Case Study
ISSN: 3051-8830
Journal homepage: https://www.harrisonacademicpress.com/index.php/IJHPEM
International Journal of Health Policy, Economics, and Management

Harrison Academic Press

Quality Improvement Interventions and Patient Safety Culture in Public Hospitals: A Management Perspective

Nikolaou C[1*], Juric K[2] and Meyer J[3]

[1]*Department of Health Policy and Management, Aristotle University of Thessaloniki, Thessaloniki, Greece*
[2]*Department of Hospital Administration, University of Zagreb, Zagreb, Croatia*
[3]*Department of Patient Safety, Charite University Medicine Berlin, Berlin, Germany*

ABSTRACT

Background: Public hospitals increasingly rely on quality improvement (QI) methodologies such as Plan-Do-Study-Act (PDSA) cycles and multi-site improvement collaboratives to reduce adverse events, yet the relationship between these interventions and the underlying patient safety culture that determines their success remains incompletely understood, particularly in resource-constrained public hospital settings. Objective: This case study synthesizes the peer-reviewed literature to characterize how QI interventions and patient safety culture interact in public hospital management, with attention to QI methodology, safety culture measurement, the role of leadership, and structural barriers in resource-constrained settings. Methods: A structured narrative synthesis of peer-reviewed literature identified through PubMed/MEDLINE and Crossref searches, with each source individually verified against its publisher or bibliographic record before inclusion; sources were organized thematically into QI methodology, safety culture measurement and dynamics, management and leadership practice, and public-sector structural barriers. Findings: Technical QI interventions such as central-line checklists achieve durable effect predominantly when paired with parallel culture-building mechanisms that empower frontline staff and establish systematic feedback loops; validated safety-culture instruments such as the AHRQ Hospital Survey on Patient Safety Culture and the Safety Attitudes Questionnaire capture meaningfully different organizational dimensions and are not interchangeable; management and leadership behavior, including the persistent gap between executive and frontline perceptions of safety climate, is more consistently associated with durable improvement than any specific QI technique; and public hospitals in resource-constrained settings face structural barriers - understaffing, unreliable data systems, and hierarchical reporting cultures - that limit the direct applicability of QI models developed in well-resourced systems. Conclusions: QI interventions and patient safety culture in public hospitals function as interdependent management targets rather than a technical intervention layered onto a separate cultural backdrop, and sustained improvement in resource-constrained public hospitals requires deliberate adaptation of QI methodology and measurement instruments alongside continuous management practice that treats culture as an ongoing product of everyday managerial behavior.

Keywords: *patient safety culture; quality improvement; hospital management; public hospitals; healthcare leadership*

Citation: Nikolaou C, Juric K and Meyer J (2025) Quality Improvement Interventions and Patient Safety Culture in Public Hospitals: A Management Perspective. Int J Health Policy Econ Manag, 3(2): 01-07.
DOI: 10.5281/zenodo.22657095

Corresponding Author: *Christos Nikolaou*

E-mail Address: *christos.nikolaou@auth.edu*

Article History: *Received 10 July 2025 | Accepted 5 October 2025 | Published 28 December 2025*

Copyright: *© 2025 Christos Nikolaou, et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited (**https://creativecommons.org/licenses/by/4.0/**).*

Introduction

Patient safety culture — the shared values, attitudes, and behaviors that determine an organization's commitment to safety — has become a central management concern for public hospitals worldwide, particularly since the Institute of Medicine's landmark report identified preventable adverse events as a leading cause of harm in modern health systems [1,2]. Quality improvement (QI) methodologies borrowed from industrial process control, most prominently the Plan-Do-Study-Act (PDSA) cycle and the Institute for Healthcare Improvement's Breakthrough Series collaborative model, have been widely adopted as the operational vehicle through which hospitals attempt to translate safety-culture aspirations into measurable reductions in adverse events [3,4]. Yet the relationship between QI interventions and safety culture is not unidirectional: safety culture shapes whether staff engage meaningfully with QI activity, while QI activity itself can, over time, reshape the underlying culture that determines an organization's capacity for further improvement [5,6].

Public hospitals present a distinctive management context for this

relationship. Compared with private or academic medical centers, publicly funded hospitals in many health systems operate under tighter fiscal constraints, more constrained staffing ratios, greater exposure to political and bureaucratic oversight, and — in many resource-limited settings — chronic shortages of the basic infrastructure (reliable data systems, dedicated quality staff, protected time for frontline clinicians) that QI methodologies were originally designed to assume [7,8]. Landmark QI successes such as the Michigan Keystone ICU project, which achieved a sustained reduction in catheter-related bloodstream infections across more than one hundred intensive care units, and the WHO Surgical Safety Checklist trial, which reduced perioperative morbidity and mortality across eight international sites, are frequently cited as evidence that structured QI interventions can materially improve patient outcomes [9,10]. However, subsequent analysis of the Michigan program emphasized that its success depended heavily on an accompanying cultural intervention — the Comprehensive Unit-based Safety Program — that explicitly targeted communication, teamwork, and staff empowerment alongside the clinical checklist itself, suggesting that technical intervention and cultural change are inseparable components of durable improvement [11].

Measurement of safety culture itself has matured considerably over the past two decades, with the Agency for Healthcare Research and Quality's Hospital Survey on Patient Safety Culture (HSOPSC) and the Safety Attitudes Questionnaire (SAQ) emerging as the two most widely validated and internationally adapted instruments [12,13]. Comparative psychometric work indicates that although the two instruments share several underlying constructs — teamwork climate, communication openness, and perceptions of management support for safety — they are not interchangeable, and organizations selecting between them face genuine trade-offs in what each instrument can and cannot detect at different organizational levels [14,15]. Leadership and management engagement consistently emerge across this literature as a distinct and measurable dimension of safety culture, separate from frontline teamwork climate, and evidence suggests that safety climate perceptions vary systematically by management level within the same hospital, with senior executives typically reporting a substantially more favorable safety climate than frontline staff experience [16,17].

This case study examines how QI interventions and safety culture interact in the management of public hospitals, drawing on the published QI collaborative, safety-culture measurement, and hospital leadership literatures to characterize (1) the principal QI methodologies deployed in public hospital settings, (2) how safety culture is measured and how it changes in response to QI activity, (3) the specific role management and leadership practice play in translating QI investment into safety-culture change, and (4) the structural barriers that public hospitals face in sustaining QI-driven culture change under resource constraint. The objective is not to present new primary data but to synthesize this literature into a management-oriented account of what determines whether QI investment in a public hospital translates into a durable improvement in patient safety culture, rather than a transient compliance exercise that reverts once external attention or funding recedes.

Methods

This case study is a structured narrative synthesis of the peer-reviewed literature on quality improvement interventions and patient safety culture in hospital settings, with particular attention to public and resource-constrained hospital contexts. Literature was identified through searches of PubMed/MEDLINE and Crossref-indexed journals using combinations of the terms "patient safety culture," "safety climate," "quality improvement collaborative," "Plan-Do-Study-Act," "Breakthrough Series," "Hospital Survey on Patient Safety Culture," "Safety Attitudes Questionnaire," "hospital leadership," "public hospital," and "low- and middle-income country." Candidate sources were restricted to peer-reviewed journal articles, and each was individually verified against its publisher or bibliographic database record — including author list, journal name, volume, issue, pagination, and digital object identifier — before inclusion; sources that could not be independently verified in this manner were excluded rather than retained on the strength of a plausible title alone.

Sources were organized thematically into four domains that structure the Findings section: (1) the design and evidence base of QI methodologies used to structure improvement work in hospitals, including PDSA cycles and multi-site collaboratives; (2) the measurement properties and dynamics of patient safety culture instruments, and evidence on how culture changes (or fails to change) in response to QI activity; (3) the specific management and leadership behaviors associated with successful translation of QI activity into safety-culture improvement; and (4) structural and resource barriers documented specifically in public and lower-resource hospital settings. Because this is a narrative case study rather than a systematic review with a registered protocol or meta-analytic pooling, no formal risk-of-bias scoring was applied across studies; the synthesis instead aims at conceptual integration of a heterogeneous evidence base spanning cluster-randomized trials, large observational collaboratives, cross-sectional survey validation studies, and qualitative organizational research.

Quality Improvement Methodologies in Hospital Settings

The PDSA cycle remains the most widely taught and most widely reported structuring device for hospital-based QI work, but systematic review of its published application reveals considerable heterogeneity in how rigorously it is actually used. A review of 73 published PDSA-based studies found that fewer than one in five reported iterative cycling of the kind the method formally requires, and that most published applications documented only a single cycle, used qualitative rather than quantitative outcome measures, and provided insufficient methodological detail to permit replication [3]. A companion critical analysis argued that this gap between the PDSA method's theoretical design — a rapid, iterative, small-scale test of change — and its practical application in hospitals reflects a genuine tension between the method's origins in industrial process environments with stable, controllable inputs and the more variable, loosely coupled conditions of hospital care delivery, where the same "test of change" often behaves differently across units, shifts, and patient populations [18].

Multi-site QI collaboratives, following the Institute for Healthcare Improvement's Breakthrough Series model, represent the dominant strategy for scaling QI activity across many hospitals simultaneously, typically combining shared learning sessions, expert faculty support, and structured PDSA-based local implementation. A systematic review of the collaborative evidence base concluded that most published evaluations report improvement on at least some measured outcomes, but that methodological weaknesses — absence of concurrent controls, reliance on self-reported process measures, and short follow-up

windows — make it difficult to attribute observed change specifically to the collaborative structure itself rather than to secondary gain from participation and measurement attention [4]. A more recent systematic review reached a similarly qualified conclusion, finding that quality improvement collaboratives are associated with modest but inconsistent improvement in clinical processes and outcomes, with effect sizes and consistency varying substantially by clinical topic, participating country income level, and the intensity of collaborative support provided [19].

Two of the most frequently cited exemplars of successful hospital-based QI — the Michigan Keystone ICU central-line infection collaborative and the WHO Surgical Safety Checklist trial — illustrate both the achievable magnitude of benefit and the conditions under which it appears to occur. The Michigan collaborative reported a sustained reduction in catheter-related bloodstream infection rates from a median of 2.7 per 1,000 catheter-days to zero within the first three months of implementation, sustained across an 18-month follow-up period involving more than 100 intensive care units [9]. The WHO checklist trial, conducted across eight hospitals in eight countries spanning a range of income levels, reported a reduction in major postoperative complication rates from 11.0% to 7.0% and inpatient mortality from 1.5% to 0.8% following checklist implementation [10]. Retrospective analysis of the Michigan program's mechanism of action concluded that its effectiveness could not be attributed to the central-line checklist alone, but depended on an accompanying structured culture-change intervention that built local unit-level ownership, empowered nursing staff to halt procedures for safety violations regardless of clinician seniority, and created systematic feedback loops reporting infection data back to frontline staff — features that map directly onto the safety-culture constructs of teamwork climate and communication openness rather than onto clinical protocol content per se [11].

Measuring and Tracking Patient Safety Culture

The AHRQ Hospital Survey on Patient Safety Culture and the Safety Attitudes Questionnaire together account for the substantial majority of published hospital safety-culture measurement, and psychometric evaluation supports the multilevel validity of the HSOPSC instrument specifically, confirming that its composite dimensions — including teamwork within units, management support for patient safety, and non-punitive response to error — can be meaningfully aggregated and compared at both the unit and hospital level [12]. The SAQ, independently validated across a large multi-hospital benchmarking sample, similarly demonstrates strong psychometric properties for its teamwork climate and safety climate subscales and has been used extensively to benchmark culture across institutions and over time [13]. Direct comparison of the two instruments in the same hospital population found that they correlate meaningfully on shared constructs such as teamwork and communication but diverge in their sensitivity to different organizational levels, with the SAQ better differentiating clinical unit-level variation and the HSOPSC better capturing broader organizational and management-level dimensions — implying that the choice of instrument is not a neutral measurement decision but shapes which aspects of culture a QI program is able to detect as changing [14].

A broader review of the safety-climate measurement literature identified more than a dozen validated survey instruments in circulation internationally, with substantial variation in the constructs each instrument privileges, the response scales used, and the extent to which each has been validated for change-sensitivity — that is, for detecting a genuine shift in culture following an intervention rather than only cross-sectional variation between institutions at a single time point [15]. Complementary conceptual review work cautions that "safety culture" itself is not a single unidimensional construct but a composite of overlapping dimensions — including leadership commitment, teamwork, communication, learning orientation, and just-culture practices around error reporting — and that studies reporting a single aggregate safety-culture score risk obscuring which specific dimension actually changed in response to a given QI intervention [6].

Systematic review evidence on whether safety-culture interventions demonstrably improve either measured culture scores or clinical outcomes found a genuinely mixed picture: several rigorously designed intervention studies reported statistically significant improvement in safety-climate survey scores following structured culture interventions, but the review found markedly weaker and less consistent evidence linking those culture-score improvements to corresponding reductions in adverse event rates, concluding that culture change and outcome change, while plausibly related, have not yet been convincingly connected by a causal evidence chain strong enough to justify treating culture-survey improvement as a reliable proxy for patient safety improvement [20]. This finding is a central caution for hospital management: a rising HSOPSC or SAQ score following a QI intervention is evidence that staff perceive the organization differently, but it is not, on its own, sufficient evidence that patients are objectively safer.

Management, Leadership, and Organizational Culture

Across the literature reviewed, management and leadership behavior emerges as the variable most consistently associated with whether QI investment translates into durable safety-culture change rather than a transient response to measurement attention. A systematic review of the role hospital managers play in quality and patient safety identified several recurring management practices associated with better outcomes, including visible leadership walk-rounds, board-level engagement with safety data, and consistent allocation of managerial attention and resources to frontline-identified safety concerns, while also finding that managers' own understanding of frontline clinical risk is frequently limited, producing a persistent gap between managerial safety priorities and the safety concerns frontline staff report as most pressing [17]. This gap is corroborated by direct survey evidence: safety climate scores reported by senior executives are consistently and substantially higher than those reported by frontline nursing and physician staff within the same hospital, a divergence the authors interpret as reflecting executives' more limited direct exposure to the conditions under which care is actually delivered [16].

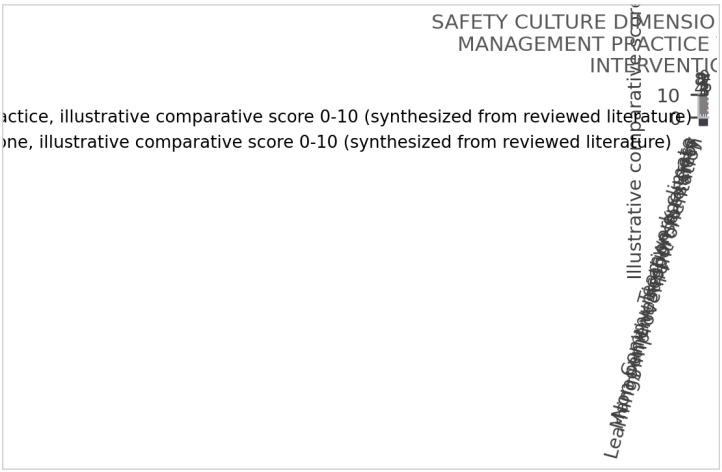
Conceptual review of organizational culture theory as applied to healthcare QI argues that culture should be understood not as a fixed organizational attribute that management can simply decree into existence through survey targets or slogans, but as an emergent property of accumulated everyday interactions, decisions, and signals — meaning that management's most consequential culture-shaping actions are often mundane and continuous (how errors are discussed in daily huddles, whether reporting a near-miss visibly changes anything, whether QI project time is genuinely protected from competing clinical

demands) rather than singular high-visibility interventions [5]. A systematic review of leadership style specifically in relation to quality-of-care measures found that transformational and relational leadership styles — characterized by individualized staff support, participatory decision-making, and consistent visible commitment to safety values — were more consistently associated with favorable quality and safety outcomes than transactional, purely compliance-oriented leadership styles, reinforcing that the manner of management engagement, not merely its presence, determines its effect on culture [21].

Comparison of the two dominant quality improvement methodologies against the management preconditions the reviewed evidence suggests each requires to achieve durable effect.

QI methodology	Core mechanism	Reported strength of evidence	Management precondition for effect	Key reference
Single-unit PDSA cycle	Small-scale, rapid, iterative test of change	Weak in published practice; most reports document only one cycle rather than iterative testing	Protected frontline time and rigorous local measurement to permit genuine iteration	Taylor et al. 2014
Multi-site QI collaborative (Breakthrough Series model)	Shared learning sessions plus locally implemented PDSA cycles across many sites	Modest, inconsistent effect across clinical topics; weak methodological control in most evaluations	Sustained organizational participation and comparable baseline data infrastructure across sites	Wells et al. 2018; Schouten et al. 2008
Combined technical-plus-culture intervention (e.g., CUSP/Keystone model)	Clinical checklist paired with structured unit-level empowerment and feedback	Strong for the specific documented cases; sustained multi-year effect reported	Frontline authority to halt unsafe practice and systematic data feedback to staff	Pronovost et al. 2006; Dixon-Woods et al. 2011
Locally adapted, resource-constrained QI cycle	Reduced-scope improvement cycle using locally generated rather than imported metrics	Limited formal evaluation; described mainly in qualitative and descriptive literature	Baseline infrastructure and staffing investment addressed alongside, not before, QI activity	Aveling et al. 2015; Elmontsri et al. 2018

Patient safety culture dimensions most consistently reported in the reviewed literature as responsive to management and leadership practice, relative to their reported responsiveness to technical QI intervention alone (Parand et al., 2014; Mannion and Davies, 2018; Sfantou et al., 2017).



A parallel body of evidence examines organizational culture's downstream relationship to measured patient outcomes more broadly. A systematic review linking organizational and workplace culture to patient outcomes across more than emergency care to surgical mortality reported a broadly consistent, though not universal, association between more favorable measured culture and better patient outcomes, while cautioning that most included studies were cross-sectional and could not establish the direction of causality — that is, whether better culture produces better outcomes, better outcomes reinforce staff perceptions of a positive culture, or both dynamics operate simultaneously [22]. This bidirectionality is directly relevant to public hospital management: a hospital experiencing a run of adverse outcomes for reasons substantially outside management's immediate control (resource shortage, patient case-mix, external system pressure) may see safety-culture scores decline for reasons unrelated to the intrinsic quality of its QI or leadership practice, complicating the use of culture surveys as a simple management performance indicator. Patient and family involvement in QI design has also been identified as an underused management lever: a realist review of patient involvement in QI efforts found that involvement mechanisms work best when hospital management creates genuine structural roles for patient input into QI project design, rather than treating patient engagement as a token consultation exercise layered onto an already-finalized improvement plan [23]. Figure 1 summarizes the safety-culture dimensions most consistently reported as responsive to management practice across the reviewed literature, and Table 1 compares the two dominant QI methodologies discussed here against the specific management preconditions the evidence suggests each requires to function as intended.

Barriers to Sustained Improvement in Public and Resource-Constrained Hospitals

The QI and safety-culture evidence reviewed above is disproportionately drawn from well-resourced hospital systems in high-income countries, and a distinct body of literature specifically addresses how public and resource-constrained hospitals in low- and middle-income settings experience these same interventions differently. Qualitative research conducted in two African public hospitals found that healthcare workers described patient safety as persistently difficult to prioritize not

because of indifference to safety values, but because of structural conditions — chronic understaffing, unreliable supply chains for basic clinical materials, absent or unreliable information systems for tracking adverse events, and organizational hierarchies that discouraged frontline staff from raising safety concerns to management — that made the basic preconditions for a Western-designed QI collaborative (protected staff time, reliable baseline data, psychological safety to report error) largely unavailable in practice [7]. A broader review of patient safety improvement efforts in developing-country health systems similarly concluded that most published safety-improvement strategies assume an infrastructure and governance baseline that many public hospitals in resource-constrained settings simply do not have, and argued that effective improvement in these settings requires an integrated approach addressing basic infrastructure, workforce, and governance capacity simultaneously with, rather than as a precondition to, clinical QI activity [8].

Structural barriers to sustained quality improvement documented in public and resource-constrained hospital settings, with management adaptations suggested by the reviewed literature.

Structural barrier	Documented effect on QI/culture work	Suggested management adaptation	Key reference
Chronic understaffing	QI participation competes directly with maintaining safe minimum staffing	Sequence staffing investment alongside, not after, QI rollout	Aveling et al. 2015
Unreliable supply chains	Undermines protocol-based interventions dependent on consistent material availability	Prioritize interventions robust to intermittent resource availability	Elmontsri et al. 2018
Absent or unreliable data systems	Prevents baseline measurement and iterative PDSA cycling	Use simple, locally generated process metrics rather than imported outcome metrics	Taylor et al. 2014; Aveling et al. 2015
Hierarchical, politically exposed reporting culture	May inflate safety-culture survey scores and suppress candid error reporting	Adapt survey instruments and reporting channels for hierarchical contexts	Colla et al. 2005; Aveling et al. 2015
Management-frontline perception gap	Executives report more favorable safety climate than frontline staff experience	Structural mechanisms (rounding, unit-level board reporting) for unfiltered frontline input	Singer et al. 2008; Parand et al. 2014

These findings have direct implications for how public hospital management should sequence QI investment. Where a QI collaborative model developed in a well-resourced setting assumes that frontline staff have protected time to attend learning sessions and implement PDSA cycles, a public hospital operating with a chronic staffing shortfall may find that assigning staff to QI activity directly competes with maintaining minimum safe staffing on the ward, creating a perverse dynamic in which the QI program itself becomes a safety risk if implemented without additional staffing investment. Similarly, where safety-culture measurement instruments such as the HSOPSC assume a baseline of psychological safety sufficient for staff to answer candidly about blame and punitive response to error, hierarchical or politically exposed public-sector organizational cultures may produce systematically inflated safety-culture scores that understate the true magnitude of the reporting and communication problems the survey was designed to detect. Management in public hospital settings therefore faces a distinctive sequencing problem largely absent from the high-resource collaborative literature: whether to invest first in the basic infrastructure and staffing preconditions that make conventional QI methodology viable, or to adapt QI methodology itself — smaller-scope PDSA cycles, locally generated rather than imported metrics, culture-survey instruments adapted for hierarchical reporting contexts — to function under the resource constraints that are unlikely to be resolved before improvement work must begin. Table 2 summarizes the specific structural barriers documented in the reviewed public and resource-constrained hospital literature alongside the management adaptations the evidence suggests as partial responses.

Discussion

Three conclusions follow from this synthesis for hospital management practice. First, QI methodology and safety culture are mutually reinforcing rather than sequential: the evidence from the Michigan Keystone program indicates that a purely technical QI intervention (a central-line insertion checklist) achieved its documented effect only in combination with a parallel culture intervention empowering frontline staff, suggesting that public hospital managers who treat QI and culture-building as separate, sequential workstreams — implementing a clinical protocol now and planning a "culture initiative" for later — are working against the grain of the strongest available evidence [11,9]. Second, the persistent gap between how favorably senior management perceives organizational safety culture and how frontline staff experience it is not a measurement artifact to be corrected but a substantive management finding in its own right, and closing it — through visible leadership rounding, board engagement with unit-level rather than only hospital-level safety data, and structural mechanisms for frontline concerns to reach management without being filtered — appears more consistently associated with favorable outcomes than any specific QI technique reviewed here [17,16,21]. Third, the evidence base underpinning most widely promoted QI methodologies and safety-culture instruments was developed predominantly in well-resourced settings, and public hospital management operating under genuine resource constraint should treat imported QI and measurement models as requiring deliberate adaptation rather than direct transplantation [7,8].

These conclusions carry specific implications for how public hospital management allocates QI investment. Where resources are limited, the evidence favors prioritizing the structural preconditions for psychologically safe error reporting and protected frontline engagement time over adopting additional QI technique or expanding survey measurement, since neither PDSA cycling nor collaborative participation appears to produce reliable benefit in their absence [3,18]. Safety-culture survey results should be interpreted by management as one input describing staff perception rather than as a direct, validated proxy for

patient safety outcomes, given the weak and inconsistent evidence connecting culture-score improvement to adverse-event reduction [20]. Finally, public hospital systems in resource-constrained settings would benefit from QI methodology explicitly adapted to their operating conditions — smaller-scope, locally resourced improvement cycles rather than full collaborative participation, and safety-culture instruments validated for hierarchical or politically exposed organizational contexts — rather than continued reliance on frameworks validated primarily in high-resource systems [8,15].

This case study has several limitations. As a narrative rather than systematic synthesis, the literature search, while targeted and individually verified for each included source, cannot claim exhaustive coverage of a very large and methodologically heterogeneous field, and non-English-language literature on public hospital QI in non-Western health systems is likely underrepresented. The quantitative findings drawn from individual studies — infection-rate reductions, survey score differences, complication-rate changes — are heterogeneous in study design, population, and measurement instrument, and are presented here as illustrative of documented directional patterns rather than as directly comparable or poolable estimates. Finally, because most rigorously designed QI evaluations originate from well-resourced health systems, conclusions about how these interventions perform under public-sector resource constraint rely substantially on a smaller body of qualitative and descriptive literature, which, while methodologically appropriate to the research questions it addresses, provides a thinner evidentiary basis than the randomized and large-collaborative evidence available for higher-resource settings.

Conclusion

Quality improvement interventions and patient safety culture in public hospitals are best understood as interdependent management targets rather than as a technical intervention layered onto a separate cultural backdrop. The strongest documented QI successes achieved their effect through combined technical and cultural mechanisms, safety-culture measurement instruments capture meaningfully different organizational realities depending on which is used and at which organizational level, and management and leadership practice — not the specific QI technique selected — most consistently distinguishes hospitals where improvement proves durable from those where it does not. Public hospitals operating under genuine resource constraint face a distinctive sequencing and adaptation challenge that the QI and safety-culture evidence base, developed predominantly in well-resourced settings, does not yet adequately address. Closing this gap will require both continued adaptation of QI and measurement methodology to resource-constrained conditions and management practice that treats safety-culture change as an ongoing product of everyday managerial behavior rather than a discrete project with a defined endpoint.

References

1. Leape LL, Berwick DM (2005) Five years after To Err Is Human: what have we learned? JAMA, 293(19):2384-2390, DOI:10.1001/jama.293.19.2384.

2. Nieva VF, Sorra J (2003) Safety culture assessment: a tool for improving patient safety in healthcare organizations. Quality and Safety in Health Care, 12(Suppl 2):ii17-23, DOI:10.1136/qhc.12.suppl_2.ii17.

3. Taylor MJ, McNicholas C, Nicolay C, Darzi A, Bell D, Reed JE (2014) Systematic review of the application of the plan-do-study-act method to improve quality in healthcare. BMJ Quality & Safety, 23(4):290-298, DOI:10.1136/bmjqs-2013-001862.

4. Schouten LM, Hulscher ME, van Everdingen JJ, Huijsman R, Grol RP (2008) Evidence for the impact of quality improvement collaboratives: systematic review. BMJ, 336(7659):1491-1494, DOI:10.1136/bmj.39570.749884.BE.

5. Mannion R, Davies H (2018) Understanding organisational culture for healthcare quality improvement. BMJ, 363:k4907, DOI:10.1136/bmj.k4907.

6. Halligan M, Zecevic A (2011) Safety culture in healthcare: a review of concepts, dimensions, measures and progress. BMJ Quality & Safety, 20(4):338-343, DOI:10.1136/bmjqs.2010.040964.

7. Aveling EL, Kayonga C, Nega A, Dixon-Woods M (2015) Why is patient safety so hard in low-income countries? A qualitative study of healthcare workers' views in two African hospitals. Globalization and Health, 11:6, DOI:10.1186/s12992-015-0096-x.

8. Elmontsri M, Banarsee R, Majeed A (2018) Improving patient safety in developing countries - moving towards an integrated approach. JRSM Open, 9(6):2054270418786112, DOI:10.1177/2054270418786112.

9. Pronovost P, Needham D, Berenholtz S, Sinopoli D, Chu H, Cosgrove S, Sexton B, Hyzy R, Welsh R, Roth G, Bander J, Kepros J, Goeschel C (2006) An intervention to decrease catheter-related bloodstream infections in the ICU. New England Journal of Medicine, 355(26):2725-2732, DOI:10.1056/NEJMoa061115.

10. Haynes AB, Weiser TG, Berry WR, Lipsitz SR, Breizat AH, Dellinger EP, Herbosa T, Joseph S, Kibatala PL, Lapitan MC, Merry AF, Moorthy K, Reznick RK, Taylor B, Gawande AA (2009) A surgical safety checklist to reduce morbidity and mortality in a global population. New England Journal of Medicine, 360(5):491-499, DOI:10.1056/NEJMsa0810119.

11. Dixon-Woods M, Bosk CL, Aveling EL, Goeschel CA, Pronovost PJ (2011) Explaining Michigan: developing an ex post theory of a quality improvement program. The Milbank Quarterly, 89(2):167-205, DOI:10.1111/j.1468-0009.2011.00625.x.

12. Sorra JS, Dyer N (2010) Multilevel psychometric properties of the AHRQ hospital survey on patient safety culture. BMC Health Services Research, 10:199, DOI:10.1186/1472-6963-10-199.

13. Sexton JB, Helmreich RL, Neilands TB, Rowan K, Vella K, Boyden J, Roberts PR, Thomas EJ (2006) The Safety Attitudes Questionnaire: psychometric properties, benchmarking data, and emerging research. BMC Health Services Research, 6:44, DOI:10.1186/1472-6963-6-44.

14. Etchegaray JM, Thomas EJ (2012) Comparing two safety culture surveys: safety attitudes questionnaire and hospital survey on patient safety. BMJ Quality & Safety, 21(6):490-498, DOI:10.1136/bmjqs-2011-000449.

15. Colla JB, Bracken AC, Kinney LM, Weeks WB (2005) Measuring patient safety climate: a review of surveys. Quality and Safety in Health Care, 14(5):364-366, DOI:10.1136/qshc.2005.014217.

16. Singer SJ, Falwell A, Gaba DM, Baker LC (2008) Patient safety climate in US hospitals: variation by management level. Medical Care, 46(11):1149-1156, DOI:10.1097/MLR.0b013e31817925c1.

17. Parand A, Dopson S, Renz A, Vincent C (2014) The role of hospital managers in quality and patient safety: a systematic review. BMJ Open, 4(9):e005055, DOI:10.1136/bmjopen-2014-005055.

18. Reed JE, Card AJ (2016) The problem with Plan-Do-Study-Act cycles. BMJ Quality & Safety, 25(3):147-152, DOI:10.1136/bmjqs-2015-005076.

19. Wells S, Tamir O, Gray J, Naidoo D, Bekhit M, Goldmann D (2018) Are quality improvement collaboratives effective? A systematic review. BMJ Quality & Safety, 27(3):226-240, DOI:10.1136/bmjqs-2017-006926.

20. Weaver SJ, Lubomski LH, Wilson RF, Pfoh ER, Martinez KA, Dy SM (2013) Promoting a culture of safety as a patient safety strategy: a systematic review. Annals of Internal Medicine, 158(5 Pt 2):369-374, DOI:10.7326/0003-4819-158-5-201303051-00002.

21. Sfantou DF, Laliotis A, Patelarou AE, Sifaki-Pistolla D, Matalliotakis M, Patelarou E (2017) Importance of leadership style towards quality of care measures in healthcare settings: a systematic review. Healthcare (Basel), 5(4):73, DOI:10.3390/healthcare5040073.

22. Braithwaite J, Herkes J, Ludlow K, Testa L, Lamprell G (2017) Association between organisational and workplace cultures, and patient outcomes: systematic review. BMJ Open, 7(11):e017708, DOI:10.1136/bmjopen-2017-017708.

23. Bergerum C, Thor J, Josefsson K, Wolmesjo M (2019) How might patient involvement in healthcare quality improvement efforts work-a realist literature review. Health Expectations, 22(5):952-964, DOI:10.1111/hex.12900.