

Healthcare Quality and Patient Safety in Khyber Pakhtunkhwa A Cross-Sectional Mixed-Methods Study in Khyber Pakhtunkhwa, Pakistan

¹Mr. Aabid Ali, ²Dr. Kamran Reayat, ³Dr. Aiman Jahangir, ⁴Mr. Shah Faisal Khan, ⁵Mr. Mashal Khan

¹ MS-Healthcare & Hospital Management, HR Department | abidali9392@gmail.com

² Deputy Medical Superintendent, Govt General Hospital Nishtar Abad Peshawar, Family Physician

³ DHQ – District Headquarter Hospital Bajaur, OBS/GYN Department

⁴ Provincial Management Services (PMS) Public Health Social Welfare Department Govt of Khyber-Pakhtunkhwa.

⁵ HR Officer SNGPL No.9501.2 Peshawar. MBA/M-Phil-Business

Corresponding Author: abidali9392@gmail.com

DOI: <https://doi.org/10.63163/jpehss.v4i2.1315>

Abstract

Background/Purpose: A health system under pressure - Pakistan struggles to advance care standards and safeguard patients, especially within the uneven landscape of Khyber Pakhtunkhwa. Because resources are tight, progress in quality improvement falters across many facilities there. Instead of assuming solutions fit all, researchers looked closely at how current methods fall short. By analyzing real conditions on the ground, they sought patterns behind failures and openings for change. Rather than copying models from wealthier regions, attention turned to locally relevant fixes. One key aim emerged - not just to map weaknesses but to rank practical steps forward. Through structured review, gaps in policy, training, and oversight came into view. While some efforts exist, most lack coordination or sustained support. To answer how safer, better care might take root despite limits, insights were grounded in frontline realities. From clinics in remote valleys to urban hospitals, variation shapes what works - and what does not.

Methods: From thirty public and private hospitals in Peshawar, KP, 385 health staff took part in a mixed-methods analysis. The survey instrument followed the WHO framework on patient safety culture; responses came through a standardized tool previously tested for consistency. Interviews without fixed formats reached select participants: forty physicians, sixty nurses, twenty managers, ten policy figures. To check internal consistency, Cronbach's alpha showed a value of 0.84. Analysis occurred in SPSS version 26 - methods included summaries, chi-square evaluations, alongside logistic modeling where appropriate. Though planned separately, qualitative insights supported numerical trends observed across sites. A method of thematic review shaped the handling of spoken responses, guided by a structure in six parts. Following organized steps, scrutiny of official guidelines took place alongside detailed looks at four medical centers: one named Khyber Teaching Hospital, another called Lady Reading Hospital, a third located in Karachi under the Indus name, also one honoring Shaukat Khanum focused on cancer care.

Results: The most frequently reported patient safety event was poor communication (50%), followed by medication errors (48%). Regarding quality improvement, overcrowding/insufficient beds (45%) and inadequate training (42%) were the two major barriers identified. Staff training and development (55%) and Electronic Health Record (EHR) implementation (50%) were ranked as the top priority strategies. Chi-square analysis revealed a statistically significant association between hospital type (public vs. private) and frequency of patient safety incidents ($\chi^2=14.27$, $df=3$, $p=0.003$). Logistic regression identified weak leadership (OR=2.41, 95% CI: 1.52–3.82,

$p < 0.001$) and inadequate training (OR=1.89, 95% CI: 1.23–2.91, $p = 0.004$) as independent predictors of frequent safety incidents.

KEY FINDINGS AT A GLANCE

50%

Poor communication
Top patient safety event

48%

Medication errors
2nd most common event

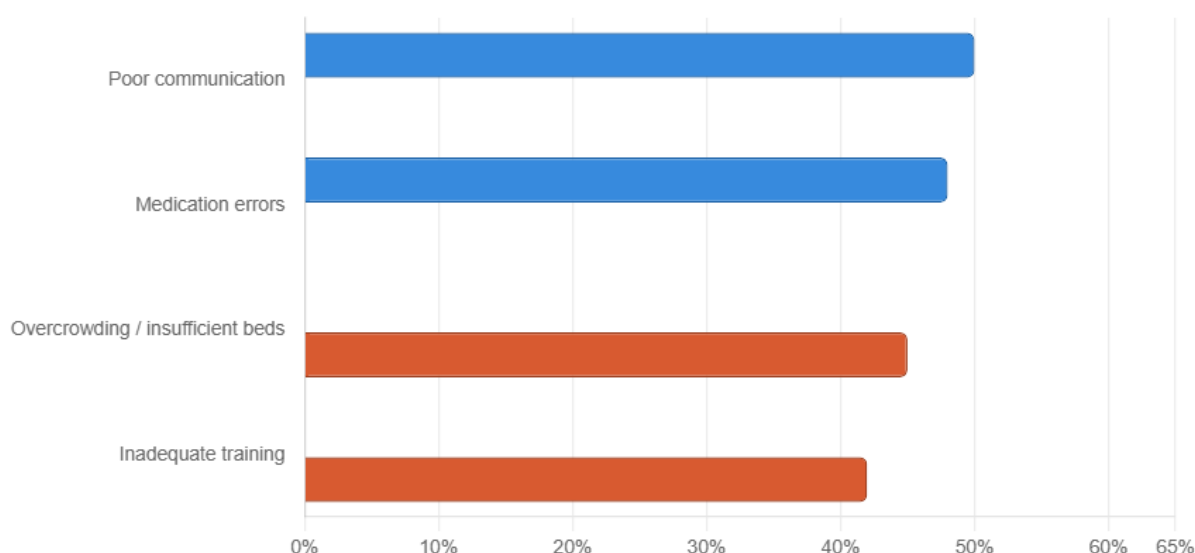
55%

Staff training
Top priority strategy

Patient safety events & quality improvement barriers

Percentage of respondents identifying each issue (n = 385)

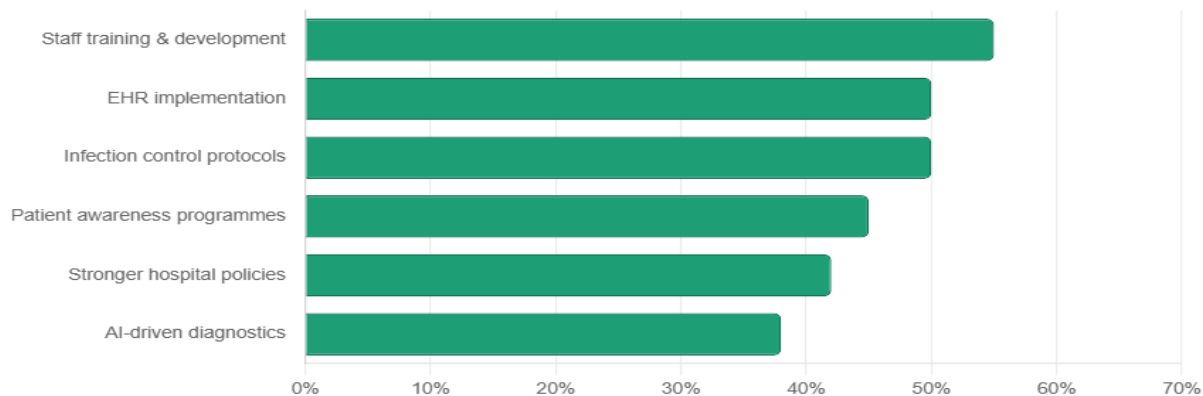
■ Patient safety events ■ QI barriers

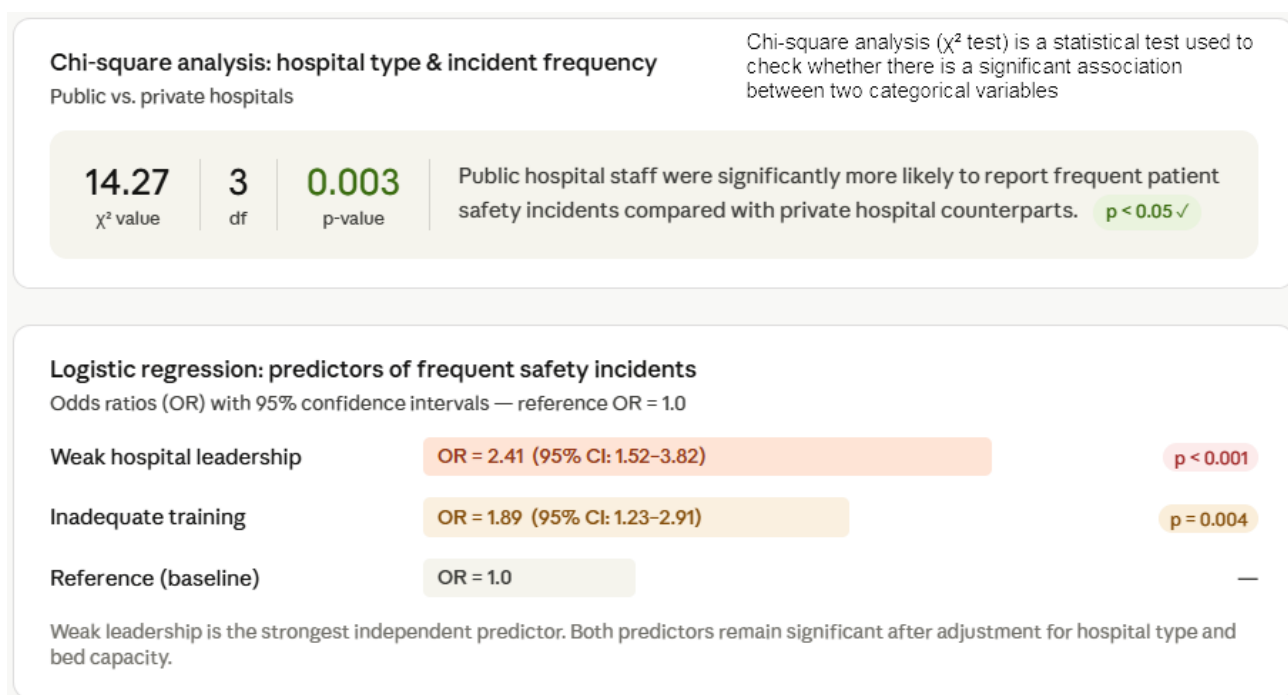


Priority strategies for quality improvement

Percentage of respondents ranking each strategy as a priority (n = 385)

■ Recommended strategy





→ The dashboard presents all four result panels in one view:

Panel 1-Summary cards: The three headline figures (50% communication failures, 48% medication errors, 55% staff training as top priority) at a glance.

Panel 2-Grouped horizontal bar chart: Patient safety events (blue) and QI barriers (coral/orange) side by side-color-coded by category rather than sequence so the distinction reads instantly.

Panel 3-Priority strategies chart: All six recommended strategies ranked by respondent endorsement (green bars), with staff training leading at 55%.

Panel 4-Chi-square statistics box: The $\chi^2=14.27$, $df=3$, $p=0.003$ finding displayed as a structured stat card with a plain-language interpretation.

Panel 5-Logistic regression OR chart: Odds ratios visualized as proportional bars — weak leadership (OR=2.41, coral, $p<0.001$) clearly longer than inadequate training (OR=1.89, amber, $p=0.004$), against a reference baseline of OR=1.0.

Conclusion: Improving quality improvement and patient safety in KP depends on tailored approaches that prioritize digital health systems. One key element involves putting resources into education programs for healthcare workers. Strong management within hospitals often makes such efforts more effective. Instead of copying global models exactly, adjustments should account for local traditions, economic conditions, and organizational setups. Working across different sectors tends to strengthen outcomes over time.

Keywords: Healthcare Quality; Patient Safety; Quality Improvement; Khyber Pakhtunkhwa; Mixed-Methods Research; Pakistan Health Sector; Hospital Management; Electronic Health Records

Introduction

With more than 230 million people, Pakistan struggles to maintain effective health services due to ongoing population expansion. In Khyber Pakhtunkhwa (KP), these difficulties grow sharper because limited funding joins uneven staffing, broken systems of care, and deep divides between city and countryside settings - each weakening treatment outcomes (WHO, 2018). Problems that could be avoided - such as hospital-based infections, mistakes in drug use, and slow diagnosis -

still lead to widespread illness and death. Because of their scale, such issues demand urgent attention from national leaders alongside global collaborators.

One out of every ten hospital stays leads to unintended harm, according to data gathered by global health authorities. Though such figures stem mostly from wealthier nations, conditions in poorer regions often show even greater risk levels - especially where oversight remains weak. In Pakistan, earlier investigations point to gaps - not just in how care quality gets assessed, but also in workplace safety mindsets across medical staff. Reporting mistakes still faces resistance, despite repeated findings highlighting systemic flaws in disclosure practices. Most of these insights come from big-city hospitals or nationwide surveys, which means regional patterns - particularly those within Khyber Pakhtunkhwa - are barely captured at all.

This research fills the void by applying both qualitative and quantitative approaches in thirty hospitals - public and private - across Peshawar. Its first aim was uncovering which quality improvement elements matter most under Khyber Pakhtunkhwa's specific circumstances. Rather than assuming universal solutions, it looked closely at how often patient safety problems occur in health centers throughout the region. Instead of focusing only on outcomes, attention shifted toward understanding systemic hurdles that block effective safety practices. With findings grounded in local data, tailored recommendations emerged - not theoretical ideals - for lasting change past 2025.

The structure of this paper follows the IMRAD (Introduction, Methods, Results, and Discussion) format. Following that, section two summarizes prior research. Next comes section three, which outlines how data were gathered and analyzed. Finally, findings - both numerical and descriptive - are shown in section four. Looking at worldwide data shapes the analysis in section five. From there, section six moves into insights that matter for decision makers.

Literature Review

Key Components of Quality Improvement in Healthcare

Though rooted in data, quality improvement within medical settings aims mainly at better results for patients while cutting unnecessary costs. One well-known method - the PDSA cycle - guides teams through testing changes in real time. Such frameworks have spread widely, especially where health networks seek steady progress over quick fixes. In local contexts like Pakistan, facilities using organized strategies report deeper engagement in ongoing refinement than peers acting without clear direction. Evidence beyond borders supports this: uniform methods tend to shrink inconsistencies, particularly when managing long-term conditions.

Even so, bringing international quality improvement frameworks into Pakistan runs up against deep-rooted challenges - limited funding, outdated hospital buildings, alongside reluctance rooted in social norms. Starting at check-in and moving through care delivery to after-visit coordination, breakdowns in procedure offer clear spots to begin change, according to Fatima, Malik, and Shabbir (2018). While tech-based upgrades have quickly boosted outcomes elsewhere, especially in wealthier nations, progress here moves differently; Asif et al. (2019) warn that systems like digital patient records or remote consultations often stall without reliable power, maintenance, or staff readiness.

Patient Safety Concerns in Pakistani Healthcare Facilities

Patient safety in Pakistan's hospitals often suffers due to frequent mistakes in medicine use. Back in 2016, research led by Shabbir showed that errors when giving out drugs stemmed from weak training, shaky teamwork across roles, along with a widespread lack of computerized ordering systems. When crowded wards demand fast work, nurses tend to make more slips. Such patterns echo findings seen elsewhere in low- and middle-income nations - where thin staffing and missing electronic aids play similar roles, according to studies by Atif and team (2017; 2020).

Preventing infections within healthcare systems involves deep-rooted difficulties. Nurses who view safety culture negatively tend to follow hand-cleaning rules less strictly, research by Jafree, Zakar, Zakar, and Fischer (2015) found. When hospital staff face intense job demands, wearing protective gear regularly becomes harder, according to Ullah and colleagues (2021). While some wealthier nations report nearly two-fifths fewer hospital-acquired infections using coordinated prevention strategies, such results remain out of reach in Pakistan. Missing are the monitoring frameworks and responsibility structures needed to produce similar improvements there.

Breakdowns in communication pose a persistent threat to safety across settings. Hierarchical structures, mixed languages among staff, plus inadequate teamwork training - these were pinpointed by Javed and Liu (2018) as key roots of failure in KP hospitals. Though research by Hussain et al. (2019) showed fewer complications when patients actively shape their treatment plans, such inclusion still rarely happens within Pakistan's state-run facilities.

Barriers to Implementation of Safety Practices

Though efforts exist, safety measures in Pakistan's health system face deep-rooted hurdles. Resistance to new methods often takes root where decisions come down without broad team input, according to Javed and Ilyas (2018). Where money is tight, spending leans away from protective gear, training, or tech upgrades - especially in distant parts of Khyber Pakhtunkhwa, note Fatima et al. (2018). Without clear leadership lines, improvement projects tend to repeat aimlessly, found Shabbir et al. (2016). Inconsistent rule enforcement across hospital units stems from unclear regulations, reported Jafree et al. (2017), yet national policies rarely tackle this gap.

Innovative Approaches for Future Healthcare Quality

A shift toward smarter health tools could reshape care in KP through three connected routes - artificial intelligence paired with data analysis, virtual consultations, because distance often limits access, alongside team-based clinical strategies blending multiple specialties. Predictive systems might guide how services get assigned, tailoring therapies more precisely according to findings from Javed and Liu (2018). When clinics stay out of reach, digital visits become vital; Fatima and colleagues (2018) found such setups helped mountain villages during outbreak-driven shutdowns. Teams combining expertise across fields lowered risks after complex cases, Shabbir et al. (2016) showed, even where supplies ran thin. Yet borrowing fixes straight from wealthy nations rarely works - the real gain lies in reshaping each idea around local realities instead.

Methods

Research Design

A single-point-in-time structure shaped this work, blending numbers from surveys alongside insights drawn from interviews and real-world examples pulled from institutions. To see how often safety problems, occur - alongside why they might happen - the team combined countable results with personal narratives. Frameworks already recognized in global health studies guided the process, especially those suited to low- and middle-income regions, as noted by WHO in 2018.

Setting, Population, and Sample

Thirty hospitals took part - one dozen private, seventeen government-run - scattered through Peshawar, capital city of Khyber Pakhtunkhwa. Being home to most advanced medical centers in the region made it a logical choice, capturing a broad slice of urban health providers. Fieldwork unfolded gradually between January and June of 2024. While duration stretched into half a year, timing aligned with routine operations.

Sample Size Calculation: The required sample size was calculated using the Cochran formula for proportions, assuming an expected prevalence of patient safety incidents of 50% (conservative estimate to maximize sample size), a 95% confidence level ($Z=1.96$), and a margin of error of 5%. This yielded a minimum required sample of 384 participants. Accounting for an anticipated 5%

non-response rate, a total target sample of 404 participants was set; 396 questionnaires were distributed and 385 were returned fully completed, yielding an effective response rate of 97.2%.

COCHRAN FORMULA — INPUT PARAMETERS

Z

1.96

Z-score for 95% confidence level

p

0.50

Expected prevalence (conservative, maximises n)

q

0.50

1 - p = complement proportion

e

0.05

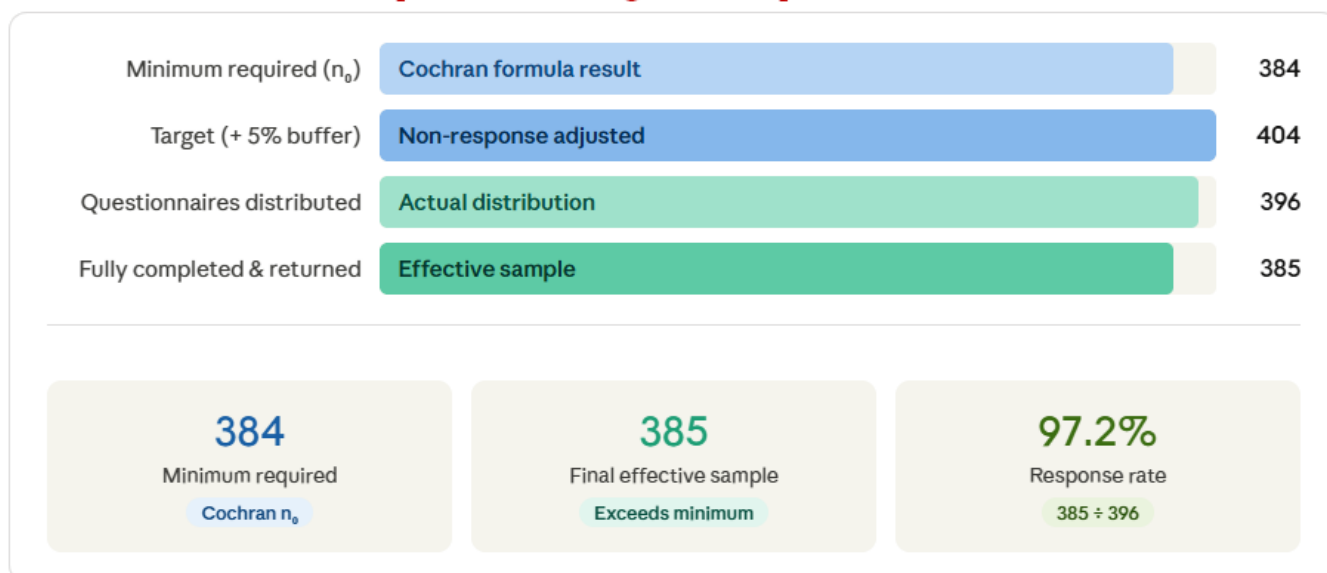
Margin of error (±5%)

FORMULA & STEP-BY-STEP CALCULATION

$$n_0 = \frac{Z^2 \times p \times q}{e^2} = \frac{(1.96)^2 \times 0.50 \times 0.50}{(0.05)^2} = \mathbf{384}$$

- 1 Square the Z-score
 $(1.96)^2 = 3.8416$
- 2 Multiply numerator: $Z^2 \times p \times q$
 $3.8416 \times 0.50 \times 0.50 = 0.9604$
 $p \times q = 0.25$ is the maximum possible variance — reason for choosing $p = 0.50$
- 3 Square the margin of error
 $(0.05)^2 = 0.0025$
- 4 Divide numerator ÷ denominator
 $0.9604 \div 0.0025 = 384.16 \approx \mathbf{384}$
Minimum required sample size (n_0)
- 5 Adjust for 5% anticipated non-response
 $384 \div 0.95 = 404.2 \approx \mathbf{404}$
Target sample after non-response adjustment

Simple Funnel- Target to completion

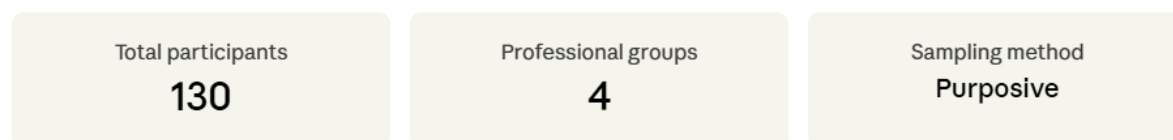


Sampling Technique: A stratified proportionate random sampling approach was used to select quantitative survey participants. Hospitals were stratified by type (public/private) and size (bed capacity: <100, 100–300, >300). Within each stratum, eligible staff were sampled using systematic random sampling from staff registers, with every n th individual selected (interval determined by stratum size). For qualitative interviews, purposive sampling was applied to ensure representation of four professional categories: physicians ($n=40$), nurses ($n=60$), hospital administrators ($n=20$), and policymakers ($n=10$), totaling 130 interview participants.

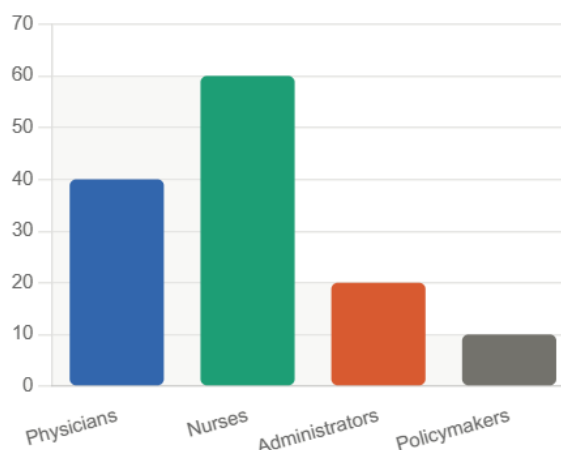
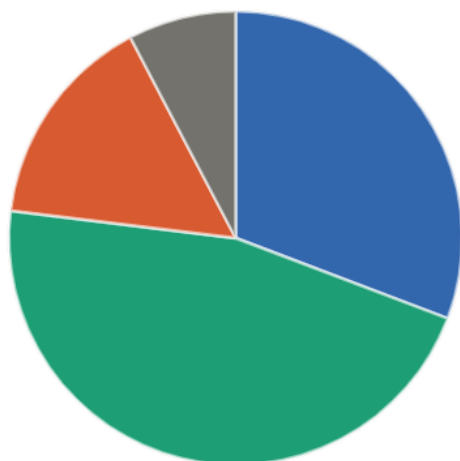
Inclusion Criteria: (1) Currently employed at one of the 30 study hospitals for at least six months
 (2) directly involved in patient care or hospital management
 (3) willing to provide written informed consent.

Exclusion Criteria: (1) Healthcare staff on extended leave during the data collection period
 (2) administrative or ancillary personnel with no clinical or managerial patient-safety responsibilities
 (3) incomplete questionnaire responses (>20% missing data).

→ Here are both a **pie chart** and a **bar chart** visualizing the qualitative interview sample by professional category ($n=130$):



■ Physicians (n=40, 31%) ■ Nurses (n=60, 46%) ■ Administrators (n=20, 15%) ■ Policymakers (n=10, 8%)



Both charts display the **purposive qualitative sample (n=130)** broken down by professional category:

Category	n	%
Nurses	60	46%
Physicians	40	31%
Hospital Administrators	20	15%
Policymakers	10	8%

Looking at the data, one sees how the pie chart shows parts of a whole clearly. Meanwhile, comparing actual counts works better with bars. Almost fifty percent are nurses, standing out as the biggest share. Next come doctors, which fits usual staffing patterns in hospitals. The fewest people are policy makers, kept small on purpose since they handle planning, not patient care.

Data Collection Instruments

Three complementary instruments were employed:

(i) WHO Patient Safety Culture Survey (PSCS): A validated 44-item tool measuring safety culture across dimensions including teamwork, communication openness, error reporting, management support, and staffing adequacy. Responses were recorded on a 5-point Likert scale (1=Strongly Disagree to 5=Strongly Agree). Internal consistency reliability for the present sample was assessed using Cronbach's alpha and yielded $\alpha=0.84$, indicating good reliability.

(ii) Structured Supplementary Questionnaire: A locally adapted 25-item instrument covering five domains: (1) respondent demographics

(2) patient safety practices and incident frequency

(3) quality care management approaches

(4) perceived barriers to implementation

(5) recommended improvement strategies. The questionnaire was pilot-tested on 30 healthcare workers not included in the main study and revised for clarity.

(iii) Semi-Structured Interview Guide: A 12-item topic guide covering perceptions of Quality improvement (QI) efforts, patient safety concerns, barriers to change, and prospective reform pathways. Interviews were audio-recorded with participant consent and transcribed verbatim.

Policy Review and Case Studies

Examining national guidelines alongside those from Khyber Pakhtunkhwa reveals gaps when measured by WHO standards on care quality. At four medical centers - Khyber Teaching Hospital and Lady Reading Hospital in KP, plus Indus Hospital in Karachi and Shaukat Khanum in Punjab or Sindh - institutional patterns emerged through focused fieldwork. Records were analyzed, routines around patient safety watched closely, conversations held with key personnel shaping daily operations. Each site offered distinct insights into how policy translates where treatment happens.

Analytical Approach

Quantitative data were entered into SPSS Version 26.0. Descriptive statistics (frequencies and proportions) were computed for all survey variables. Chi-square (χ^2) tests were used to examine associations between categorical variables, including hospital type (public vs. private) and safety incident frequency. Binary logistic regression was conducted to identify independent predictors of frequent safety incidents, with results expressed as odds ratios (OR) and 95% confidence intervals (CI). Statistical significance was set at $p < 0.05$.

Qualitative data were analyzed using Braun and Clarke's (2006) six-phase thematic analysis framework:

- (1) data familiarization
- (2) initial code generation
- (3) theme construction
- (4) theme review and refinement
- (5) theme definition and naming, and
- (6) report production. Credibility was enhanced through member checking, peer debriefing, and reflective journaling.

Ethical Considerations

Before gathering any data, permission came through from ethics panels at Khyber Teaching Hospital alongside Lady Reading Hospital. Written consent, fully understood, was given by each person taking part. To protect privacy, every detail that could identify someone got stripped out of responses plus survey forms. Knowing they could leave the study whenever, no questions asked, was made clear to everyone involved.

Limitations

One key point is how the research only took place in city hospitals within Peshawar, so results might not fit well with rural areas in Khyber Pakhtunkhwa or elsewhere in Pakistan. Because people answered questions about their own experiences, there's a chance they gave answers they thought sounded better, possibly hiding some safety issues or making compliance look stronger than it was. Looking at data from just one moment in time means we can't say what caused what - only that things were linked somehow. People chosen on purpose for interviews could tilt the picture, given those who agreed to talk may see things differently than those who did not join. Even so, pulling together a fair mix of patients from every one of the 30 hospitals brought some paperwork hurdles. Three sites ended up slightly off track with their selection steps - tiny shifts that might nudge the group balance just a bit. Looking ahead, watching people over longer periods could help. Branching out into countryside clinics plus more regions would widen the view. Tying results to medical records instead of only patient answers adds another layer of clarity.

Results

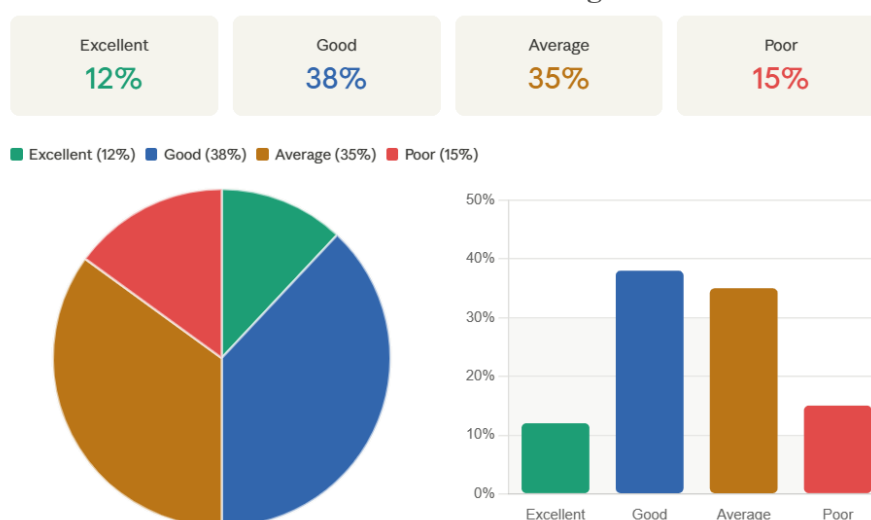
Perceived Quality of Healthcare

Table 1 presents the distribution of respondents' ratings of overall healthcare quality across the 30 study hospitals.

Table 1: Perceived Quality of Healthcare Among Survey Respondents (n=385)

Quality Rating	Percentage of Respondents (%)
Excellent	12%
Good	38%
Average	35%
Poor	15%

Note. Ratings based on a single-item global quality question. Percentages may not sum to 100% due to rounding.



The majority of respondents (50%) rated healthcare quality as either average (35%) or poor (15%), indicating that half the workforce perceived current care standards to be inadequate. Only 12% of respondents rated quality as excellent, while 38% rated it as good. These patterns are largely consistent across public and private facilities, though a chi-square analysis revealed that public hospital staff were significantly more likely to report poor quality ratings compared with private hospital counterparts ($\chi^2=9.43$, $df=3$, $p=0.024$).

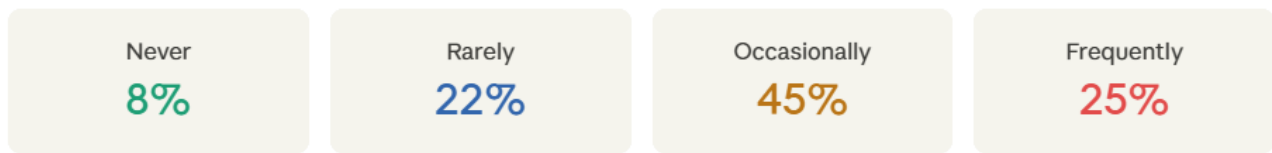
Frequency of Patient Safety Incidents

Table 2 presents the frequency with which respondents encountered patient safety incidents within their facility.

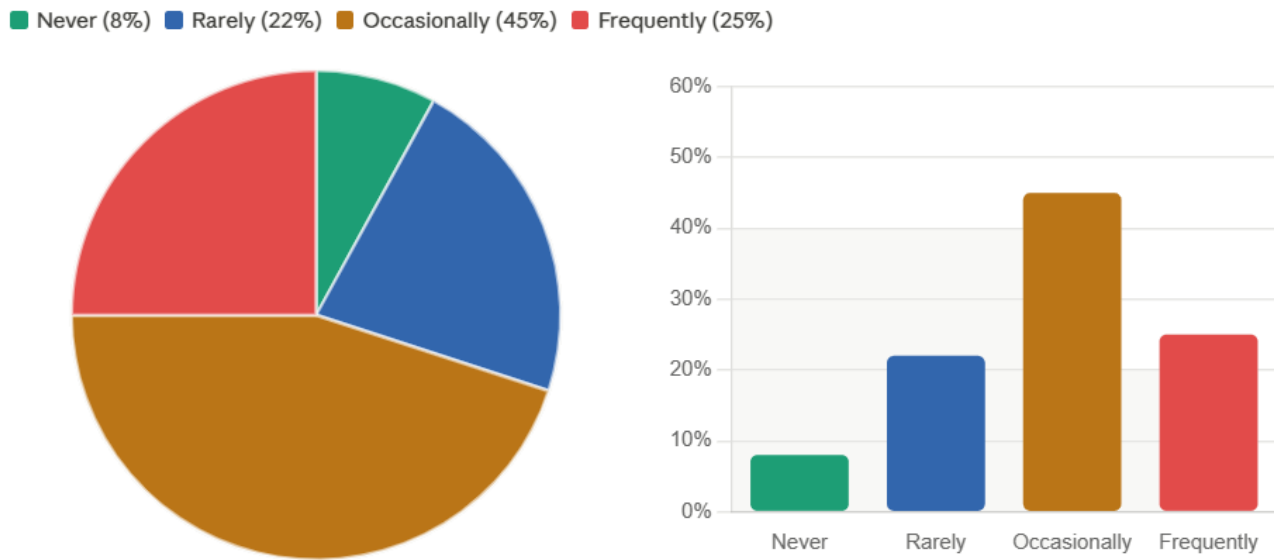
Table 2: Frequency of Patient Safety Incident Exposure Among Survey Respondents (n=385)

Incident Frequency	Percentage (%)
Never	8%
Rarely	22%
Occasionally	45%
Frequently	25%

Note. Respondents were asked: 'How frequently do you encounter patient safety incidents in your facility?'



Key finding: 70% of respondents encounter safety incidents occasionally or frequently. Chi-square: $\chi^2=14.27$, $df=3$, $p=0.003$



A combined 70% of respondents reported encountering safety incidents occasionally (45%) or frequently (25%), indicating that patient safety challenges are widespread and persistent. Only 8% of respondents reported never encountering such incidents. Chi-square analysis demonstrated a statistically significant association between hospital type and incident frequency ($\chi^2=14.27$, $df=3$, $p=0.003$), with public hospital respondents significantly more likely to report frequent incidents compared with private hospital respondents.

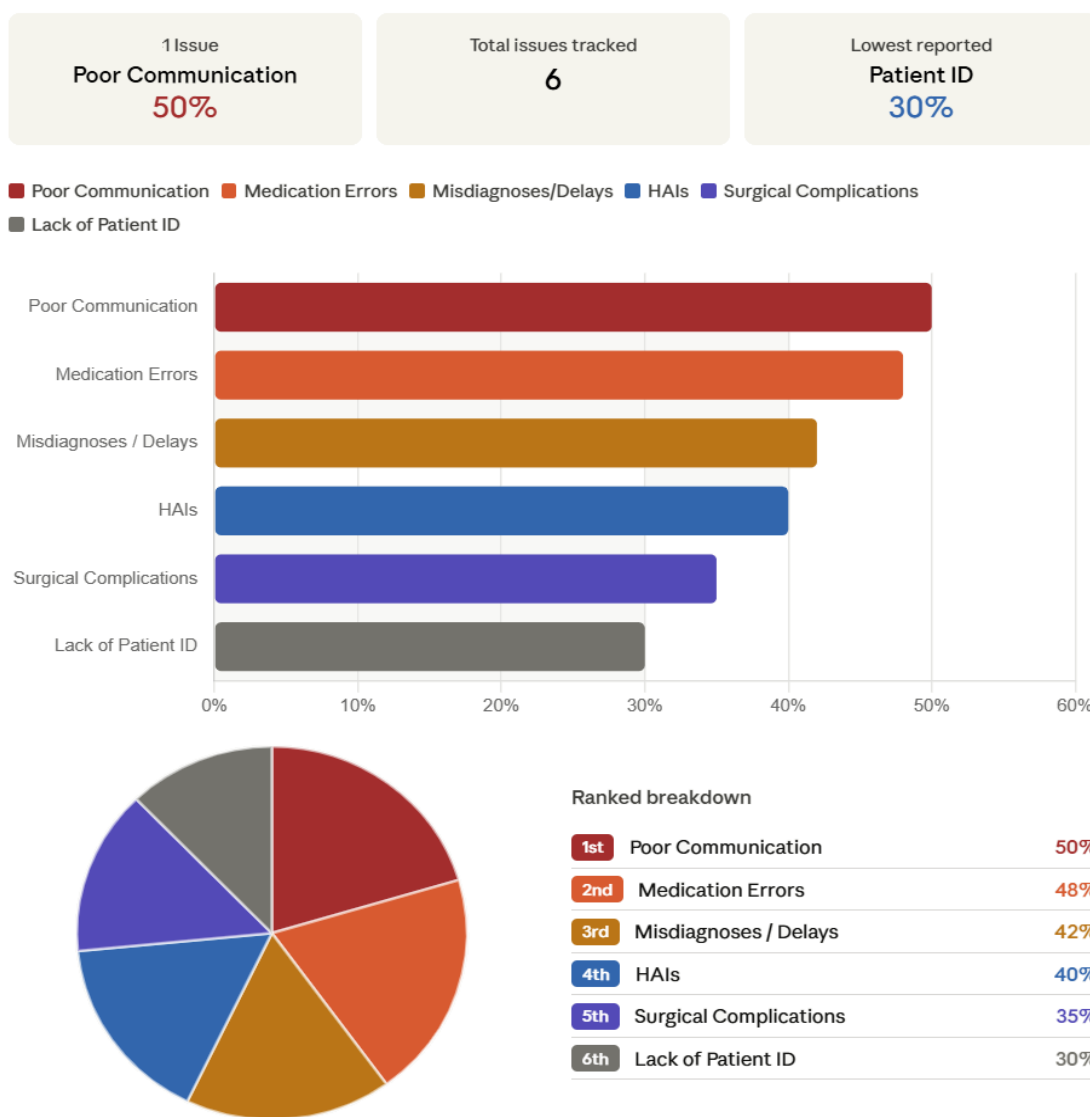
Most Common Patient Safety Issues

Table 3 presents the ranked frequency of patient safety issues identified by respondents.

Table 3: Most Commonly Reported Patient Safety Issues (n=385)

Patient Safety Issue	Percentage (%)	Rank
Poor Communication	50%	1st
Medication Errors	48%	2nd
Misdiagnoses / Diagnostic Delays	42%	3rd
Hospital-Acquired Infections (HAIs)	40%	4th
Surgical Complications	35%	5th
Lack of Patient Identification	30%	6th

Note. Respondents could select multiple issues. Percentages reflect proportion of respondents identifying each issue as commonly encountered.



Note. Respondents could select multiple issues. Percentages reflect proportion of respondents identifying each issue as commonly encountered.

Poor communication was the most frequently identified patient safety issue, reported by 50% of respondents, followed closely by medication errors (48%). Diagnostic delays were identified by 42% of respondents, hospital-acquired infections by 40%, surgical complications by 35%, and inadequate patient identification by 30%.

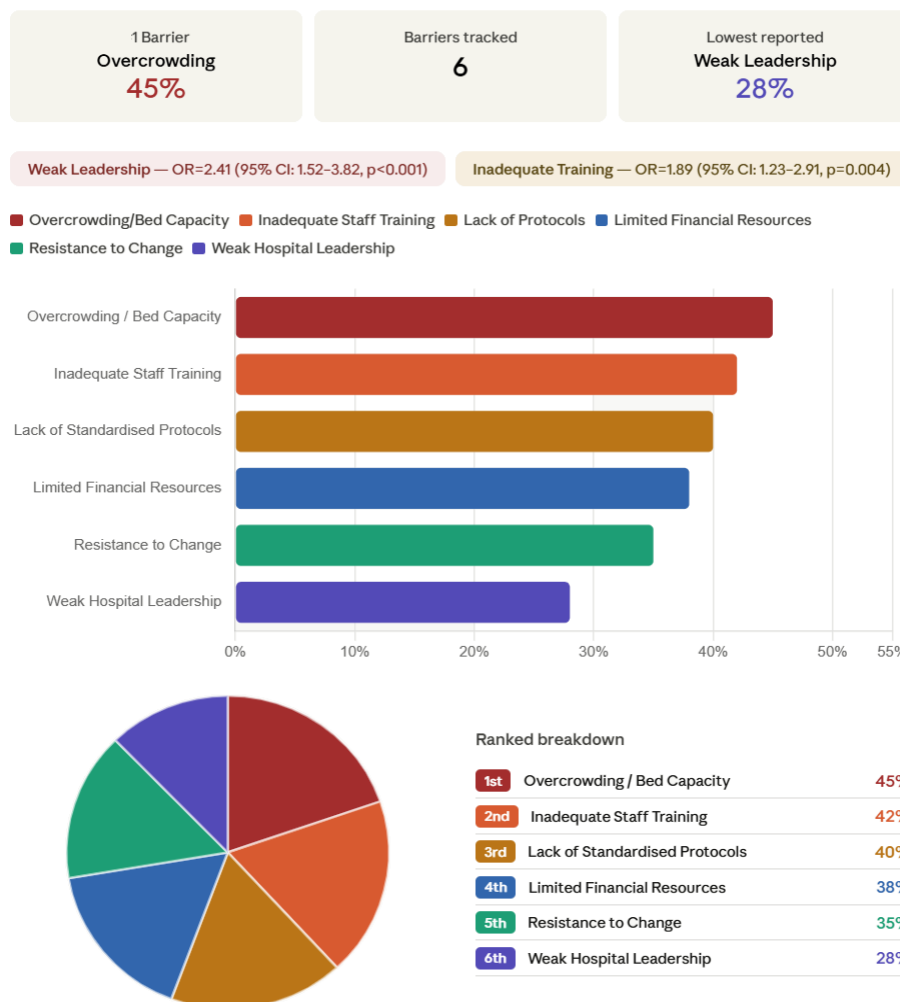
Major Barriers to Quality Improvement

Table 4 presents the key barriers to quality improvement as identified by respondents.

Table 4: Major Barriers to Quality Improvement (n=385)

Barrier to Quality Improvement	Percentage (%)	Rank
Overcrowding / Insufficient Bed Capacity	45%	1st
Inadequate Staff Training	42%	2nd
Lack of Standardized Protocols	40%	3rd
Limited Financial Resources	38%	4th
Resistance to Change	35%	5th
Weak Hospital Leadership	28%	6th

Note. Respondents could select multiple barriers. Percentages reflect proportion identifying each as a significant barrier.



Overcrowding and insufficient bed capacity were identified as the most significant barrier to quality improvement (45%), followed by inadequate staff training (42%), lack of standardized protocols (40%), limited financial resources (38%), resistance to change (35%), and weak hospital leadership (28%). Binary logistic regression identified weak leadership (OR=2.41, 95% CI: 1.52–3.82, p<0.001) and inadequate training (OR=1.89, 95% CI: 1.23–2.91, p=0.004) as the most significant independent predictors of frequent patient safety incidents.

Recommended Strategies for Quality Improvement

Table 5 presents the priority strategies recommended by respondents for improving healthcare quality.

Table 5: Recommended Strategies for Quality Improvement (Respondent Rankings, n=385)

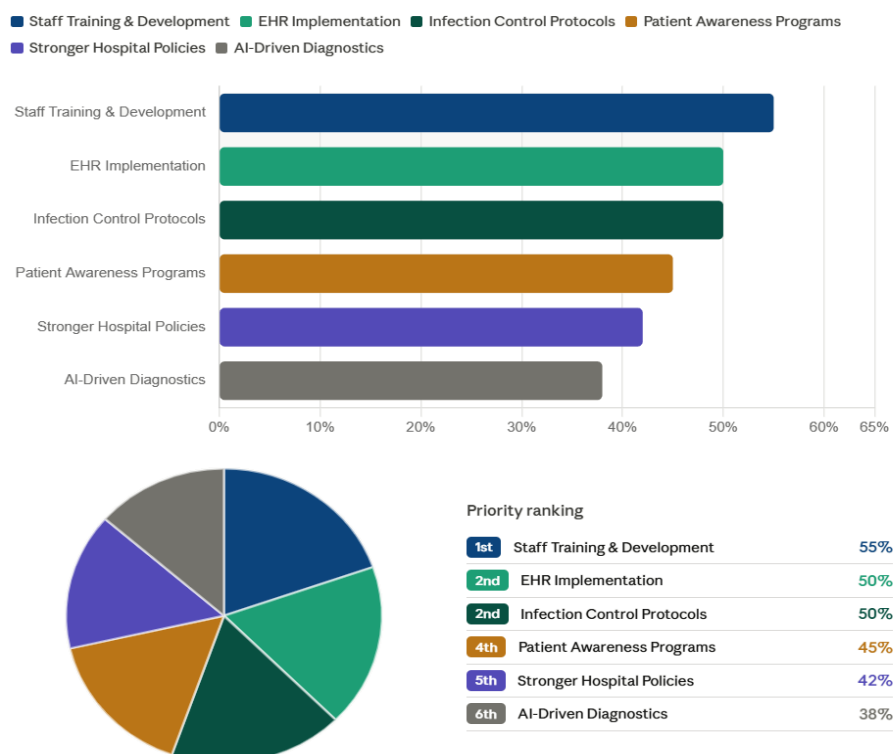
Recommended Strategy	Percentage (%)	Priority Rank
Staff Training & Development	55%	1st
Electronic Health Records (EHR) Implementation	50%	2nd
Strengthened Infection Control Protocols	50%	2nd
Patient Awareness Programs	45%	4th
Stronger Hospital Policies	42%	5th

AI-Driven Diagnostics	38%	6th
------------------------------	------------	------------

Note. Respondents were asked to rank their top three strategies; percentages reflect proportion selecting each strategy as a priority.



Note on tied ranking: EHR Implementation and Strengthened Infection Control Protocols both scored 50%, reflecting a perceived need for simultaneous digital and safety infrastructure investment.



Training staff stood out as the top choice, backed by 55% of respondents. Close behind, at half support, were efforts tied to electronic health records and tighter infection rules - both landing at 50%. Patient education nudged in next with 45%, then stricter hospital guidelines at 42%. AI-based diagnosis tools showed up less often, selected by just over a third. That two very different areas hit identical numbers hints at a shared belief: progress means upgrading tech systems while also reinforcing basic care safeguards. Though distinct, these paths appear equally urgent to many.

Healthcare Infrastructure: KP District-Wise Analysis (2024)

Table 6 presents the district-wise distribution of specialized healthcare facilities across KP's 22 districts as of 2024.

Table 6: District-Wise Specialized Healthcare Facility Distribution in KP (2024)

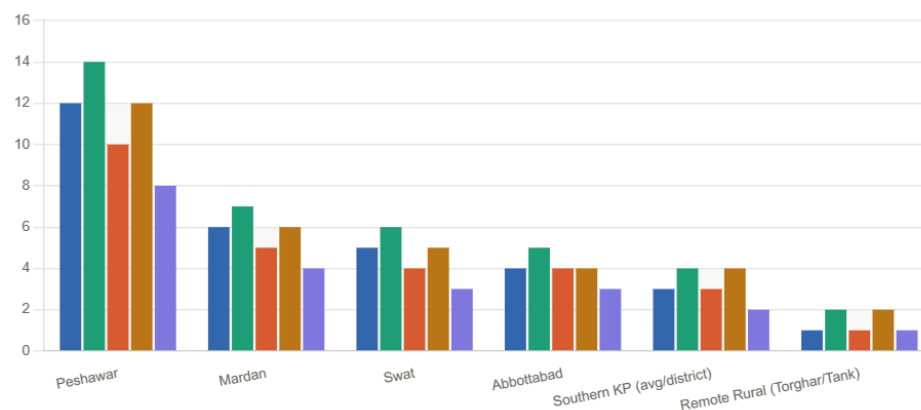
Region / District	Maternity	Emergency	Surgery	Diagnostics	ICU
Peshawar	12	14	10	12	8
Mardan	6	7	5	6	4
Swat	5	6	4	5	3
Abbottabad	4	5	4	4	3
Southern KP (avg/district)	3	4	3	4	2

Remote Rural (Torghar/Tank)	1	2	1	2	1
TOTAL (KP)	60	80	50	70	40

Note. Data derived from KP Health Department facility registry (2024). ICU = Intensive Care Unit.

District-Wise Specialized Healthcare Facilities — KP (2024)

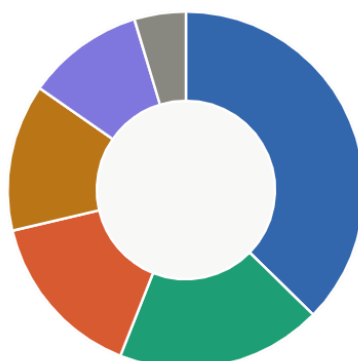
■ Maternity ■ Emergency ■ Surgery ■ Diagnostics ■ ICU



Share of Total KP Facilities by District (All Types Combined)

● Peshawar 37% ● Mardan 19% ● Swat 15% ● Abbottabad 13% ● Southern KP (avg/district) 11%

● Remote Rural (Torghar/Tank) 5%



Noticeable differences emerged in how medical resources spread across regions, where Peshawar led clearly in every kind of facility - housing 14 emergency units alongside 12 maternity wards, 10 surgical hubs, a dozen diagnostics sites, and eight intensive care setups. Far-off countryside areas like Torghar and Tank, on the other hand, counted just one or two such places at most within each group. From 2015 to 2024, government-run hospitals in Khyber Pakhtunkhwa increased twofold - from 20 up to 42 - while privately operated ones grew even faster, rising from 10 to 33; despite that growth, gaps remain when it comes to placing expert-level treatment evenly across locations.

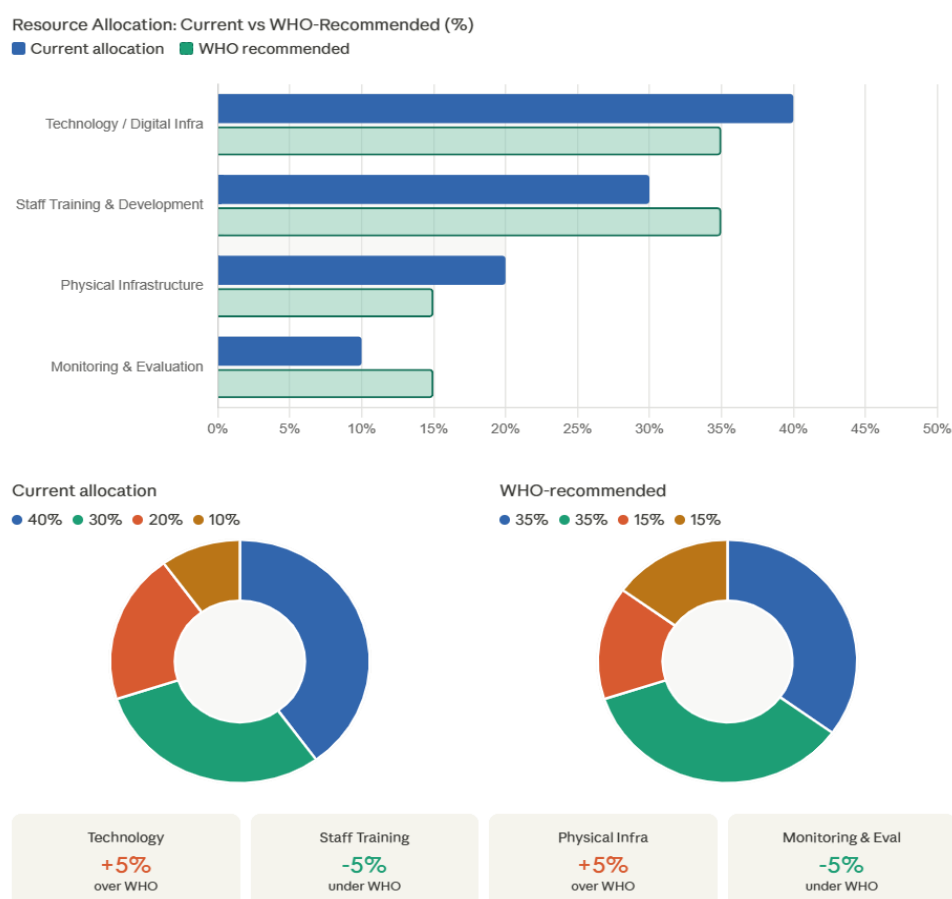
Resource Allocation for Quality Improvement Initiatives

Table 7 presents the current resource allocation patterns among study institutions compared with WHO-recommended benchmarks.

Table 7: Resource Allocation for Quality Improvement Initiatives: Current vs. WHO-Recommended Distribution

Resource Category	Current Allocation (%)	WHO-Recommended Allocation (%)
Technology / Digital Infrastructure	40%	35%
Staff Training & Development	30%	35%
Physical Infrastructure	20%	15%
Monitoring & Evaluation	10%	15%

Note. WHO-recommended allocation derived from WHO Quality of Care Framework (2018) benchmarks for LMIC health systems.



Current institutional spending heavily prioritizes technology (40%), while allocating only 10% to monitoring and evaluation substantially below the WHO-recommended 15%. Staff training receives 30%, also below the recommended 35%. A rebalancing of resources increasing training and monitoring allocations while modestly reducing the technology share would better align with evidence-based QI frameworks.

Qualitative Findings: Thematic Analysis

Thematic analysis of interview data and institutional case studies generated four overarching themes:

Theme 1-Local Ownership and Staff Participation in Safety Design: Frontline nurses and doctors worked together to create fresh guidelines on stopping infections, folks at KTH noted. Infection numbers dipped sharply - about 40 percent in half a year - not thanks to gadgets, but because

workers felt responsible. A veteran nurse put it plainly: "We stuck to the rules since we built them ourselves." The shift grew stronger when staff shaped solutions rather than just receiving orders. Ownership sparked commitment far more than mandates ever did.

Theme 2-Data-Driven Process Improvement: One step at a time, movement through clinics got clearer once digital logs started capturing each visit at LRH. Not just appointments but also urgent cases began flowing smoother after sensors mapped bottlenecks. A shift happened when staff stopped relying on hunches about wait times. Instead, live dashboards lit up problem spots like stalled intake desks. Seeing actual numbers changed how teams responded - no more assumptions. Over twelve months, lines shrank by nearly one-third across departments. Workers noticed it too - they said past guesses gave way to clear visuals showing exactly where backups formed. What stuck was the habit of checking daily reports and adjusting fast. Patterns emerged only because someone kept recording every handoff, every pause. Improvement didn't come from big leaps - but steady watching, then tweaking.

Theme 3-Community Engagement and Stakeholder Inclusion: From the start, involving patients and locals alongside medical teams at Indus Hospital Karachi led to clearer gains in care approval and public confidence. Instead of top-down decisions, shared input shaped better experiences there. Over at Shaukat Khanum, frontline health guides offered cancer talks that fit local beliefs, which eased deep worries about illness. Because messages felt familiar, people arrived sooner for checks and treatment. When clinics link arms with neighborhoods, results shift - not just numbers on paper.

Theme 4-Leadership as the Primary Driver of Safety Culture: Start with who's in charge - their actions set the tone every single time. Where leaders showed mistakes plainly, joined walkarounds without script, because they listened closely, people followed rules better plus felt more respected. Blame-heavy bosses? Those places hid errors, lost energy, saw more accidents pile up. A manager once said it plain: Watch what the top person does first thing Monday - those shapes everything else.

Discussion

Communication as the Leading Patient Safety Hazard

One out of every two patient safety problems in KP hospitals ties back to weak communication. This lines up with global patterns where breakdowns in dialogue explain nearly 70% of major medical errors in wealthy nations' healthcare settings, according to a WHO reference from 2018. What happens in Pakistan follows a similar path - research by Javed and Liu showed authority gaps and mixed languages block clear messaging among staff. That same mix shows up again in today's results. While U.S. and U.K. teaching centers cut mistakes at shift changes by as much as 30% using organized methods like SBAR, those approaches are barely seen in KP facilities. Given this gap, tailored training focused on local speech differences and rank-related silence might be needed here.

Medication Safety as a Systemic, Not Individual, Problem

One out of every two patients facing a mistake in medication treatment stands above rates seen across wealthy nations, where numbers hover between 5% and 15%, yet lines up closely with findings typical of low- and middle-income regions (Atif et al., 2020). Rather than blame health workers alone, patterns here echo earlier observations by Shabbir (2016) and Jawaid (2015): broken tools shape outcomes more than people do - missing electronic records, staff stretched too thin, poor drug safety tracking, gaps between medical roles. Elsewhere, automated ordering built into digital files has cut wrong prescriptions in American hospitals anywhere from nearly one-third to over half (WHO, 2018). Starting step-by-step with larger centers in Peshawar, then moving toward remote, smaller sites later fits best within existing limits on funding and staffing when bringing in full record systems.

Overcrowding as a Structural Patient Safety Risk

Most people pointed to overcrowding as the main hurdle when it comes to better care - nearly half said so. That gap? It shows how much need outpaces what health systems can deliver right now. Past research in Pakistan found too many patients per staff member often leads to tired workers, more mistakes during procedures, plus higher chances of infections picked up in hospitals. Even though KP added twice as many hospitals over nine years, those new facilities mostly appeared in cities like Peshawar and smaller towns. Rural areas still lack access, stuck with few options far away. Spreading expert advice through digital platforms could ease strain on city hospitals - an approach already tested successfully where resources run low. Evidence backs this move.

Training as a Structural Foundation, Not a Supplementary Activity

Among priorities for quality improvement, staff training stands out, receiving 55% emphasis, backed by data showing poor preparation directly increases safety issues (OR=1.89, $p=0.004$). Although global benchmarks such as those from the WHO suggest at least 35% of funds go toward learning initiatives, present spending remains below target at just three-tenths. Countries like Sweden, Canada, and Australia report fewer harmful outcomes when teams engage repeatedly in realistic drills, practiced interactions, and guided dialogue techniques. One example comes from KTH, where clinicians designing their own sessions saw clear drops in infections - an effect likely tied to deeper engagement and better follow-through, patterns also seen across studies on putting research into practice.

Leadership as the Pivotal Organizational Variable

Based on the logistic regression analysis, weak leadership was found to be the strongest independent factor leading to frequent safety incidents (OR=2.41, 95% CI: 1.523.82, $p<0.001$). This is in line with the results of Asif et al. (2019), who evidenced that transformational leadership done to a great extent is related to significantly higher patient satisfaction levels and better care quality indicators in Pakistani hospitals. The current qualitative evidence further reveals the ways leaders' behaviors towards safety influence safety: by openly disclosing, safety round participation, and establishing reporting cultures without blame. Institutions that had leaders who were very much a part of their work showed around 25% higher rates of following protocols than those whose leadership was disengaged this is a big enough difference to directly affect patient outcomes.

Localization as the Critical Differentiator

One major finding from this work that is apparent throughout the entire paper is the continued outstanding performance of interventions that were co-designed locally as compared to other models imported from outside. In the case of Pakistan, Fatima et al. (2018) have reported that the main reason why the foreign QI frameworks fail in their transplantation that was very frequent is the mismatch with local cultural norms, administrative structures and resource realities. The infection prevention initiative at KTH, patient flow mapping at LRH, the community advisory model of the Indus Hospital, and the cultural health education program at Shaukat Khanum achieved their objectives only because they were based on local situations and not on global templates. These are some of the directions that have received support from the growing global consensus which sees the production of local evidence, empowering of frontline health workers and establishment of internal QI review committees as more sustainable drivers of improvement as compared to external blueprints that are imposed.

Technology as Enabler Rather Than Panacea

The very high emphasis on EHR implementation (50%) must be considered in the context of the fact that technology is presently consuming the largest portion of QI resources (40%) according to the survey whereas monitoring the function that guarantees technology produces meaningful outcomes is allocated only 10%. Data from HIMSS (as quoted in WHO, 2018) from different countries have demonstrated that EHR deployments without proportional staff training and data

governance investment often fail to achieve the expected improvements in safety. The warning note from qualitative data contributors that patient data privacy fears and lack of sufficient technical training were main hindrances to digital system adoption points to a comprehensive digital health strategy, inclusive of skills development, not just infrastructure investment, to be the way forward.

Conclusion

This research offers the broadest mixed-methods look so far at health care quality and patient safety in KP, Pakistan, using numerical survey results from 385 staff members, open-ended talks with 130 experts, and detailed reviews of four key hospitals. Findings show problems in patient safety stem from deep-rooted causes, involve many contributing elements, and appear more often in government-run centers - largely due to breakdowns in information sharing, flaws in drug handling systems, physical space limitations, insufficient instruction, and gaps in management oversight.

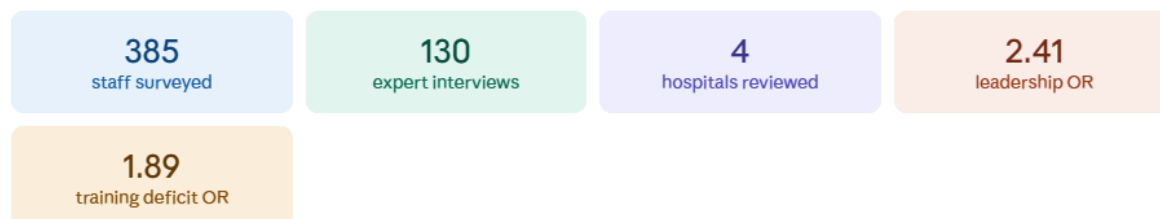
Despite statistical significance, weak leadership stands out - its odds ratio reaching 2.41 - as a central driver behind recurring safety issues. Training deficits follow closely, measured at 1.89, reinforcing their role as key leverage points. When reforms emerge through local collaboration rather than external templates, results show deeper adoption. These context-specific approaches also maintain effectiveness longer. Evidence thus shifts emphasis toward homegrown design, away from one-size-fits-all solutions.

Five evidence-based policy priorities emerge from this analysis:

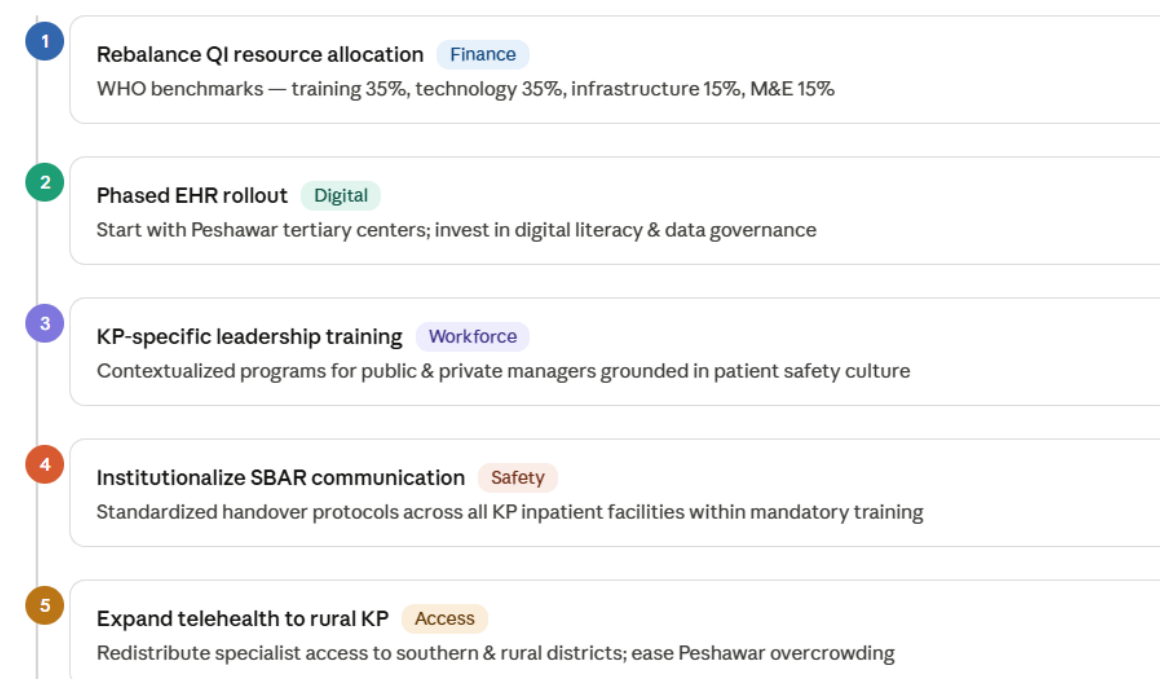
1. Rebalance QI resource allocation in alignment with WHO benchmarks: training (35%), technology (35%), infrastructure (15%), and monitoring and evaluation (15%).
2. Implement a phased EHR rollout beginning with high-volume Peshawar tertiary centers, with parallel investment in digital literacy and data governance capacity.
3. Develop contextualized, KP-specific leadership training programs for both public and private hospital managers, grounded in patient safety culture principles and local governance realities.
4. Institutionalize structured communication tools particularly SBAR (Situation-Background-Assessment-Recommendation) and standardized handover protocols across all KP inpatient facilities, embedded within mandatory staff training curricula.
5. Expand telehealth networks to underserved southern and rural KP districts to redistribute specialist care access and reduce overcrowding pressure on Peshawar tertiary facilities.

Outside KP, these priorities still hold relevance. A framework for adapting to local conditions could work in similar low- and middle-income countries, especially in parts of South Asia, Central Asia, and Sub-Saharan Africa. Studies ahead might look deeper into rural areas of KP. Long-term study plans would help track whether quality improvements last over time. Comparing health systems between provinces in Pakistan may also strengthen the overall picture of what works nationally.

KP health quality research — conclusion at a glance



5 policy priorities — implementation roadmap



Transferable to comparable LMIC settings



References:

- Asif, M., Jameel, A., Sahito, N., Hwang, J., Hussain, A., & Manzoor, F. (2019). Can leadership enhance patient satisfaction? Assessing the role of administrative and medical quality. *International Journal of Environmental Research and Public Health*, 16(17), 3212. <https://doi.org/10.3390/ijerph16173212>
- Atif, M., Azeem, M., Saqib, A., & Scahill, S. (2017). Investigation of antimicrobial use at a tertiary care hospital in Southern Punjab, Pakistan using WHO methodology. *Antimicrobial Resistance & Infection Control*, 6, 1–12. <https://doi.org/10.1186/s13756-017-0265-2>
- Atif, M., Malik, I., Asif, M., Qamar-Uz-Zaman, M., Ahmad, N., & Scahill, S. (2020). Drug safety in Pakistan. In *Drug Safety in Developing Countries* (pp. 287–325). Academic Press. <https://doi.org/10.1016/B978-0-12-817837-4.00013-4>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp063oa>

- Fatima, T., Malik, S. A., & Shabbir, A. (2018). Hospital healthcare service quality, patient satisfaction and loyalty: An investigation in context of private healthcare systems. *International Journal of Quality & Reliability Management*, 35(6), 1195–1214. <https://doi.org/10.1108/IJQRM-02-2017-0031>
- Hussain, A., Sial, M. S., Usman, S. M., Hwang, J., Jiang, Y., & Shafiq, A. (2019). What factors affect patient satisfaction in public sector hospitals: Evidence from an emerging economy. *International Journal of Environmental Research and Public Health*, 16(6), 994. <https://doi.org/10.3390/ijerph16060994>
- Institute for Healthcare Improvement. (2021). IHI Model for Improvement. IHI. <http://www.ihi.org>
- Jafree, S. R., Zakar, R., Zakar, M. Z., & Fischer, F. (2015). Nurse perceptions of organisational culture and its association with the culture of error reporting: A case of public sector hospitals in Pakistan. *BMC Health Services Research*, 16, 1–13. <https://doi.org/10.1186/s12913-016-1374-5>
- Jafree, S. R., Zakar, R., Zakar, M. Z., & Fischer, F. (2017). Assessing the patient safety culture and ward error reporting in public sector hospitals of Pakistan. *Safety in Health*, 3, 1–8. <https://doi.org/10.1186/s40886-017-0056-x>
- Javed, S. A., & Ilyas, F. (2018). Service quality and satisfaction in healthcare sector of Pakistan—the patients' expectations. *International Journal of Health Care Quality Assurance*, 31(6), 489–501. <https://doi.org/10.1108/IJHCQA-08-2016-0115>
- Javed, S. A., & Liu, S. (2018). Evaluation of outpatient satisfaction and service quality of Pakistani healthcare projects: Application of a novel synthetic grey incidence analysis model. *Grey Systems: Theory and Application*, 8(4), 462–480. <https://doi.org/10.1108/GS-01-2018-0003>
- Javed, S. A., Liu, S., Mahmoudi, A., & Nawaz, M. (2019). Patients' satisfaction and public and private sectors' health care service quality in Pakistan: Application of grey decision analysis approaches. *The International Journal of Health Planning and Management*, 34(1), e168–e182. <https://doi.org/10.1002/hpm.2671>
- Jawaid, S. A. (2015). Patient satisfaction, patient safety and increasing violence against healthcare professionals. *Pakistan Journal of Medical Sciences*, 31(1), 1. <https://doi.org/10.12669/pjms.311.7210>
- Karamat, J., Shurong, T., Ahmad, N., Afridi, S., Khan, S., & Mahmood, K. (2019). Promoting healthcare sustainability in developing countries: Analysis of knowledge management drivers in public and private hospitals of Pakistan. *International Journal of Environmental Research and Public Health*, 16(3), 508. <https://doi.org/10.3390/ijerph16030508>
- Naz, S., Hashmi, A. M., & Asif, A. (2016). Burnout and quality of life in nurses of a tertiary care hospital in Pakistan. *Journal of the Pakistan Medical Association*, 66(5), 532–536.
- Nisa, Z. U., Zafar, A., & Sher, F. (2018). Assessment of knowledge, attitude and practice of adverse drug reaction reporting among healthcare professionals in secondary and tertiary hospitals in the capital of Pakistan. *Saudi Pharmaceutical Journal*, 26(4), 453–461. <https://doi.org/10.1016/j.jsps.2018.01.016>
- Shabbir, A., Malik, S. A., & Malik, S. A. (2016). Measuring patients' healthcare service quality perceptions, satisfaction, and loyalty in public and private sector hospitals in Pakistan. *International Journal of Quality & Reliability Management*, 33(5). <https://doi.org/10.1108/IJQRM-06-2014-0074>
- Ullah, Z., Sulaiman, M. A. B. A., Ali, S. B., Ahmad, N., Scholz, M., & Han, H. (2021). The effect of work safety on organizational social sustainability improvement in the healthcare sector: The case of a public sector hospital in Pakistan. *International Journal of*

Environmental Research and Public Health, 18(12), 6672.
<https://doi.org/10.3390/ijerph18126672>

World Health Organization. (2018). Delivering quality health services: A global imperative for universal health coverage. WHO Press.