demonstrates that engaged employees generally perform 20% better than their colleagues.⁴ Reports based on hospital-level data suggest staff engagement and health care safety performance may be strongly associated,^{3,5} for example, that engaged staff deliver better quality care,^{3,6} lower patient mortality,⁷ and better reporting of errors, near misses and incidents.⁶ Staff engagement has also been associated with lower

staff turnover and reduced absenteeism,⁸ which are known to affect safety.^{9,10} Given this and the large variations in staff engagement levels between organizations,^{7,11,12} generalized interventions to increase staff engagement may be equally, if not more, impactful and cost-effective than local interventions addressing specific risks such as falls or pressure ulcers.

Staff engagement is a broad concept⁸ characterized by a fragmented and complex literature, with more than 50 definitions identified.¹¹ One systematic review¹³ identified 6 definition categories. These were personal role engagement, work task or job engagement, multidimensional engagement, engagement as a composite attitudinal and behavioral concept, engagement as management practice, and self-engagement with performance. Definitions broadly fall into 2 overarching categories, one focusing on engagement as a personal state¹⁴ and the second on engagement as practice.¹⁵ It is important therefore to consider this distinction because it may have a bearing on how this relationship is conceptualized and measured.

Previous reviews have investigated the effectiveness of work engagement interventions,^{16,17} characteristics of engaged staff,¹⁸ how to enhance staff well-being,¹⁹ engagement outcomes for other staff groups,^{13,20} and engagement and care quality²¹ or have reviewed the association between engagement and safety but not specifically in health care.^{13,22} Thus, with one notable exception,²³ there is a gap in the evidence base on the relationship between staff engagement and patient safety. Mossburg and Dennison-Himmelfarb²³ reported a moderately strong positive association between engagement and patient safety culture, but limited evidence on the links between engagement and errors. They did, however, recommend further investigation of this relationship, including exploration of how engagement and patient safety are operationalized in the literature. They also highlighted the opportunity to move away from the traditional, deficit-based focus on burnout. This review addresses both of these gaps.

Before recommending staff engagement interventions as a target for improving patient safety, we must first understand the evidence regarding the nature of the relationship between these 2 constructs (engagement as a personal state versus engagement as practice) and whether this differs depending on the type of staff engagement or how we measure patient safety. This systematic review and meta-analysis therefore set out to answer the following research questions:

- What is the strength of the relationship between staff engagement and patient safety outcomes?
- Which conceptualization of staff engagement is most associated with patient safety outcomes?

METHODS

This review followed PRISMA guidelines²⁴ (Fig. 1; preregistered at https://www.crd.york.ac.uk/prospero/display_record.php?RecordID=108599).

Scope of the Review

Studies exploring the relationship between staff engagement and patient safety outcomes were included. With no consensus

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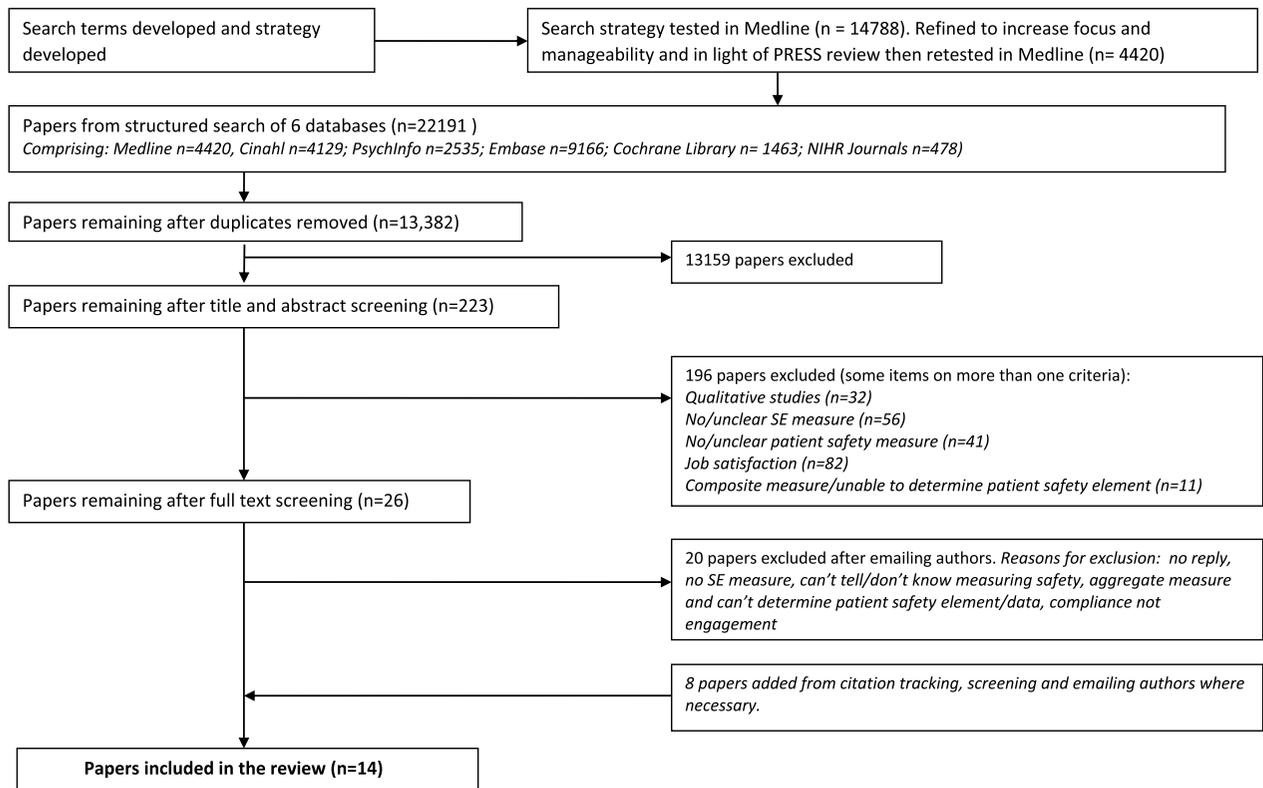


FIGURE 1. Overview of study selection process (PRISMA diagram).

on the definition of staff engagement,¹³ studies addressing this concept in its broadest sense were considered based on 2 working definitions. The first, commonly used in the organizational psychology literature, conceptualizes engagement as a state:

“A positive, fulfilling, work-related state of mind that is characterized by vigor, dedication and absorption.”^{14(p74)}

The second, broader definition, adopted by the UK National Health Service, emphasizes engagement as practice:

“...a positive attitude held by an employee toward the organization and its values. An engaged employee is aware of business context and works with colleagues to improve performance within the job for the benefit of the organisation.”^{15(p4)}

The review was limited to studies published in 1999 onward to correspond with the publication of *To Err Is Human*,⁵ the major catalyst for developing safer health care. Other inclusion criteria were as follows: peer-reviewed studies, published in English, involving health care staff, using quantitative methods/measures of staff engagement and patient safety, and cross-sectional, prospective, or interventional designs. Exclusion criteria were studies measuring satisfaction or composite quality of care from which patient safety could not be disaggregated.

Medline, CINAHL, PsycInfo, Embase, Cochrane Library, and National Institute for Health Research Journals databases were searched by an academic/health care librarian from January 1999 to February 2020 using 3 blocks of search terms/synonyms (health care staff, staff/employee engagement, patient safety/quality of care). The search strategy was tested in Medline, refined

and retested after independent peer review using the Peer Review of Electronic Search Strategies guidelines²⁵ (Supplementary File 1). We completed citation tracking of all included studies to identify additional studies. After the removal of duplicates, G.J. and T. M. independently screened all titles and abstracts, then full texts for potentially relevant records. Any discrepancy or uncertainty at any stage was resolved through full-text review and team discussion (J.J., R.L., L.B.). We contacted 19 authors for clarification of measures or unadjusted or item-level correlations; 1 author²⁶ provided the data requested.

Data extraction and quality assessment templates were developed, piloted on 20% of the included articles (G.J., T.M., L.B.) and then iterated after team discussion. Extracted data comprised the following: author, setting, participant characteristics, staff engagement definition, sample size, study design, outcomes, measures, analysis method, inclusion/exclusion criteria, study limitations, and conclusions. Four reviewers (G.J., T.M., J.J., R.L.) independently categorized the engagement definitions from individual articles and through discussion arrived at a consensus categorization (Table 1). Data were independently extracted then agreed by G.J./T.M. (qualitative) and G.J./L.B. (quantitative). G.J./T.M. independently completed quality assessment for each study. Quality assessment comprised items from the guidance on the assessment of observational studies⁴⁰ and Cochrane risk of bias tool plus “a priori,” team-defined criteria specific to our review.⁴¹ A score of 0 was awarded for criteria where information was indeterminable. Possible scores ranged from 0 to 6. A score of 5 to 6 was considered high; 3 to 4, fair; and 0 to 2, poor quality (Supplementary File 2).

Narrative analysis appraised studies according to research design, country, participant group, setting, engagement definition, patient safety outcome, and measures. Study information was systematically tabulated and patterns within and between studies were explored to identify commonalities/differences and potential reasons for these.

¹For the meta-analysis, this was higher because the data set provided to us from the author included more participants.

TABLE 1. Summary of Studies Included in the Review

Source and Grouping(s) for Analysis	Setting	Professional Group and Sample	Quality Score	Staff Engagement Definition	Staff Engagement Measure	Patient Safety Measure	Summary Findings
Ametz et al ²⁷ (United States)*††	Nursing home	Mixed 312	3	NHS (practice, personal)	Quality-Work Competence Questionnaire (employeeship scale: nonpunitive response to error; communication about incidents, compliance with safety procedures)	Nursing Home Survey on Patient Safety Culture	<p>Employeeeship and</p> <ul style="list-style-type: none"> • Nonpunitive response to error ($r = 0.21, P < 0.001$) • Communication about incidents ($r = 0.27, P < 0.001$) • Compliance with safety procedures ($r = 0.15, P < 0.001$) <p>Engagement and</p> <ul style="list-style-type: none"> • Total safety scores ($r = 0.65, P < 0.01$), although big variations in safety scores between units (41%–82%) • All 12 dimensions of SAQ, 9 of which were significant, including <ul style="list-style-type: none"> • Frequency incident reporting ($r = 0.56, P < 0.01$) • Overall perceptions safety ($r = 0.43, P < 0.05$) • Significant result for one hospital-level dimension, teamwork across hospital units ($r = 0.46, P < 0.05$)
Collier and Fitzpatrick ²⁸ (United States)*††	Hospital (ITU)	Nurses 26 units	3	Gallup Q ¹² (practice, organizational)	Gallup Q ¹²	HSOPSC	<p>Engagement and unit-level safety climate in all 4 domains of SAQ at 3 time points, all $P < 0.001$:</p> <p>Spearman $\rho = 0.69$ (58 units, 2009)</p> <p>$\rho = 0.57$ (68 units, 2011)</p> <p>$\rho = 0.43$ (59 units, 2013)</p> <ul style="list-style-type: none"> • Vigor: $r = 0.06$ (n/s) • Dedication: $r = 0.13$ ($P < 0.01$) <p>Frequency events reported and</p> <ul style="list-style-type: none"> • Vigor: $r = 0.10$ ($P < 0.05$) • Dedication: $r = 0.10$ ($P < 0.05$) <p>Affective commitment and perception of patient safety culture: $r = 0.26$ ($P < 0.05$)</p> <p>Affective commitment and perception of patient safety culture: $r = 0.08$ ($P = 0.13, n/s$)</p>
Daugherty-Biddison et al ²⁹ (United States)*†	Hospital	Mixed 58–68 units × 3	3	Gallup (practice, organizational)	Gallup Q ¹²	SAQ	<p>Engagement and unit-level safety climate in all 4 domains of SAQ at 3 time points, all $P < 0.001$:</p> <p>Spearman $\rho = 0.69$ (58 units, 2009)</p> <p>$\rho = 0.57$ (68 units, 2011)</p> <p>$\rho = 0.43$ (59 units, 2013)</p> <ul style="list-style-type: none"> • Vigor: $r = 0.06$ (n/s) • Dedication: $r = 0.13$ ($P < 0.01$) <p>Frequency events reported and</p> <ul style="list-style-type: none"> • Vigor: $r = 0.10$ ($P < 0.05$) • Dedication: $r = 0.10$ ($P < 0.05$) <p>Affective commitment and perception of patient safety culture: $r = 0.26$ ($P < 0.05$)</p> <p>Affective commitment and perception of patient safety culture: $r = 0.08$ ($P = 0.13, n/s$)</p>
Georganta et al ³⁰ (Europe)*§	Hospital	Mixed 532	4	Schaufeli (state)	UWES	HSOPSC	<p>Engagement and unit-level safety climate in all 4 domains of SAQ at 3 time points, all $P < 0.001$:</p> <p>Spearman $\rho = 0.69$ (58 units, 2009)</p> <p>$\rho = 0.57$ (68 units, 2011)</p> <p>$\rho = 0.43$ (59 units, 2013)</p> <ul style="list-style-type: none"> • Vigor: $r = 0.06$ (n/s) • Dedication: $r = 0.13$ ($P < 0.01$) <p>Frequency events reported and</p> <ul style="list-style-type: none"> • Vigor: $r = 0.10$ ($P < 0.05$) • Dedication: $r = 0.10$ ($P < 0.05$) <p>Affective commitment and perception of patient safety culture: $r = 0.26$ ($P < 0.05$)</p> <p>Affective commitment and perception of patient safety culture: $r = 0.08$ ($P = 0.13, n/s$)</p>
Horwitz and Horwitz ³¹ (United States)*†	Hospital	Doctors 63	1	NHS (practice, personal)	OCQ (short version)	Patient Safety Climate in Healthcare Organisations	<p>Engagement and unit-level safety climate in all 4 domains of SAQ at 3 time points, all $P < 0.001$:</p> <p>Spearman $\rho = 0.69$ (58 units, 2009)</p> <p>$\rho = 0.57$ (68 units, 2011)</p> <p>$\rho = 0.43$ (59 units, 2013)</p> <ul style="list-style-type: none"> • Vigor: $r = 0.06$ (n/s) • Dedication: $r = 0.13$ ($P < 0.01$) <p>Frequency events reported and</p> <ul style="list-style-type: none"> • Vigor: $r = 0.10$ ($P < 0.05$) • Dedication: $r = 0.10$ ($P < 0.05$) <p>Affective commitment and perception of patient safety culture: $r = 0.26$ ($P < 0.05$)</p> <p>Affective commitment and perception of patient safety culture: $r = 0.08$ ($P = 0.13, n/s$)</p>
Lotfi et al ³² (Tehran)*†	Hospital	Nurses 340	3	NHS (practice, personal)	OCQ	HSOPSC	<p>Engagement and unit-level safety climate in all 4 domains of SAQ at 3 time points, all $P < 0.001$:</p> <p>Spearman $\rho = 0.69$ (58 units, 2009)</p> <p>$\rho = 0.57$ (68 units, 2011)</p> <p>$\rho = 0.43$ (59 units, 2013)</p> <ul style="list-style-type: none"> • Vigor: $r = 0.06$ (n/s) • Dedication: $r = 0.13$ ($P < 0.01$) <p>Frequency events reported and</p> <ul style="list-style-type: none"> • Vigor: $r = 0.10$ ($P < 0.05$) • Dedication: $r = 0.10$ ($P < 0.05$) <p>Affective commitment and perception of patient safety culture: $r = 0.26$ ($P < 0.05$)</p> <p>Affective commitment and perception of patient safety culture: $r = 0.08$ ($P = 0.13, n/s$)</p>

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TABLE 1. (Continued)

Source and Grouping(s) for Analysis	Setting	Professional Group and Sample	Quality Score	Staff Engagement Definition	Staff Engagement Measure	Patient Safety Measure	Summary Findings
Lowe ²⁶ (Canada) ^{*,‡}	Hospital	Mixed 27,018	1	NHS (practice, personal)	Engagement Scale	Patient Safety Culture Scale	<ul style="list-style-type: none"> No correlations were published. The narrative outlines a consistently strong relationship between engagement and organizational performance (e.g., errors and near misses, and safety culture) 58% of highly engaged employees were in top quartile of patient safety culture scores, and only 3% in lowest quartile. <p>Note: Pearson <i>r</i> was calculated for our meta-analysis from unpublished data provided by the author at our request (see Supplementary file 3)</p>
Prins et al ³³ (the Netherlands) ^{†§}	Hospital	Doctors 2,115	2	Schaufeli (state)	UWES	Self-reported error questionnaire	<p>Total engagement score and</p> <ul style="list-style-type: none"> Action/inexperience errors: <i>r</i> = -0.07 (<i>P</i> < 0.001) Errors due to lack of time: <i>r</i> = -0.22 (<i>P</i> < 0.001) <p>Action/inexperience errors and</p> <ul style="list-style-type: none"> Vigor: <i>r</i> = -0.09 (n/s) Dedication: <i>r</i> = -0.07 (n/s) Absorption: <i>r</i> = -0.03 (n/s) <p>Errors due to lack of time and</p> <ul style="list-style-type: none"> Vigor: <i>r</i> = -0.23 (<i>P</i> < 0.001) Dedication: <i>r</i> = -0.24 (<i>P</i> < 0.001) Absorption: <i>r</i> = -0.11 (<i>P</i> < 0.001)
Rathert et al ³⁴ (United States) ^{*,†§§}	Hospital	Mixed 252	2	Schaufeli (state) and NHS (practice, personal)	Adapted Engagement Scale • OCQ	HSOPSC	<p>Overall patient safety perceptions and</p> <ul style="list-style-type: none"> Engagement: <i>r</i> = -0.14 (<i>P</i> < 0.01; note: direction as expected based on the way the items are constructed) Organizational commitment: <i>r</i> = 0.40 (<i>P</i> < 0.01)

Author(s)	Setting	Sample	Measure	Work Commitment Scale	Medication errors	Work commitment and medication errors
Rezaianin et al ³⁵ (Tehran) ^{††}	Hospital (ITU)	Nurses 117	4	NHS (practice, personal)		<ul style="list-style-type: none"> Total errors: $r = -0.25$ ($P = 0.006$) IV: $r = -0.21$, ($P = 0.02$) Non-IV: $r = -0.27$ ($P = 0.003$) <p>Multiple linear regression (age, sex, etc. adjusted) was consistent:</p> <ul style="list-style-type: none"> Total errors $\beta = -0.27$ ($P = 0.02$) IV errors $\beta = -0.12$ ($P = 0.06$) Non-IV $\beta = -0.15$ ($P = 0.01$)
Teng et al ³⁶ (Taiwan) ^{††}	Hospital	Nurses 284 (as best we can determine)	5	NHS (practice, personal)	Commitment 6 measures of patient safety	<p>Engagement and overall patient safety: $r = 0.19$ ($P < 0.05$)</p> <p>Adjusted for nurse working experience, regression showed associations with injuries due to care ($\beta = 0.16$, $P < 0.05$), patient falls ($\beta = 0.12$, $P < 0.05$), nosocomial infections ($\beta = 0.11$, $P = 0.07$), medication errors ($\beta = 0.18$, $P < 0.01$), incomplete/incorrect documentations ($\beta = 0.18$, $P < 0.01$), and delayed care and overall patient safety ($\beta = 0.19$, $P < 0.01$)</p>
Thorp et al ³⁷ (United States) ^{*†}	Hospital	Mixed Max 129 units 2009	6	Gallup (practice, organizational)	HSOPSC	<p>Mean engagement scores in 2007 predicted 2009 patient safety scores ($\beta = 0.77$, $P < 0.001$; among other supporting results)</p>
Toode ³⁸ (Estonia) ^{*††}	Hospital	Nurses 201	3	NHS (practice, personal)	HSOPSC	<p>Engagement and empowerment in the unit and</p> <ul style="list-style-type: none"> Overall perceptions of patient safety: $r = 0.44$ ($P < 0.001$) Patient safety grade in unit: $r = 0.20$ ($P < 0.01$) Frequency of events reported in unit: $r = 0.23$ ($P < 0.001$) Self-reported events during last 12 mo: $r = 0.24$ ($P < 0.001$)
Tsiga et al ³⁹ (Greece) ^{†§}	Hospital	Doctors 117	2	Schaufeli (state)	Medical Error Checklist	<p>Engagement and errors: Surgeons (n = 117) $r = -0.33$ ($P < 0.001$)</p> <p>Internists (n = 66) = not reported</p> <p>Pediatricians (n = 48) = not reported</p>

*Staff engagement versus patient safety culture.

†Staff engagement versus errors/adverse events.

‡Staff engagement as practice versus patient safety.

§Staff engagement as state versus patient safety.

ITU, intensive therapy unit; OCQ, Organizational Commitment Questionnaire; SAQ, Safety Attitudes Questionnaire; UWES, Utrecht Work Engagement Scale.

Meta-analyses were conducted using random-effects weighting (DerSimonian-Laird) and Fisher *z* to *r* back-transformation method, using R Studio (version 3.5.2)⁴² with the *Metacor* (<https://repo.beppt.go.id/cran/web/packages/metacor/metacor.pdf>) package.⁴³ The pooled effect size metric was Pearson *r*, based on unadjusted correlations where possible. Effects sizes of *r* = 0.10, 0.30, and 0.50 were considered small, medium, and large, respectively.⁴⁴ Where other effect metrics (e.g., Spearman ρ) or summary data were reported, *r* was estimated using conversion formulas (Supplementary File 3). To mitigate violations of statistical independence, average effect across measures was taken for studies with 2 or more measures of interest (e.g., subscales)⁴⁵; Supplementary File 3).

Aside from overall pooled analyses, studies were pooled separately according to staff engagement definition groups, such as engagement-as-practice and engagement-as-state, and outcome types, such as patient safety culture (a higher positive *r* was deemed favorable) and self-reported adverse errors/events (a higher negative *r* was deemed favorable), where effect size directions were altered as appropriate. An exploratory meta-regression analysis assessed whether any of the aforementioned engagement definitions was more highly associated with patient safety.

Heterogeneity was assessed with Cochran *Q* statistic and related *I*² statistic. Funnel plots were generated and used to provide some insight into small study bias (an indicator of publication bias), alongside Kendall τ , Egger regression, and failsafe *N* (Orwin method) statistics. All analyses were subject to leave-one-out sensitivity analyses.⁴⁶

RESULTS

Systematic searching yielded 13,382 records after the removal of duplicates. Study selection (Fig. 1) resulted in 14 studies eligible for the overall review and 11 for meta-analysis. Table 1 summarizes the studies included in the review. Seven were from North America/Canada,^{26–29,31,34,37} 4 from Europe^{30,32,38,39} and 3 from the Middle/Far East.^{32,35,36} Thirteen were cross-sectional, and 1 was non-cross-sectional.³⁷ All but 1 study²⁷ were hospital based. Six involved mixed staff groups^{26,27,29,30,34,37}; 5, nurses only^{28,32,35,36,38}; and 3, doctors only.^{31,33,39} The relationship between our variables of interest was a secondary or incidental objective in half of the eligible studies.^{30,31,34,35,37–39} Only 2 studies were deemed of high quality (scoring 5–6 in the quality assessment)^{36,37}; 7, fair (scoring 3–4)^{27–30,32,35,38}; and 5, poor (scoring 0–2)^{26,31,33,34,39} (Supplementary File 2). Samples ranged from 63 (doctors only)³¹ to 27,018¹ (mixed staff group)²⁶ for participant-level data and from 26 (nurses only groups)²⁸ to 68 (mixed staff groups)²⁹ for unit-level data. Ten studies measured

patient safety culture, and 4 measured the number of errors/adverse events. Of the studies included, 3 used the Hospital Survey of Patient Safety Culture (HSOPSC) measure and reported subscale scores. One subscale of this questionnaire assesses the frequency of errors/events reporting. This was considered a safety culture rather than adverse events measure because it reflects reporting culture rather than the frequency of events occurring.

The main and subgroup analyses are reported by research question.

Question 1: What is the strength of the relationship between staff engagement and patient safety outcomes?

All 14 studies reported a relationship between staff engagement and patient safety in the predicted direction except for one engagement measure in a dual-measure study.³⁴ All results were statistically significant except 1 study³² and 1 subscale (the number of reported events) in a multioutcome study.³⁰ Eleven of the 14 were suitable for inclusion in a meta-analysis of studies measuring any patient safety outcome and any definition of engagement. Random-effects meta-analysis suggested a small to medium positive, significant relationship between engagement and patient safety (*r* = 0.22; 95% confidence interval [CI], 0.07–0.36; *n* = 30,490) with considerable heterogeneity (*P* < 0.01; *I*² = 98%; Fig. 2).

Three studies^{28,29,37} were excluded from all meta-analyses because they reported unit-level analyses (pooling unit and participant-level data would bias the meta-analyses by artificially lending more weight to participant-level studies that had much higher *n* values). Their findings were consistent with the aforementioned meta-analysis. Two reported stronger effects than the individual-level studies: *r* = 0.65 (for patient safety culture), *r* = 0.56 (for frequency of incident reporting (both *P* < 0.01),²⁸ and Spearman ρ = 0.69, 0.57, and 0.44 (*P* < 0.001; for patient safety culture at 3 time points).²⁹ The third also supported the meta-analysis findings (β = 0.75, *P* < 0.001)³⁷ (see Supplementary File 3 for small, unit-level-only meta-analysis).

The Relationship Between Staff Engagement and Patient Safety by Outcome Group

Safety outcomes were broadly categorized as follows: patient safety culture and errors/adverse events. Three studies^{28,30,38} reported on both these outcomes.

Staff Engagement and Patient Safety Culture

Ten studies explored this relationship; 6 included mixed staff groups,^{26,27,29,30,34,37} 3 included nurses only,^{28,32,38} and 1 included doctors only.³¹ The most frequent patient safety culture measure, used by half of these 10 studies, was the HSOPSC. Nine

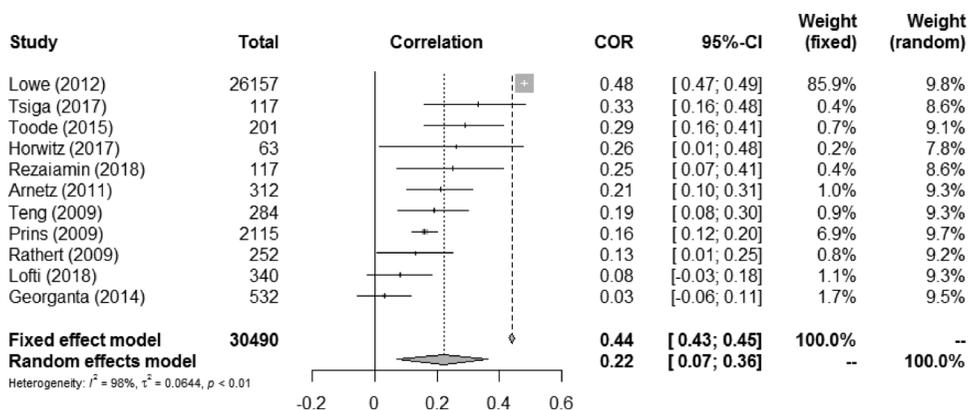


FIGURE 2. Patient safety and staff engagement (n = 11).

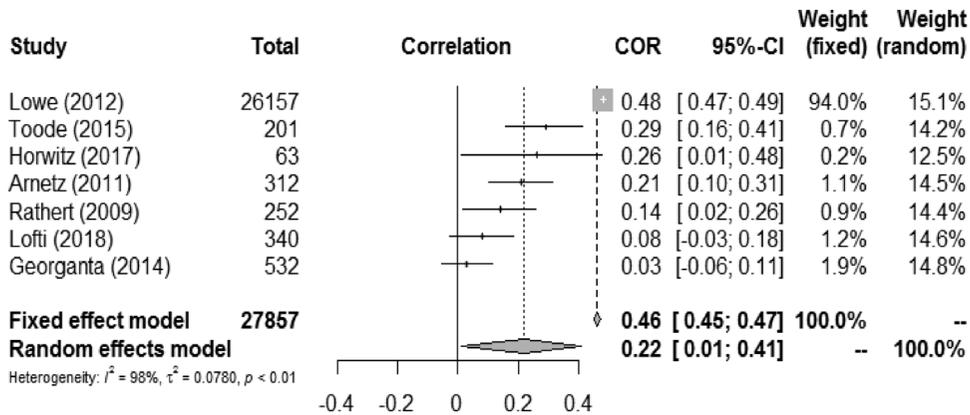


FIGURE 3. Engagement × patient safety culture (n = 7).

of the 10 reported positive, statistically significant correlations. The 7 studies suitable for meta-analysis showed a small positive, significant association ($r = 0.22$; 95% CI, 0.01–0.41; $n = 27,857$) with considerable heterogeneity ($P < 0.01$; $I^2 = 98\%$; Fig. 3).

Three unit-level studies were excluded from this meta-analysis. Two involved mixed staff groups. The first and highest-quality study in the review³⁷ reported a positive association of engagement with a validated index of patient safety culture ($\beta = 0.75$, $P < 0.001$). The second²⁹ found strong, significant correlations between staff engagement and all 4 domains of the Safety Attitudes Questionnaire (mean Spearman $\rho = 0.69$ [in 2009], 0.57 [in 2011], 0.43 [in 2013]; $P < 0.001$). The third, smaller study of nurses in 26 units²⁸ found a strong, positive relationship between staff engagement and total patient safety culture scores ($r = 0.65$, $P < 0.01$) and with 9 of the 12 safety dimensions of the HSOPSC (Table 1).

Staff Engagement and Errors/Adverse Events

Seven studies examined this relationship. All were cross-sectional. Five were of good or fair quality,^{28,30,35,36,38} and 2 were of poor quality.^{33,39} More than half involved only nurses^{28,35,36,38}, 2, only doctors^{33,39}; and 1, a mixed staff group.³⁰ Three studies used the HSOPSC self-reported events subscale and so were not included in this meta-analysis. This is because the HSOPSC measures reporting culture rather than incident rates and would therefore be hypothesized as positively related to staff engagement, whereas incident rates are predicted to be correlated in a negative direction. Pooled analysis of the 4 studies measuring the number of errors/adverse events indicated that higher engagement had a small, inverse relationship with errors/events ($r = -0.20$; 95% CI, -0.26 to -0.13; $n = 2633$) with low heterogeneity ($P = 0.22$; $I^2 = 32\%$; Fig. 4).

Question 2: Which conceptualization of staff engagement is most closely associated with patient safety outcomes?

Studies conceptualized staff engagement in 2 main ways: engagement-as-practice ($n = 11$) and engagement-as-state ($n = 4$), although one reflected both.³⁴ Of the 11 adopting an engagement-as-practice approach, 8 reflected the definition of engagement-as-personal-practice.^{26,27,31,32,34–36,38} The other 3 had an engagement-as-organizational-practice focus^{28,29,37} and used the Gallup Q¹² questionnaire.⁴

Engagement-as-Practice and Patient Safety Outcomes

Pooled analysis of 8 studies indicated that staff engagement-as-practice showed a small, significant positive association with patient safety ($r = 0.21$, 95% CI, 0.01–0.39; $n = 27,726$) with high heterogeneity ($P < 0.01$, $I^2 = 97\%$; Supplementary File 3). The 3 unit-level studies unsuitable for meta-analysis consistently supported these findings, all reporting highly significant, moderate to strong correlations of $r = 0.65$ (safety culture) and 0.56 (frequency of incident reporting; $P < 0.01$)²⁸, $r = 0.69$, 0.57, and 0.44 (safety culture at 3 time points; $P < 0.001$)²⁹; and $\beta = 0.75$ (safety culture; $P < 0.001$).³⁷

Engagement-as-State and Patient Safety Outcomes

Four studies addressed this relationship, with 2 using mixed staff groups^{30,34} and 2 using doctors only.^{33,39} One was of fair³⁰ and the other 3 were of poor quality.^{33,34,39} All were suitable for meta-analysis. The pooled effect showed a small, positive correlation ($r = 0.22$; 95% CI, 0.08–0.36; $n = 3016$) and high heterogeneity ($P < 0.01$, $I^2 = 90\%$; Supplementary File 3).

A meta-regression assessed whether the 2 definitions of engagement had differential effects on patient safety. One study measuring staff engagement in both ways³⁴ was excluded from this analysis

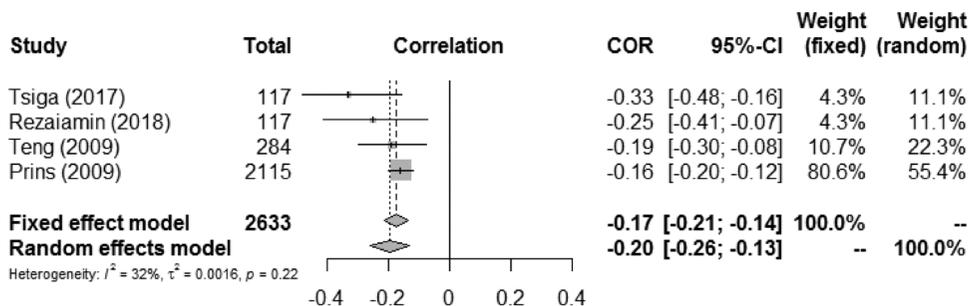


FIGURE 4. Engagement × errors/events/incidents (n = 4).

(to mitigate dependency), and meta-regression showed no significant differences ($\beta = 0.09$; 95% CI, -0.17 to 0.34 ; $P = 0.50$).

Sensitivity Analyses

Although there was some evidence of small study bias, the overall pooled analysis was robust in leave-one-out analyses. When stratified by outcome type, the significance of the effect size of pooled errors outcome was unaffected in leave-one-out analyses, but the safety culture outcome became marginally nonsignificant when excluding 3 studies.^{27,31,38} When studies were stratified by engagement concept, leave-one out analyses rendered the pooled effect sizes for engagement-as-state marginally nonsignificant when 1 study³³ was excluded and similarly for engagement-as-practice in respect of 5 studies.^{27,31,35,36,38} All leave-one-out analyses effects were in the same direction as the main analyses; thus, lack of significance may have been driven by type II error given the small number of studies and moderate effect sizes. Full details are given in Supplementary File 3.

DISCUSSION

Extensive research has demonstrated links between staff engagement and work performance in non-health care^{4,11} and health care settings.^{7,47} There is also compelling evidence of links between staff engagement and care quality.^{48–50} However, links between staff engagement and patient safety specifically have been more speculative.²³ This systematic review and meta-analysis therefore explored whether the beneficial relationship between staff engagement and safety outcomes identified in other sectors was evident in health care and whether how these concepts were defined and measured made any difference.

This review is only the second exploring this relationship and the first to demonstrate a consistent, statistically significant relationship between reported engagement and both safety culture scores and errors/events. The previous review²³ explored relationships between burnout and staff engagement with patient and staff safety outcomes. We used a more comprehensive search strategy and focused specifically on patient safety outcomes. We identified more eligible studies but excluded 2 they included. This could partly explain why this review reports a smaller though consistent relationship with both safety outcomes, whereas its forerunner²³ found inconsistent findings regarding engagement and errors.

The broadly consistent and statistically significant beneficial relationship we found between staff engagement and patient safety (all outcomes) and both safety outcome categories (i.e., patient safety culture and errors/adverse events) indicates that the relationship previously identified elsewhere is also present in health care. Although the relationship was small for the individual-level studies, the 3 unit-level studies^{28,29,37} consistently reported strong correlations, which may warrant further research. A large study,⁵¹ although not specific to health care or safety, found that group-level performance outcomes were positively related to group-level engagement, which itself was positively related to but distinct from individual engagement, pointing to nuanced relationships between these concepts. The unit-level studies in our review all featured an “engagement as organizational practice” approach using the Gallup Q¹² tool⁵² but indicate this nuanced relationship could also be true in health care settings; therefore, research to determine if and how patient safety outcomes are influenced by specific, yet unknown, group-level engagement may be warranted. This is particularly so given the complex, interprofessional and collaborative nature of health care.

Regarding the review’s second aim, it seems the way staff engagement was conceptualized did not differentially affect safety outcomes. There was a small positive association between patient

safety (all outcomes) and both conceptions of staff engagement (i.e., engagement-as-practice and engagement-as-state). Contrary to the dominance of the psychological state definition previously reported,⁷ the majority of studies we reviewed investigated engagement as practice. Our review also identified that only 2 of the 6 engagement categories identified by a cross-sector review¹³ have been studied in relation to patient safety, indicating potential gaps in health research regarding the other 4: personal role engagement, multidimensional engagement, engagement as management practice, self-engagement with performance.

Nevertheless, the findings indicate that this may be a very important area of focus for safety interventions in the future. They support expert opinion that engaging staff by enabling them to raise concerns and contribute to service improvement can prevent poor-quality care.^{26,53,54} They also illustrate the potential of staff engagement as a strategy for building safety into health care, as has repeatedly been advocated.^{2,5,6} Furthermore, our findings are consistent with others arguing that effective systems and processes alone cannot improve safety^{5,7}; therefore “...accelerated evolution...” and evaluation of the impact of organizational models on staff engagement and outcomes are also needed.^{6 (p42)} Thus, although staff engagement is nuanced in nature¹² and varies between organizations^{3,50} developing this broader approach to patient safety has the potential for significant gains and provides unprecedented opportunities for achieving multiple, complementary benefits at scale.

Improving patient safety remains a global policy priority, but the human-centric nature of health care delivery means achieving this is dependent on an appropriately skilled and engaged workforce of sufficient number. This review provides the foundation for a potentially fruitful yet underexplored research and policy agenda to support the achievement of this aim. Further research is needed to clarify the nature and confirm the magnitude of the relationship between staff engagement and patient safety outcomes identified. The call for longitudinal studies, made more than a decade ago,⁴ to help determine causality remains unanswered. In addition, exploring the impact of generalized staff engagement interventions on patient safety outcomes compared with the traditional focus on safety interventions to address specific risks, for example, falls or pressure ulcers, is likely to prove fruitful. Finally, studies in a broader range of health care settings, involving a wider range of staff groups at unit/team and individual levels, would inform the effective development and testing of safety improvement interventions.

Including a broad range of relevant databases, terms and independent peer review enabled a robust and comprehensive but focused review. This was important given the lack of consensus on the definition of engagement and broad range of patient safety outcomes in use. Independent screening and data extraction by 2 reviewers and consensus decision making within the review team enhanced rigor.

LIMITATIONS

These findings must be interpreted in the context of the limited evidence base, with few studies specifically addressing the relationship between staff engagement and patient safety outcomes. In addition, the varied safety outcomes and measurement tools used makes direct comparison challenging. Current evidence is primarily correlational, so causality cannot be inferred. There is also a focus on hospital settings involving mainly doctors and nurses. This limits transferability to other parts of the health system, with different characteristics and priorities potentially affecting the staff engagement/patient safety relationship. Thus, our findings support a previous call¹² for multicenter studies across health services.

The quality assessment tool was designed for this study. Although based on validated sources, it was not previously tested. The review includes 2 high-quality studies^{36,37} but study quality overall was only fair. All studies used self-reporting that features inherent risk of bias compared with objective measurement. The correlational nature of the eligible studies prevented any inference of causality. Exclusion of qualitative studies and gray literature means useful insights may be missing, particularly as the peer-reviewed literature is relatively limited. In addition, several analyses exhibited high heterogeneity, which may be due to the varied study quality, sample characteristics, measurement tools, outcome measures, and conceptions of engagement used. This reflects the conceptual ambiguities in the developing engagement/safety literature.^{13,23}

CONCLUSIONS

The review identified a small but consistent and significant relationship between staff engagement and both patient safety culture and errors/events, the strength and certainty of which vary between contexts and specific outcome measures. Although the findings need cautious interpretation, increasing staff engagement could offer an impactful and cost-effective means of enhancing a range of patient safety outcomes.

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