

Beyond the Safety Grade: A Comparative Cross-Sectional Study of Patient Safety Culture in Secondary and Tertiary Hospitals in Bayelsa State, Nigeria

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Abstract:-

Background: Patient safety culture is a modifiable determinant of harm in hospitals, yet evidence from Nigeria's Niger Delta is almost absent. Most studies also stop at the global safety grade, which may hide important differences between levels of care. We compared patient safety culture in secondary and tertiary hospitals in Bayelsa State, Nigeria. **Methods:** Between December 2015 and March 2016, we conducted a multicentre cross-sectional survey of 438 healthcare workers (response rate 87.6%) in five general (secondary) hospitals (n = 252) and one federal tertiary hospital (n = 186). We used an adapted version of the Agency for Healthcare Research and Quality Hospital Survey on Patient Safety Culture (HSOPSC). Composite scores were expressed as a mean score index (mean/5 × 100) and classified as strength (≥75%), area for improvement (50–74.9%) or weakness (<50%). Levels were compared item by item with Welch's t-test and Hedges' g, with Holm correction across 41 items. Patient safety grades were compared with the chi-square test. **Results:** The mean composite index was 66.6% in secondary and 72.3% in tertiary hospitals. Tertiary hospitals had six areas of strength; secondary hospitals had one (teamwork within units, 76.4%) and one weakness (non-punitive response to error, 48.0%). Secondary respondents more often awarded an "Excellent" grade (31.1% vs 21.4%; p = 0.026), but the proportion grading safety excellent or very good did not differ (68.5% vs 72.5%; p = 0.37). Of 30 items outside the reporting and blame domains, 21 differed after correction, 19 in favour of tertiary hospitals. The largest gaps were at system interfaces: information exchange across units (g = 1.07), supervisors overlooking recurring problems (g = 1.05) and inter-unit collaboration (g = 0.92). Tertiary staff scored lower on "patient safety is never sacrificed to get more work done" (g = -0.41) and "mistakes have led to positive changes" (g = -0.46). **Conclusions:** A favourable global grade concealed large, level-specific deficits. Secondary hospitals need investment at handoffs, inter-unit coordination, staffing and leadership follow-through. Tertiary hospitals need to convert visible improvement activity into learning from error while protecting safety from production pressure. Safety culture assessments in Nigeria should report dimension-level and item-level results, not the grade alone.

Keywords: Patient Safety Culture; HSOPSC; Secondary Care; Tertiary Care; Handoffs; Nigeria; Niger Delta.

I. INTRODUCTION

Unsafe care is one of the leading causes of death and disability worldwide. Most of that burden falls on low- and middle-income countries [1,2]. Since *To Err is Human* [3], the safety sciences have moved the field away from blaming individual clinicians. The focus is now on the latent conditions in the system: design, staffing, supervision and communication. These conditions allow front-line errors to reach patients [4]. Safety culture is the shared values, attitudes and patterns of behaviour that shape an organisation's commitment to safety [5]. It is the social layer of those latent conditions, and it can be measured and changed [6]. Stronger safety culture has been linked to fewer adverse events [7]. Improving culture is one of the strategies recommended in the World Health Organization's Global Patient Safety Action Plan 2021–2030 [1,8].

The Agency for Healthcare Research and Quality (AHRQ) Hospital Survey on Patient Safety Culture (HSOPSC) is the most widely used instrument for this purpose [9,10]. Across more than 30 countries, a consistent picture has emerged. Teamwork within units is the strongest dimension. Non-punitive response to error, staffing, handoffs and event reporting are the weakest [11]. A 2024 meta-analysis of African health facilities found the same pattern. The pooled positive safety culture was only 51.6%. The weakest dimensions were non-punitive response to error (34.5%) and staffing (36.9%) [12].

Nigerian evidence is growing but uneven. Recent HSOPSC studies come from Katsina in the north-west [13] and Ibadan in the south-west [14]. Nearly all Nigerian studies survey one professional group or one level of care. Bayelsa State is one of the country's least-studied settings. It is an oil-producing, largely riverine state in the Niger Delta, with difficult access to care. To our knowledge, the only earlier hospital safety culture survey there covered two donor-supported secondary facilities [15], and it did not compare levels of care.

The comparison matters because Nigeria's secondary and tertiary hospitals differ in more than size. General hospitals are run by state governments and staffed mostly by nurses. They carry most inpatient and emergency care. Federal tertiary hospitals are teaching institutions, with resident doctors, larger specialist teams and more formal governance. In neighbouring Delta State, pharmacy safety culture rose steadily from primary to secondary to tertiary level [16]. Whether this gradient holds for whole-hospital culture, and in which dimensions, is unknown. A second gap is analytical. Many studies rely on the overall patient safety grade and on unadjusted p-values across dozens of items. This makes it hard to know how large and how robust any difference is.

This study compared patient safety culture between secondary and tertiary hospitals in Bayelsa State. It had three objectives:

1. Estimate the composite safety culture scores at each level.
2. Compare the levels at composite and item level, using effect sizes and multiplicity-adjusted inference.
3. Identify level-specific areas of strength and areas for improvement to guide targeted intervention.

Novelty Statement

This is the first multi-facility assessment of hospital-wide patient safety culture in Bayelsa State. It is also among the few Nigerian studies to compare secondary and tertiary hospitals directly on all 12 HSOPSC dimensions. The only earlier survey in the state covered two donor-supported secondary facilities. The study adds three new findings.

1. **A discordance between the safety grade and the culture profile.** Secondary hospitals gave more "Excellent" grades while scoring lower on nine of 12 dimensions.
2. **A location of the level gap.** The gap lies mainly at system interfaces (handoffs, inter-unit information flow and leadership follow-through), not within clinical teams.
3. **An "improvement without learning" pattern in the tertiary hospital.** Staff reported high improvement activity but little conversion of mistakes into change, alongside greater production pressure.

We report standardized effect sizes with confidence intervals and multiplicity-adjusted p-values. This lets future Nigerian and African studies benchmark the size of differences, not just whether they are statistically significant.

What This Study Adds

- **What is already known:** Teamwork within units is usually the strongest HSOPSC dimension worldwide. Non-punitive response to error and staffing are usually the weakest, including in African hospitals.
- **What this study adds:** The level of care changes where the weaknesses sit. Secondary hospitals struggle at the seams between units. The tertiary hospital struggles to turn error into learning under production pressure. A reassuring global grade can mask both.
- **How this might affect practice:** Hospital managers and the Bayelsa State Ministry of Health can target different interventions at each level. Structured handoff tools and inter-unit communication for general hospitals; learning-from-error systems and protected safety time for the tertiary hospital.

II. METHODS

Study Design and Setting

We conducted an analytical, multicentre, cross-sectional survey, reported according to the STROBE statement [18]. Bayelsa State lies in the central Niger Delta of southern Nigeria and has eight local government areas. Its 2006 census population was about 1.7 million, now estimated at over 2 million [17]. Much of the state is riverine, and some communities are reached only by water. We purposively selected six public hospitals to represent both levels of care across the state's main towns:

- **Secondary level:** the general hospitals at Okolobiri, Sagbama, Otuasega, Amassoma and Kaiama.
- **Tertiary level:** the Federal Medical Centre, Yenagoa, the state's federal teaching and referral hospital.

Data were collected between December 2015 and March 2016.

Participants and Sampling

All categories of hospital staff were eligible, clinical and non-clinical. We used total population sampling: questionnaires were offered to every staff member on duty during working hours on the survey days who gave verbal informed consent. Of 500 questionnaires distributed, 438 were retrieved and analysed, a response rate of 87.6%. Of these, 252 came from secondary hospitals and 186 from the tertiary hospital. During data collection, the investigators also made field observations of how incidents were handled, mainly at the general hospitals; these are reported descriptively.

Instrument

We used the AHRQ Hospital Survey on Patient Safety Culture (version 1.0), adapted for the Nigerian setting [9]. It has 42 items grouped into 12 composite dimensions. Items used 5-point agreement scales (strongly disagree to strongly agree) or frequency scales (never to always). The survey also asked for an overall patient safety grade for the work unit on a four-point scale (A = excellent, B = very good, C = acceptable, D = poor), respondents' background characteristics and free-text comments. The instrument has shown acceptable multilevel psychometric properties in large samples [10].

Scoring

Negatively worded items were reverse-coded, so a higher score always means a more positive safety culture. For each item we calculated the mean and standard deviation at each level. We calculated a composite *mean score index* as the mean of its item means divided by 5 and multiplied by 100. For example, a composite mean of 3.75 gives an index of 75%. We classified composites and items as follows:

- **Area of strength:** index $\geq 75\%$ (mean ≥ 3.75).
- **Area for improvement:** index 50–74.9% (mean 2.50–3.74).
- **Area of weakness:** index $< 50\%$ (mean < 2.50).

This index is not the same as AHRQ's "percent positive" score, which is the proportion of respondents who agree or strongly agree. Because a neutral answer contributes 60% to the index but 0% to percent positive, the index usually runs higher. External comparisons are therefore directional only.

III. STATISTICAL ANALYSIS

The original analysis was done in SPSS version 20. Individual-level records were no longer available for this paper, so all comparative inference was re-run from item-level summary statistics (n, mean, SD) for each level. We did this in Python 3 (SciPy). For the tests below, summary-statistic inference gives the same results as raw-data analysis, apart from rounding of the reported means and SDs to two decimals.

- **Item comparisons:** Welch's unequal-variance t-test [19], chosen because several item variances differed between levels.
- **Effect sizes:** Hedges' g with 95% confidence intervals [20]. A positive g means a more positive culture in the tertiary hospital. We interpreted |g| of 0.2, 0.5 and 0.8 as small, medium and large.
- **Multiple comparisons:** Holm's sequentially rejective procedure across all 41 analysed items of the survey [21]. We interpret only Holm-adjusted p-values below 0.05 as statistically significant.
- **Patient safety grades:** Pearson's chi-square test, with Cramér's V as the effect size. Only five respondents graded safety as poor, so the poor and acceptable categories were combined for the omnibus test.
- **Composite comparisons:** Composite-level standard deviations cannot be derived from item summaries. We therefore describe composite differences as index points and base inference on the constituent items.

Reliability

Cronbach's alpha was calculated for each composite in the original analysis [22]. Values were acceptable (≥ 0.70) for frequency of events reported (0.81), non-punitive response to error (0.77) and handoffs and transitions (0.75). Values were moderate (0.50–0.69) for teamwork across units (0.66), teamwork within units (0.64), communication openness (0.64), management support

(0.57) and supervisor/manager expectations (0.51). Values were low for overall perception of safety (0.40), feedback about error (0.41), staffing (0.22) and organisational learning (0.19). For the low-reliability composites we interpret results at item level rather than as a single construct.

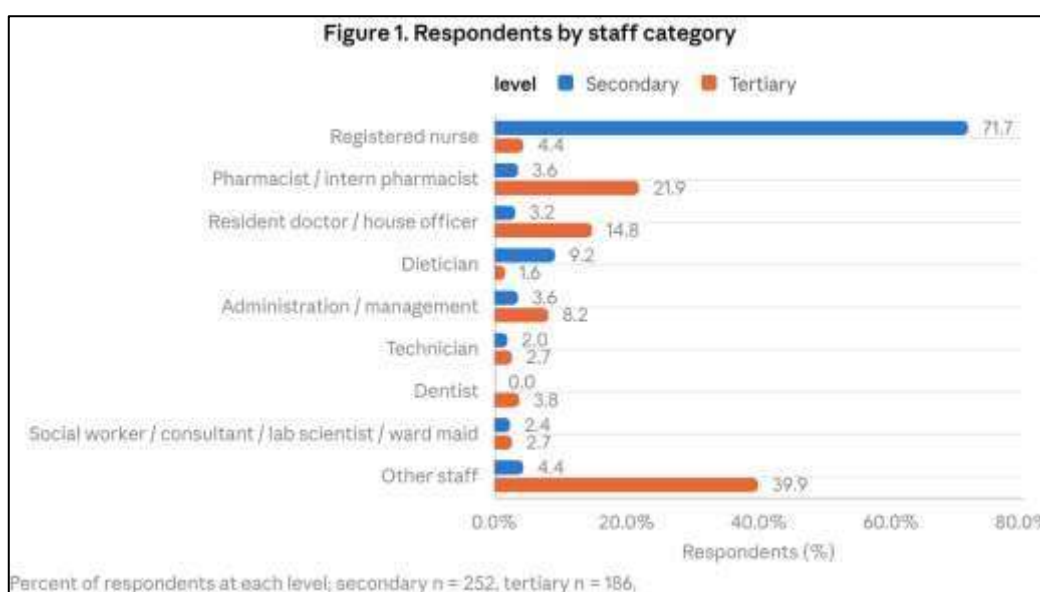
Ethical Considerations

Ethical approval was granted by the Bayelsa State Ethics Committee. The management of each participating hospital also gave permission for the study. Participation was voluntary and anonymous. Verbal informed consent was obtained from each respondent before the questionnaire was handed out. No identifying information was collected.

IV. RESULTS

Participant characteristics

Of the 438 respondents, 252 (57.5%) worked in secondary hospitals and 186 (42.5%) in the tertiary hospital. The workforce mix differed sharply by level (Figure 1). Registered nurses made up 71.7% of secondary respondents but only 4.4% of tertiary respondents. The tertiary sample was mostly pharmacists and intern pharmacists (21.9%), resident doctors and house officers (14.8%) and staff in "other" categories (39.9%). The tertiary "other" category was not broken down further on the questionnaire.



Experience also differed by level (Table 1). Secondary staff were much more likely to be new to their unit: 52.4% had worked there for less than a year, compared with 32.8% in the tertiary hospital. Secondary staff were also more often new to their specialty (22.8% vs 3.3%). Working hours ran the other way. 41.9% of tertiary staff worked 60 hours or more per week, against 6.0% of secondary staff; 19.9% of tertiary staff reported 80–99 hours.

Table 1. Work experience and working hours of respondents, by level of care (column %)

Characteristic	Category	Secondary (n = 252)	Tertiary (n = 186)
Years in this hospital	<1	24.7	43.2
	1–5	40.6	47.0
	6–10	17.9	7.7
	11–15	15.9	1.1
	≥16	0.8	1.2
Years in current unit	<1	52.4	32.8
	1–5	18.0	51.1
	6–10	21.2	10.8
	11–15	8.0	3.8
	16–20	0.4	1.6
Years in current specialty	<1	22.8	3.3
	1–5	25.6	52.5
	6–10	32.8	22.4
	11–15	13.6	12.6
	≥16	5.2	9.3
Hours worked per week	<20	6.0	1.6

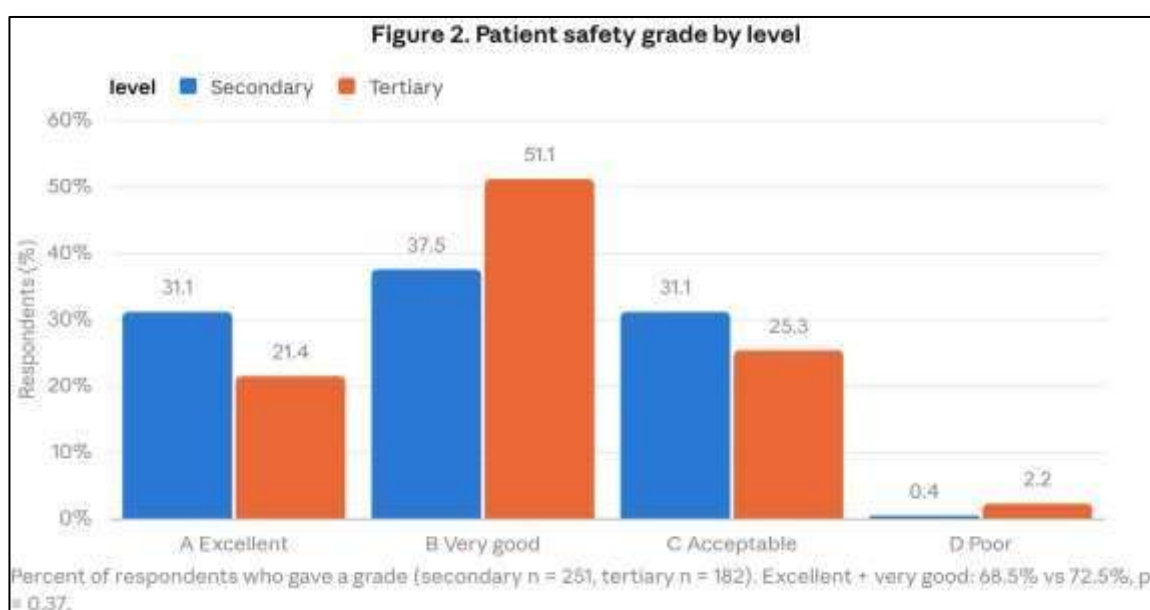
	20–39	46.4	15.1
	40–59	41.6	41.4
	60–79	4.8	20.4
	≥80	1.2	21.5

Percentages may not sum to 100 because of rounding.

Overall patient safety grade

Of the 433 respondents who gave a grade, 304 (70.2%) rated their unit's patient safety as excellent or very good. Only five (1.2%) rated it poor. The distribution differed by level: $\chi^2(2) = 8.75$, $p = 0.013$, Cramér's $V = 0.14$, with acceptable and poor combined (uncombined: $\chi^2(3) = 12.38$, $p = 0.006$).

The difference was one of shape rather than direction (Figure 2). Secondary respondents were more polarised. They more often chose "excellent" (31.1% vs 21.4%; $\chi^2(1) = 4.98$, $p = 0.026$) but also more often chose "acceptable" (31.1% vs 25.3%). Tertiary respondents clustered on "very good" (51.1%). The combined proportion grading safety as excellent or very good was similar at both levels (68.5% vs 72.5%; $\chi^2(1) = 0.81$, $p = 0.37$).

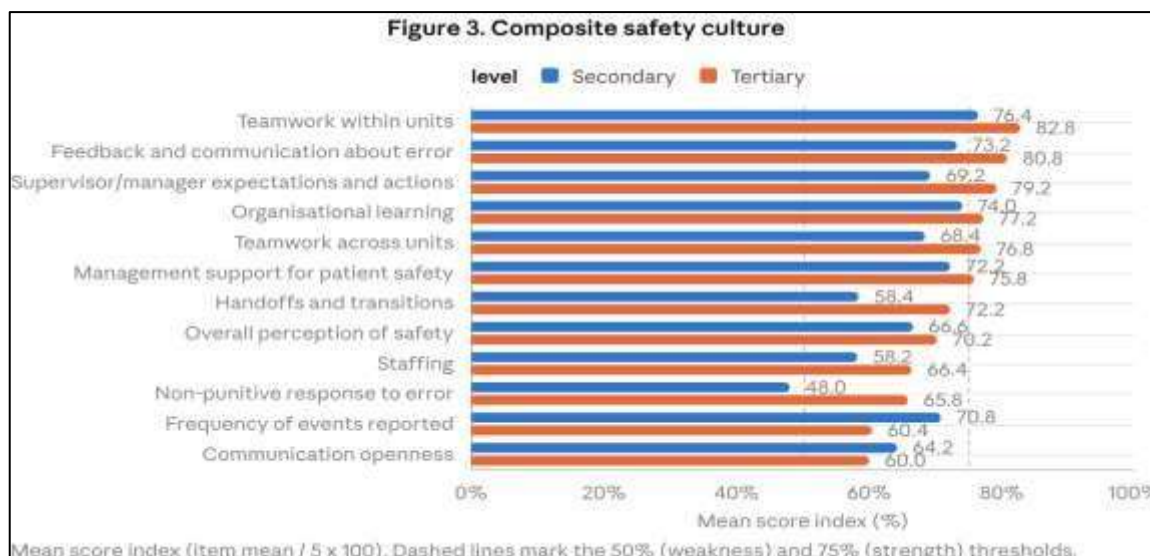


Composite safety culture profile

The mean composite index across the 12 dimensions was 66.6% in secondary hospitals and 72.3% in the tertiary hospital. The tertiary hospital scored higher on 10 of 12 dimensions (Figure 3).

- **Tertiary hospital:** six areas of strength, led by teamwork within units (82.8%), feedback and communication about error (80.8%) and supervisor/manager expectations (79.2%). It had no area of weakness.
- **Secondary hospitals:** one area of strength, teamwork within units (76.4%), and one area of weakness, non-punitive response to error (48.0%). The remaining 10 dimensions were areas for improvement.

The widest composite gaps were in non-punitive response to error (17.8 index points), handoffs and transitions (13.8), supervisor/manager expectations (10.0), teamwork across units (8.4) and staffing (8.2). Two dimensions favoured secondary hospitals: frequency of events reported (70.8% vs 60.4%) and communication openness (64.2% vs 60.0%). These two, along with non-punitive response and feedback, are analysed in detail in the companion paper.



Item-level comparison

Of the 30 items outside the reporting and blame domains, 21 differed between levels after Holm correction. Nineteen of these favoured the tertiary hospital (Table 2; Figure 4). Three findings stand out.

Interfaces, not teams. The largest effects were at the seams of the organisation. They concerned information exchange across units ($g = 1.07$), supervisors acting on recurring problems ($g = 1.05$) and units working well together for patients ($g = 0.92$). All three were large. Within-unit teamwork items differed by small to medium amounts ($g = 0.24$ – 0.67). Every handoff item favoured the tertiary hospital. In secondary hospitals, the mean for "things fall between the cracks when transferring patients" (2.51) sat just above the weakness threshold.

Staffing adequacy versus hours. Secondary staff were far less likely to report enough staff for the workload (3.16 vs 4.01; $g = 0.80$). They also scored lowest of all 41 items on working longer hours than is best for patient care (2.08; $g = 0.75$). This is despite reporting shorter working weeks (Table 1). Use of temporary staff and working in "crisis mode" did not differ.

Two reversals in the tertiary hospital. Tertiary staff scored highest on actively improving patient safety (4.35) and on evaluating changes (4.25). Yet they scored lower than secondary staff on "mistakes have led to positive changes here" (2.98 vs 3.49; $g = -0.46$). They also scored lower on "patient safety is never sacrificed to get more work done" (2.95 vs 3.44; $g = -0.41$). Management provided a similar safety climate at both levels. Neither level believed management's interest was confined to the period after adverse events (both $p > 0.3$).

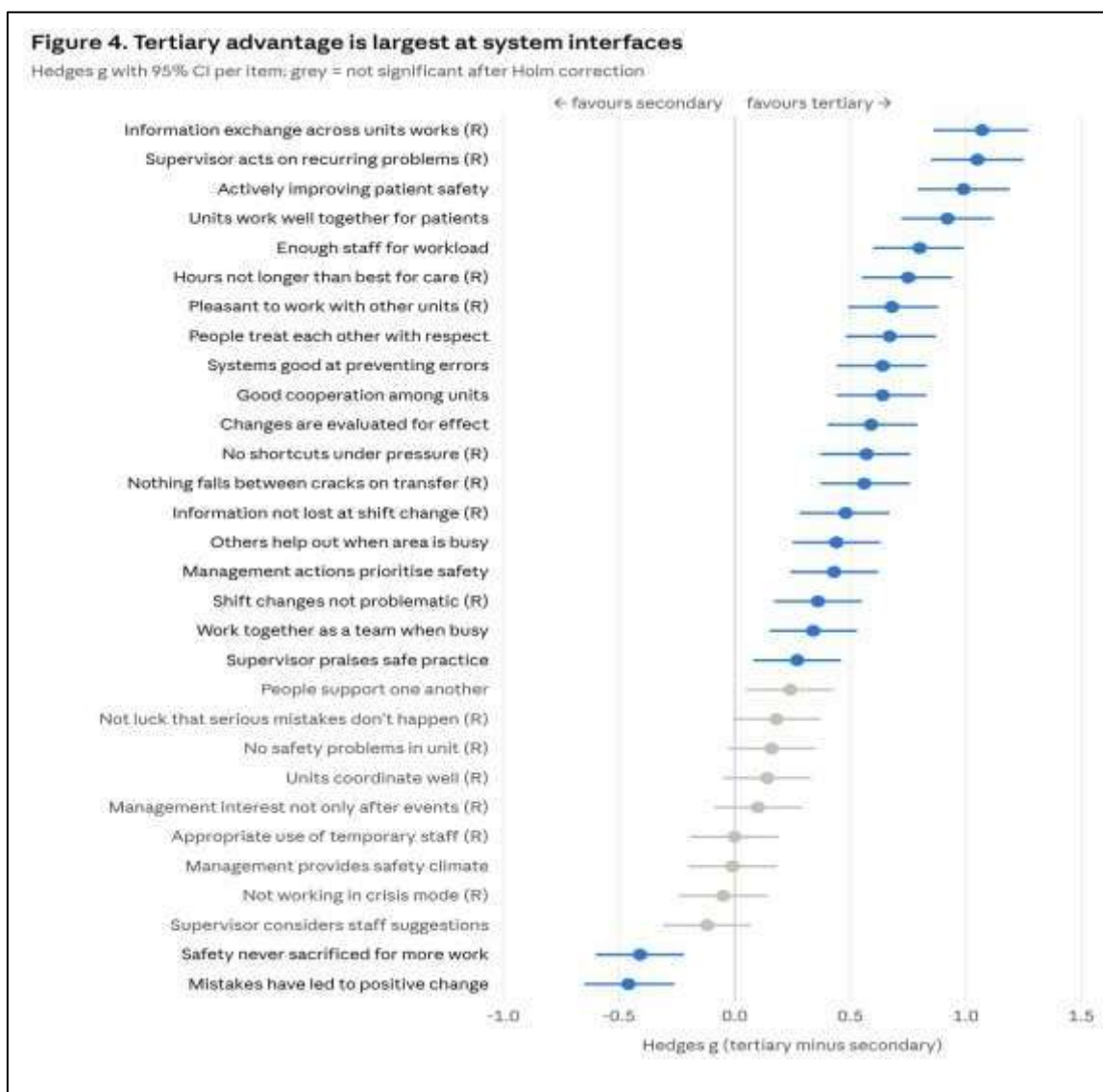
Table 2. Item-level comparison of secondary and tertiary hospitals (excluding the four reporting and blame composites)

Composite / item	Secondary mean (SD)	Tertiary mean (SD)	t	p	Holm p	Hedges' g (95% CI)
Overall perception of safety						
It is just by chance that more mistakes don't happen around here (R)	3.21 (1.27)	3.41 (0.76)	2.05	0.041	0.327	+0.18 (−0.01 to +0.37)
Patient safety is never sacrificed to get more work done	3.44 (1.05)	2.95 (1.35)	−4.12	<0.001	<0.001	−0.41 (−0.60 to −0.22)
We have patient safety problems in this unit (R)	3.13 (1.22)	3.33 (1.35)	1.60	0.111	0.779	+0.16 (−0.03 to +0.35)
Our procedures and systems are good at preventing errors from happening	3.55 (0.87)	4.08 (0.77)	6.74	<0.001	<0.001	+0.64 (+0.44 to +0.83)
Supervisor/manager expectations and actions						
My supervisor/manager says a good word when he/she sees a job done according to established patient safety procedures	3.83 (0.88)	4.05 (0.71)	2.89	0.004	0.044	+0.27 (+0.08 to +0.46)
My supervisor/manager seriously considers staff suggestions for improving patient safety	4.08 (0.75)	3.98 (0.93)	−1.21	0.229	1.000	−0.12 (−0.31 to +0.07)
Whenever pressure builds up, my	2.95 (1.29)	3.65 (1.16)	5.95	<0.001	<0.001	+0.57 (+0.37 to

Composite / item	Secondary mean (SD)	Tertiary mean (SD)	t	p	Holm p	Hedges' g (95% CI)
supervisor/manager wants us to work faster, even if it means taking shortcuts (R)						+0.76)
My supervisor/manager overlooks patient safety problems that happen over and over (R)	2.96 (1.23)	4.18 (1.06)	11.12	<0.001	<0.001	+1.05 (+0.85 to +1.25)
Organisational learning and continuous improvement						
We are actively doing things to improve patient safety	3.76 (0.66)	4.35 (0.50)	10.63	<0.001	<0.001	+0.99 (+0.79 to +1.19)
Mistakes have led to positive changes here	3.49 (0.95)	2.98 (1.31)	-4.51	<0.001	<0.001	-0.46 (-0.65 to -0.26)
After we make changes to improve patient safety, we evaluate their effectiveness	3.84 (0.79)	4.25 (0.53)	6.49	<0.001	<0.001	+0.59 (+0.40 to +0.79)
Teamwork within units						
People support one another in this unit	4.04 (0.66)	4.20 (0.70)	2.42	0.016	0.143	+0.24 (+0.05 to +0.43)
When a lot of work needs to be done quickly, we work together as a team	3.92 (0.64)	4.16 (0.80)	3.37	<0.001	0.010	+0.34 (+0.15 to +0.53)
In this unit, people treat each other with respect	3.83 (0.73)	4.29 (0.61)	7.17	<0.001	<0.001	+0.67 (+0.48 to +0.87)
When one area in this unit gets really busy, others help out	3.50 (1.04)	3.92 (0.81)	4.75	<0.001	<0.001	+0.44 (+0.25 to +0.63)
Teamwork across units						
There is good cooperation among hospital units that need to work together	3.54 (0.87)	4.08 (0.81)	6.68	<0.001	<0.001	+0.64 (+0.44 to +0.83)
Hospital units work well together to provide the best care for patients	3.61 (0.88)	4.30 (0.52)	10.24	<0.001	<0.001	+0.92 (+0.72 to +1.12)
Hospital units do not coordinate well with each other (R)	3.32 (0.98)	3.46 (1.08)	1.39	0.165	0.993	+0.14 (-0.05 to +0.33)
It is often unpleasant to work with staff from other hospital units (R)	3.01 (1.12)	3.73 (0.95)	7.25	<0.001	<0.001	+0.68 (+0.49 to +0.88)
Staffing						
We have enough staff to handle the workload	3.16 (1.08)	4.01 (1.04)	8.32	<0.001	<0.001	+0.80 (+0.60 to +0.99)
Staff in this unit work longer hours than is best for patient care (R)	2.08 (0.94)	2.91 (1.31)	7.36	<0.001	<0.001	+0.75 (+0.55 to +0.94)
We use more agency/temporary staff than is best for patient care (R)	3.17 (1.06)	3.17 (1.40)	0.00	1.000	1.000	+0.00 (-0.19 to +0.19)
We work in "crisis mode" trying to do too much, too quickly (R)	3.24 (1.30)	3.18 (1.29)	-0.48	0.632	1.000	-0.05 (-0.24 to +0.14)
Handoffs and transitions						
Things "fall between the cracks" when transferring patients from one unit to another (R)	2.51 (1.06)	3.10 (1.03)	5.83	<0.001	<0.001	+0.56 (+0.37 to +0.76)
Important patient care information is often lost during shift changes (R)	2.91 (0.87)	3.39 (1.17)	4.70	<0.001	<0.001	+0.48 (+0.28 to +0.67)
Problems often occur in the exchange of information across hospital units (R)	2.69 (1.05)	3.79 (1.00)	11.11	<0.001	<0.001	+1.07 (+0.86 to +1.27)
Shift changes are problematic for patients in this hospital (R)	3.88 (0.75)	4.16 (0.82)	3.66	<0.001	0.004	+0.36 (+0.17 to +0.55)
Management support for patient safety						
Hospital management provides a work climate that promotes patient safety	3.77 (0.88)	3.76 (0.96)	-0.11	0.911	1.000	-0.01 (-0.20 to +0.18)
The actions of hospital management	3.75 (0.94)	4.14 (0.85)	4.52	<0.001	<0.001	+0.43 (+0.24 to

Composite / item	Secondary mean (SD)	Tertiary mean (SD)	t	p	Holm p	Hedges' g (95% CI)
show that patient safety is a top priority						+0.62)
Hospital management seems interested in patient safety only after an adverse event happens (R)	3.34 (1.33)	3.47 (1.36)	0.99	0.321	1.000	+0.10 (-0.09 to +0.29)

Scores are item means on a 1–5 scale after reverse-coding negatively worded items (R), so higher is always more positive. t and p: Welch's t-test. Holm p is adjusted across all 41 survey items. g > 0 favours the tertiary hospital. Tertiary n was 184 for seven items; secondary n ranged from 250 to 252.



Hedges g recomputed from thesis item means and SDs (30 items)

Two items were nominally significant but not after correction: "it is just by chance that more serious mistakes don't happen" (p = 0.041) and "people support one another" (p = 0.016). We do not interpret these as differences. "Hospital units do not coordinate well with each other" did not differ (p = 0.17).

V. DISCUSSION

Principal findings

This multicentre survey is the first to compare hospital-wide patient safety culture across levels of care in Bayelsa State. Five findings stand out.

1. The tertiary hospital had a stronger culture on most dimensions, with six areas of strength against one in the secondary hospitals.

2. The difference was concentrated at the interfaces between units and in leadership follow-through, not in within-team relationships.
3. The tertiary hospital showed a distinct pattern of high improvement activity with weak learning from error, under greater production pressure.
4. Secondary hospitals combined thin staffing with high staff turnover within units.
5. The single-item safety grade was a poor guide to any of these differences.

Beyond the grade

Both levels awarded high safety grades: seven in ten respondents said "excellent" or "very good". The original thesis interpreted the significant chi-square as a better rating in secondary hospitals. Our re-analysis shows this was a difference in the shape of responses, not their level. Secondary staff used both ends of the scale more often. The share giving a favourable grade was the same at both levels.

Meanwhile, secondary hospitals scored lower on nine of 12 dimensions. Similar gaps between favourable grades and weak dimension scores have been reported elsewhere. In Lebanon and Palestine, more than 60% of staff graded safety highly, yet most had reported no events in the previous year [23,25]. Saudi hospitals showed a comparable pattern of high grades alongside weak reporting and non-punitive scores [24]. The pooling of five general hospitals may also have contributed, since safety culture clusters strongly at unit and hospital level [28].

The practical point is simple. A reassuring grade should not be used as the headline indicator of safety culture in Nigerian hospitals. Dimension-level and item-level profiles are needed to locate risk [35].

The seams of the system

The largest level differences were not about whether colleagues respect and support one another. Teamwork within units was the strongest dimension at both levels, as in almost every HSOPSC study worldwide and in Africa [11–14,23–27]. The differences lay in whether:

- information survives a transfer between units;
- units cooperate to deliver care;
- supervisors act on problems that recur.

In Reason's terms these are latent conditions [4]. They sit dormant until a transfer, a shift change or a busy night lines them up with a front-line slip. Communication failures at handoffs are among the most common contributors to adverse events [30]. Structured handoff programmes have reduced preventable adverse events by about a third in teaching hospitals [31].

Two features of the secondary hospitals may explain their weakness at the seams. First, the workforce was unstable: over half of secondary staff had been in their current unit for less than a year, and nearly a quarter were new to their specialty. Frequent rotation weakens the informal relationships and local knowledge on which unstructured handoffs depend. Second, secondary staff reported too few staff for the workload and hours longer than is safe, even though their contracted weeks were shorter than in the tertiary hospital. This is consistent with a nurse-led service stretched thin. It matches the Katsina findings, where 85% of nurses in secondary facilities judged their hours too long [13]. It also matches the African meta-analysis, where staffing was among the two weakest dimensions [12]. Nurse staffing levels are causally linked to patient mortality [33]. Nigeria's inclusion on the WHO Health Workforce Support and Safeguards List signals that this pressure is structural rather than local [37].

Secondary respondents also reported that supervisors often overlook recurring safety problems (mean 2.96, against 4.18 in the tertiary hospital). This was one of the largest effects in the survey. Supervisors appear to be willing to listen: "seriously considers staff suggestions" scored 4.08, the same as the tertiary hospital. The gap is in closing the loop. Field observations during data collection, mainly at the general hospitals, showed that incidents often went unrecorded because staff feared being issued a query, the formal disciplinary letter used in the Nigerian public service. Unrecorded incidents cannot be analysed, so the same problems recur; this is exactly the pattern captured by the "overlooks recurring problems" item. Safety culture interventions that pair listening with visible action, such as leadership walk-rounds with tracked follow-up and unit-based safety programmes, have the best evidence for shifting culture [8,36].

Improvement without learning in the tertiary hospital

The tertiary hospital gave the highest scores in the survey to "we are actively doing things to improve patient safety" (4.35) and "we evaluate the effectiveness of changes" (4.25). Yet it scored below the secondary hospitals on "mistakes have led to positive changes here" (2.98). We read this as a decoupling of improvement activity from learning from error. Tucker and Edmondson described how hospitals work around failures ("first-order problem solving") instead of changing the systems that produced them [32]. As a teaching and accredited institution, the tertiary hospital probably runs visible audits, training and quality projects. These may be driven by accreditation and training requirements rather than by the hospital's own incidents. The companion paper shows that the tertiary hospital also reported fewer events, especially those with no potential for harm. That would starve its improvement system of the near-miss data from which learning from error is built.

The second reversal points to production pressure. Tertiary staff were less convinced that safety is never sacrificed to get more work done. Two in five worked 60 hours or more a week, and one in five worked 80–99 hours. These hours are typical of resident-led services. They are known to increase serious medical errors: interns on traditional extended shifts made 36% more serious errors than those on shorter schedules [34]. The tertiary hospital's strengths in leadership and teamwork do not remove this risk; they may help staff to absorb it.

Comparison with Nigerian and international evidence

Our findings partly reproduce the gradient that rises from primary to secondary to tertiary level reported for pharmacy safety culture in Delta State [16]. The gradient did not hold for event reporting or communication openness. Unlike many international studies, teamwork across units was an area of strength in the tertiary hospital (76.8%) [11,23,26,27]. This may reflect the smaller size of a single-site regional teaching hospital compared with multi-hospital systems. Our composite indices look higher than the pooled African percent-positive estimate of 51.6% [12]. Most of this difference is expected from the scoring method (see Methods), and it should not be read as Bayelsa hospitals outperforming the continent.

Implications for practice and policy

For the five general hospitals and the Bayelsa State Hospitals Management Board:

- Adopt a structured handoff tool (for example, SBAR or an adapted I-PASS) for inter-unit transfers and shift changes, with a written transfer checklist [31].
- Limit rotation of nurses between units in the first year, so that units keep their local knowledge.
- Set and monitor staffing norms per ward.
- Give each supervisor a visible log of recurring safety problems and the actions taken.

For the tertiary hospital:

- Link quality improvement projects to the hospital's own incident and near-miss data, for example by reforming morbidity and mortality meetings into system-focused learning reviews [32].
- Treat resident working hours as a patient safety issue and monitor them [34].
- Protect safety-critical tasks from throughput pressure.

For the Bayelsa State Ministry of Health:

- Make a repeat survey with the HSOPSC version 2.0 a routine requirement, every two years.
- Report results at dimension level, not as a single grade [1,35].

Strengths and limitations

Strengths. The study covered six hospitals and both levels of public hospital care, and it included every staff group rather than one profession. We report effect sizes with confidence intervals and control the family-wise error rate across all 41 items. This protects against the over-interpretation common in item-by-item HSOPSC comparisons. All item-level statistics are published, so the analysis can be reproduced and included in future meta-analyses.

VI. LIMITATIONS

- **Design and sites:** This was a cross-sectional study, and the tertiary level was represented by a single hospital. We therefore cannot draw causal inferences or fully separate level-of-care effects from that institution's own culture.
- **Workforce mix:** Nurses dominated the secondary sample, and pharmacists, doctors and other staff the tertiary sample. Individual-level data were no longer available to adjust for profession, so some level differences may reflect professional perspective, since safety culture perceptions differ by job class and clinical status [29].

VII. CONCLUSION

Patient safety culture in Bayelsa State's public hospitals is moderate. It is stronger in the tertiary hospital than in the general hospitals, and a reassuring global safety grade hides this. The level gap sits at the seams of the system: handoffs, inter-unit information flow, staffing and supervisors' follow-through on recurring hazards. It does not sit within clinical teams, which are a shared strength.

The tertiary hospital's weaknesses are different. It has a busy improvement agenda that is only loosely connected to learning from its own mistakes, and it is exposed to long working hours. Improvement therefore needs to be tailored by level, not delivered as one package. Future work should repeat the assessment with the HSOPSC 2.0, include primary care and private facilities, and link culture scores to incident and outcome data.

DECLARATIONS

Ethics approval and consent to participate: Ethical approval was granted by the Bayelsa State Ethics Committee. Permission was also obtained from the management of all participating hospitals. All participants gave verbal informed consent. Participation was voluntary and anonymous.

Consent for publication: Not applicable.

Availability of data and materials: All item-level summary statistics analysed in this study are reported in Table 2 and the companion paper. The analysis script is available from the corresponding author.

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REFERENCES

- [1]. World Health Organization. Global patient safety action plan 2021–2030: towards eliminating avoidable harm in health care. Geneva: WHO; 2021.
- [2]. Jha AK, Larizgoitia I, Audera-Lopez C, Prasopa-Plaizier N, Waters H, Bates DW. The global burden of unsafe medical care: analytic modelling of observational studies. *BMJ Qual Saf*. 2013;22(10):809–15.
- [3]. Kohn LT, Corrigan JM, Donaldson MS, editors. To err is human: building a safer health system. Washington (DC): National Academy Press; 2000.
- [4]. Reason J. Human error: models and management. *BMJ*. 2000;320(7237):768–70.
- [5]. Health and Safety Commission, ACSNI Study Group on Human Factors. Third report: organising for safety. Sudbury: HSE Books; 1993.
- [6]. Nieva VF, Sorra J. Safety culture assessment: a tool for improving patient safety in healthcare organizations. *Qual Saf Health Care*. 2003;12(Suppl 2):ii17–23.
- [7]. Vikan M, Haugen AS, Bjørnnes AK, Valeberg BT, Deilkås ECT, Danielsen SO. The association between patient safety culture and adverse events – a scoping review. *BMC Health Serv Res*. 2023;23:300.
- [8]. Weaver SJ, Lubomski LH, Wilson RF, Pfoh ER, Martinez KA, Dy SM. Promoting a culture of safety as a patient safety strategy: a systematic review. *Ann Intern Med*. 2013;158(5 Pt 2):369–74.
- [9]. Sorra JS, Nieva VF. Hospital survey on patient safety culture. AHRQ Publication No. 04-0041. Rockville (MD): Agency for Healthcare Research and Quality; 2004.
- [10]. Sorra JS, Dyer N. Multilevel psychometric properties of the AHRQ hospital survey on patient safety culture. *BMC Health Serv Res*. 2010;10:199.
- [11]. Reis CT, Paiva SG, Sousa P. The patient safety culture: a systematic review by characteristics of Hospital Survey on Patient Safety Culture dimensions. *Int J Qual Health Care*. 2018;30(9):660–77.
- [12]. Muhammed OS, Fenta TG. Patient safety culture in African health facilities: a systematic review and meta-analysis. *IJQHC Communications*. 2024;4(1):lyae002.
- [13]. Kaware MS, Ibrahim MI, Shafei MN, Mohd Hairon S, Abdullahi AU. Patient safety culture and its associated factors: a situational analysis among nurses in Katsina public hospitals, Northwest Nigeria. *Int J Environ Res Public Health*. 2022;19(6):3305.
- [14]. Chukwuemeka A, Ezechi O, Akinsolu F. Assessing patient safety culture among healthcare professionals in Ibadan South-west region of Oyo State, Nigeria. *J Patient Saf Risk Manag*. 2023;28(3):116–25.
- [15]. Ogbonnaya LU, Fakunle B. Hospital survey on patient safety culture in SPDC-supported health facilities in the Niger Delta region of Nigeria. Paper presented at: Society for Quality in Health Care in Nigeria conference; 2013 Jul 18; Lagos, Nigeria.
- [16]. Eniojukan JF, Okinedo PO, Ishiekwe AK, Aghoja OC. Comparative evaluation of pharmacy patient safety culture in all levels of health care delivery in Delta State, Nigeria. *UK J Pharm Biosci*. 2015;3(5):30–40.
- [17]. National Population Commission. 2006 Population and housing census of the Federal Republic of Nigeria: priority tables. Abuja: NPC; 2009.
- [18]. von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *Lancet*. 2007;370(9596):1453–7.

- [19]. Welch BL. The generalization of "Student's" problem when several different population variances are involved. *Biometrika*. 1947;34(1-2):28-35.
- [20]. Lakens D. Calculating and reporting effect sizes to facilitate cumulative science: a practical primer for t-tests and ANOVAs. *Front Psychol*. 2013;4:863.
- [21]. Holm S. A simple sequentially rejective multiple test procedure. *Scand J Stat*. 1979;6(2):65-70.
- [22]. Tavakol M, Dennick R. Making sense of Cronbach's alpha. *Int J Med Educ*. 2011;2:53-5.
- [23]. El-Jardali F, Jaafar M, Dimassi H, Jamal D, Hamdan R. The current state of patient safety culture in Lebanese hospitals: a study at baseline. *Int J Qual Health Care*. 2010;22(5):386-95.
- [24]. Alahmadi HA. Assessment of patient safety culture in Saudi Arabian hospitals. *Qual Saf Health Care*. 2010;19(5):e17.
- [25]. Hamdan M, Saleem AA. Assessment of patient safety culture in Palestinian public hospitals. *Int J Qual Health Care*. 2013;25(2):167-75.
- [26]. Bodur S, Filiz E. A survey on patient safety culture in primary healthcare services in Turkey. *Int J Qual Health Care*. 2009;21(5):348-55.
- [27]. Chen IC, Li HH. Measuring patient safety culture in Taiwan using the Hospital Survey on Patient Safety Culture (HSOPSC). *BMC Health Serv Res*. 2010;10:152.
- [28]. Smits M, Wagner C, Spreeuwenberg P, van der Wal G, Groenewegen PP. Measuring patient safety culture: an assessment of the clustering of responses at unit level and hospital level. *Qual Saf Health Care*. 2009;18(4):292-6.
- [29]. Singer SJ, Gaba DM, Geppert JJ, Sinaiko AD, Howard SK, Park KC. The culture of safety: results of an organization-wide survey in 15 California hospitals. *Qual Saf Health Care*. 2003;12(2):112-8.
- [30]. Sutcliffe KM, Lewton E, Rosenthal MM. Communication failures: an insidious contributor to medical mishaps. *Acad Med*. 2004;79(2):186-94.
- [31]. Starmer AJ, Spector ND, Srivastava R, West DC, Rosenbluth G, Allen AD, et al. Changes in medical errors after implementation of a handoff program. *N Engl J Med*. 2014;371(19):1803-12.
- [32]. Tucker AL, Edmondson AC. Why hospitals don't learn from failures: organizational and psychological dynamics that inhibit system change. *Calif Manage Rev*. 2003;45(2):55-72.
- [33]. Aiken LH, Clarke SP, Sloane DM, Sochalski J, Silber JH. Hospital nurse staffing and patient mortality, nurse burnout, and job dissatisfaction. *JAMA*. 2002;288(16):1987-93.
- [34]. Landrigan CP, Rothschild JM, Cronin JW, Kaushal R, Burdick E, Katz JT, et al. Effect of reducing interns' work hours on serious medical errors in intensive care units. *N Engl J Med*. 2004;351(18):1838-48.
- [35]. Pronovost P, Sexton B. Assessing safety culture: guidelines and recommendations. *Qual Saf Health Care*. 2005;14(4):231-3.
- [36]. Morello RT, Lowthian JA, Barker AL, McGinnes R, Dunt D, Brand C. Strategies for improving patient safety culture in hospitals: a systematic review. *BMJ Qual Saf*. 2013;22(1):11-8.
- [37]. World Health Organization. WHO health workforce support and safeguards list 2023. Geneva: WHO; 2023.