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ASSESSMENT OF KNOWLEDGE, ATTITUDE AND PRACTICE (KAP) REGARDING EMERGENCY COLOUR CODES AMONG HEALTHCARE PROFESSIONALS IN A TERTIARY CARE TEACHING HOSPITAL, JHARKHAND

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ABSTRACT

Background: A hospital emergency code is useful only when staff recognise the alert, understand the locally approved response and act without avoidable delay. Colour-code systems simplify communication, but their reliability depends on shared definitions, clear responsibilities and regular rehearsal.

Objective: To examine knowledge, attitudes and self-reported practices concerning institutional emergency colour codes among healthcare professionals in a tertiary care teaching hospital in Jharkhand, India.

Methods: This hospital-based cross-sectional study enrolled 384 doctors, nurses, technicians and paramedical personnel. Participants completed a structured bilingual questionnaire containing 10 knowledge, 10 attitude and 10 practice items. Correct or favourable responses were assigned one point and all other responses zero. Each domain had a possible score of 0-10; the composite KAP score ranged from 0 to 30. Results were summarised from the verified dataset using descriptive statistics.

Results: The mean knowledge, attitude and practice scores were 7.19 ± 1.17, 6.92 ± 1.14 and 6.44 ± 1.33, corresponding to 71.9%, 69.2% and 64.4% of the maximum score. The mean composite score was 20.55 ± 2.70 out of 30 (68.5%). Overall, KAP was classified as adequate in 214 participants (55.7%), moderate in 165 (43.0%) and inadequate in 5 (1.3%). Practice remained 7.5 percentage points below knowledge. Although 98.2% were aware of the colour-code system, only 26.3% reported participation in a mock drill.

Conclusion: The workforce had a sound base of knowledge and generally favourable attitudes, but reported practice was less developed. Institution-wide standardisation, bilingual role-based orientation, repeated multidisciplinary drills and documented competency review are needed to convert recognition into dependable emergency action.

KEYWORDS: emergency communication; hospital preparedness; healthcare personnel; patient safety; simulation exercise; tertiary care

1. INTRODUCTION

Hospitals are expected to manage sudden clinical, environmental and security events without interrupting essential care. Cardiopulmonary arrest, fire, hazardous-material exposure, violence, child abduction, suspected explosives, evacuation and mass-casualty incidents may all demand an immediate coordinated response. In a tertiary teaching hospital, that response involves multiple professions, crowded clinical areas, dependent patients, complex equipment and services operating across shifts. A brief alert can shorten the interval between recognition and mobilisation, but only when its meaning and associated actions are understood throughout the institution. [1-6]

Emergency preparedness is therefore an organisational capability rather than a measure of individual recall. It depends on hazard planning, command arrangements, communication pathways, trained personnel, available equipment, continuity plans, exercises, documentation and follow-up of deficiencies. Clinical teams are central to this work, but safe response also relies on technicians, security, engineering, transport, logistics, communications and hospital administration. [1-6, 29-31]

Colour-coded alerts provide a compact way to identify an event and its location. Their principal limitation is variation between institutions. Blue and red are commonly associated with resuscitation
and fire, respectively, whereas codes for abduction, bomb threat, disaster, hazardous materials, violence or evacuation may differ. Staff entering a new hospital may consequently apply a meaning learned elsewhere. One approved local code matrix, reinforced through visible aids and induction, reduces this source of ambiguity. [7, 8, 10, 26]

Awareness, however, is not equivalent to readiness. A respondent may name a code correctly yet hesitate when activating the system, notifying the control point, moving to the designated location or performing the first action assigned to the

role. Favourable attitudes can likewise coexist with little exposure to drills. Questionnaire findings are most informative when treated as a diagnostic baseline and interpreted alongside simulation, response-time data and observed performance. [11-14, 17, 18]

Indian evidence that examines an entire emergency colour-code system across several professional groups remains limited. Published assessments often concentrate on awareness or selected clinical cadres, with less attention to technical and paramedical personnel and to the gap between recognition and rehearsed behaviour. Evidence from Jharkhand and eastern India is particularly sparse. The present study assessed domain and composite KAP scores, mapped item-level strengths and deficiencies, and described patterns across professional groups.

The study was intended to support practical governance decisions. By distinguishing what staff know from what they report doing, it provides a basis for prioritising code standardisation, role-specific education, simulation and performance monitoring within a large teaching-hospital system.

2. MATERIALS AND METHODS

2.1 Study design, setting and participants

This hospital-based cross-sectional observational study was conducted at Rajendra Institute of Medical Sciences, Ranchi, a public tertiary care teaching hospital in Jharkhand, India, during the approved postgraduate research period. The study population comprised doctors, nurses, technicians and paramedical personnel whose duties could involve recognising an emergency, initiating or relaying an alert, providing an immediate response, supporting patient movement or maintaining operational services.

2.2 Sample size and recruitment

The required sample was estimated with the single-proportion formula at a 95% confidence level, an anticipated proportion of 50% and an absolute precision of 5%. The use of 50% produced the most conservative estimate in the absence of a stable local prevalence, resulting in a target of 384 participants. Eligible personnel were approached according to availability in the participating work areas; recruitment was therefore non-probability based.

2.3 Instrument and administration

Data were collected using a structured bilingual English-Hindi questionnaire. Along with participant characteristics, the instrument included 10 knowledge items, 10 attitude items and 10 self-reported practice items. All participants received uniform instructions, and responses were scored with a predefined key. The dissertation documents local review of the instrument for clarity and relevance; formal psychometric validation and reliability coefficients were not available and are therefore not claimed.

2.4 Scoring and outcomes

A correct or favourable response was scored as one and an incorrect, unfavourable or uncertain response as zero. Knowledge, attitude and practice scores could each range from 0 to 10, while the composite score ranged from 0 to 30. Prespecified domain categories were adequate (7-10), moderate (5-6) and inadequate (0-4). The corresponding composite categories were adequate (21-30), moderate (15-20) and inadequate (0-14). These cut-offs were operational study definitions rather than externally validated competency thresholds.

2.5 Data quality and statistical analysis

Before analysis, the de-identified master dataset was checked against the scoring key for completeness, allowable values and internal consistency. Categorical variables are presented as frequencies and percentages, while domain and composite scores are summarised as means with standard deviations. Item-level favourable-response proportions were calculated from the locked dataset. Because verified inferential outputs were not available in the controlling study records, the analysis was intentionally descriptive.

2.6 Ethics and reporting

The Institutional Ethics Committee approved the study (Letter No. 55, dated 21 February 2026; institutional registration No. ECR/769/INST/JH/2015/RR-21). Participation was voluntary and written informed consent was obtained. Direct identifiers were excluded from the analytical file, and findings are reported in aggregate. Reporting was guided by the STROBE recommendations for cross-sectional studies.

3. RESULTS

3.1 Participant characteristics

The analysis included 384 complete records. Doctors represented 136 participants (35.4%), nurses 116 (30.2%), paramedical personnel 82 (21.4%) and technicians 50 (13.0%).

Table 1. Selected participant characteristics (n=384)

Characteristic	Category	n	%
Professional category	Doctors	136	35.4
	Nurses	116	30.2
	Technicians	50	13.0
	Paramedical personnel	82	21.4
Gender	Male	194	50.5

Characteristic	Category	n	%
	Female	190	49.5
Qualification	Diploma	107	27.9
	Graduate	98	25.5
	Postgraduate	179	46.6
Work experience	<1 year	18	4.7
	1-5 years	44	11.5
	6-10 years	49	12.8
	>10 years	273	71.1
Age (years)	Mean ± SD; range	40.10 ± 10.60	22-58

3.2 Domain and composite scores

Knowledge produced the highest mean score at 7.19 ± 1.17 (71.9%), followed by attitude at 6.92 ± 1.14 (69.2%) and practice at 6.44 ± 1.33 (64.4%). The composite mean was 20.55 ± 2.70 out of 30, equivalent to 68.5% of the available score. Practice was 7.5 percentage points lower than knowledge and 4.8 points lower than attitude.

Table 2. Knowledge, attitude, practice and composite scores

Domain	Possible score	Mean ± SD	% of maximum
Knowledge	0-10	7.19 ± 1.17	71.9
Attitude	0-10	6.92 ± 1.14	69.2
Practice	0-10	6.44 ± 1.33	64.4
Composite KAP	0-30	20.55 ± 2.70	68.5

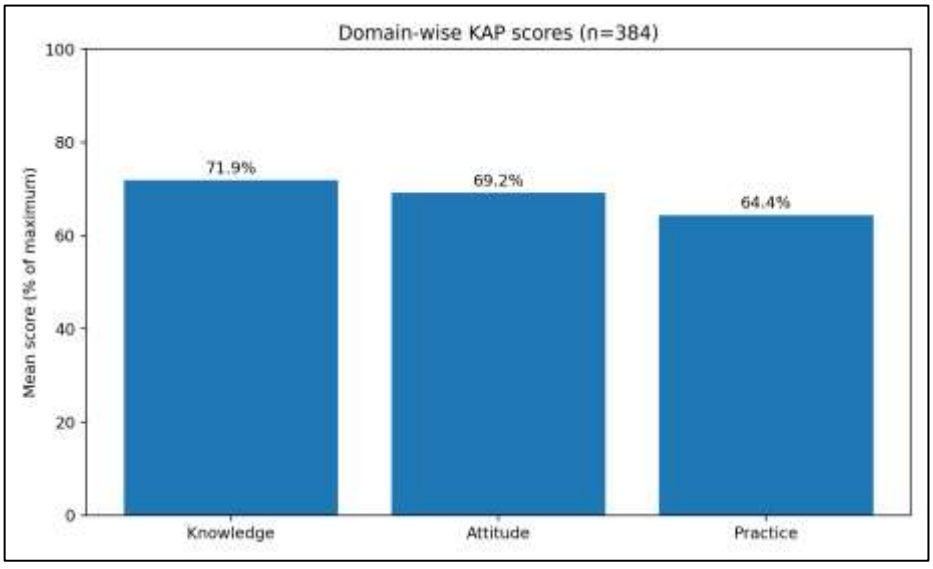

Figure 1. Mean percentage scores for knowledge, attitude and self-reported practice domains (n=384).

3.3 Selected preparedness indicators

Table 3. Selected favourable responses indicating strengths and operational gaps

Indicator	n	%
Aware of emergency colour-code system	377	98.2

Indicator	n	%
Correct identification of Code Red	378	98.4
Correct identification of Code Blue	373	97.1
Correct identification of Code Pink	267	69.5
Participated in an emergency mock drill	101	26.3
Reported confusion through the proper channel	237	61.7

Awareness of the emergency colour-code system was reported by 377 participants (98.2%), whereas only 101 (26.3%) reported taking part in a mock drill. The contrast between broad awareness and limited rehearsal was the most prominent operational gap in the item-level findings.

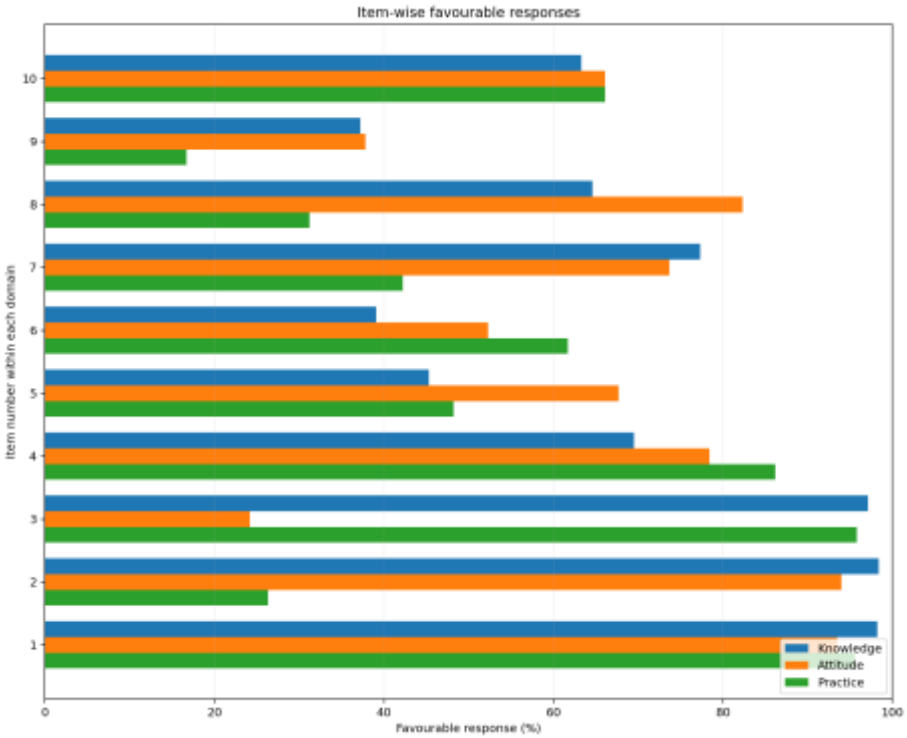

Figure 2. Item-wise favourable-response percentages across the knowledge, attitude and practice domains.

3.4 Overall classification and professional patterns

Table 4. Overall KAP classification according to prespecified study thresholds

Classification	n	%
Adequate	214	55.7
Moderate	165	43.0
Inadequate	5	1.3

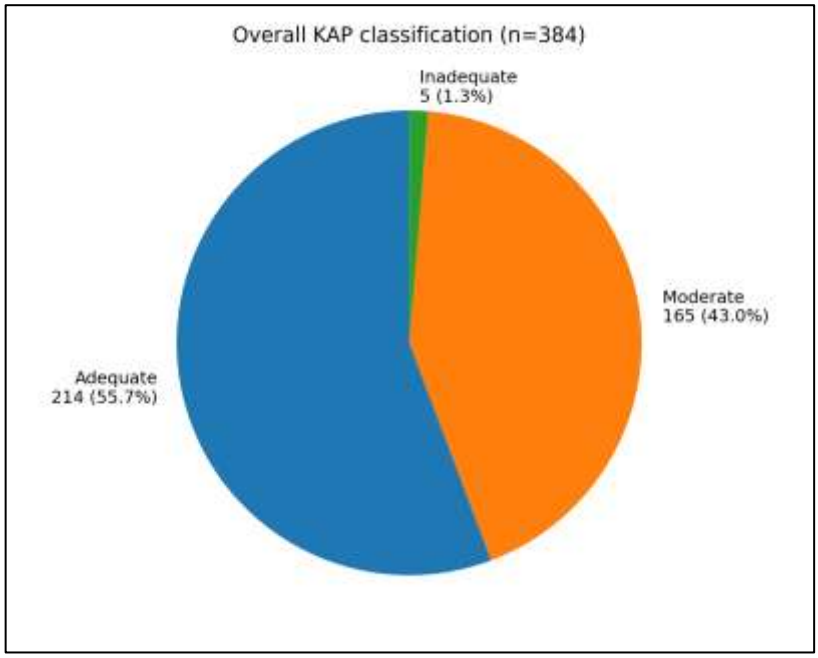

Figure 3. Distribution of participants according to the prespecified overall KAP classifications (n=384).

Descriptive performance differed across professional categories. The overall percentages were 72.5% among doctors, 66.4% among nurses, 58.0% among technicians and 51.7% among paramedical personnel. As no verified adjusted analysis was available, these values should be read as observed group patterns rather than independent effects of professional category.

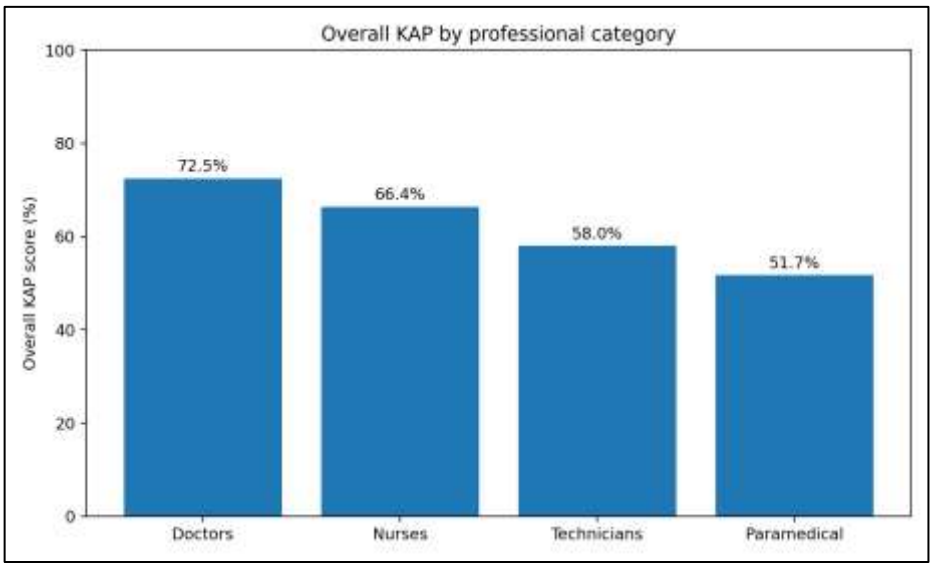

Figure 4. Overall KAP percentage scores across professional categories. The comparison is descriptive.

3.5 Complete item-level response profile

Item-level results are presented to show where aggregate domain scores were supported by consistent strengths and where specific deficiencies remained concealed within the mean values.

Table 5. Item-wise favourable knowledge responses (n=384)

Item	Favourable n	Favourable %	Rank
K1	377	98.2	2
K2	378	98.4	1
K3	373	97.1	3
K4	267	69.5	5

Item	Favourable n	Favourable %	Rank
K5	174	45.3	8
K6	150	39.1	9
K7	297	77.3	4
K8	248	64.6	6
K9	143	37.2	10
K10	243	63.3	7

Table 6. Item-wise favourable attitude responses (n=384)

Item	Favourable n	Favourable %	Rank
A1	359	93.5	2
A2	361	94.0	1
A3	93	24.2	10
A4	301	78.4	4
A5	260	67.7	6
A6	201	52.3	8
A7	283	73.7	5
A8	316	82.3	3
A9	145	37.8	9
A10	254	66.1	7

Table 7. Item-wise favourable self-reported practice responses (n=384)

Item	Favourable n	Favourable %	Rank
P1	367	95.6	2
P2	101	26.3	9
P3	368	95.8	1
P4	331	86.2	3
P5	185	48.2	6
P6	237	61.7	5
P7	162	42.2	7
P8	120	31.2	8
P9	64	16.7	10
P10	254	66.1	4

Note: P8 was negatively worded and reverse scored. Rankings are descriptive and do not assign differential psychometric weight to individual items.

4. DISCUSSION

4.1 Principal findings

The findings reveal a clear preparedness gradient. Knowledge was the strongest domain, attitude was moderately favourable and self-reported practice was the weakest. The 7.5-percentage-point difference between knowledge and practice indicates that familiarity with the code system had not consistently translated into action. Although 55.7% of

participants reached the study-defined adequate threshold, 43.0% remained in the moderate category, showing that readiness was not uniform across the workforce.

This distinction is operationally important because emergency response is procedural, coordinated and time-sensitive. Correctly naming a code does not demonstrate the ability to activate an alert, communicate the precise location, mobilise the appropriate team, use relevant equipment or begin the first role-specific action. The scores should therefore be interpreted as indicators of perceived preparedness rather than proof of observed competence.

The item pattern reinforces that interpretation. Almost all respondents knew that a colour-code system existed, yet several less familiar codes were recognised far less consistently. Drill participation and involvement in preparedness meetings were also uncommon. Together, these findings suggest that information has reached much of the workforce, while opportunities to practise and verify coordinated behaviour remain uneven.

4.2 Interpretation in relation to existing evidence

Recognition was strongest for frequently taught alerts and weaker for Code Black, Code Yellow and drill-related knowledge. This pattern is compatible with the practical difficulty created by non-uniform terminology: personnel may retain the meaning used in a previous institution or remember only the alerts encountered most often. Local orientation should therefore cover not merely the colour names, but also activation criteria, announcement wording, escalation routes and immediate duties for less frequent events.

Attitudes were largely supportive. Most respondents considered the codes important for safety, endorsed mandatory training and agreed that uncertainty should be reported. Nevertheless, only 24.2% felt confident about responding to every code, while 37.8% believed that protocols were updated regularly. The combination of willingness and low confidence points to a receptive workforce that requires clearer, recurrent institutional reinforcement.

The practice domain contained the most consequential implementation gaps. Only 26.3% reported participation in a mock drill, 16.7% had attended preparedness meetings and 42.2% reported keeping themselves updated about protocol changes. High self-reported calmness and procedural compliance should be interpreted carefully because these behaviours were not observed during actual or simulated emergencies. Scenario-based assessment, objective timing and structured debriefing provide stronger evidence of operational competence.

Differences between professional groups were descriptive. Doctors had the highest overall percentage, followed by nurses, technicians and paramedical personnel. Unequal access to training, differences in education, work location, emergency exposure and role expectations may all contribute to this pattern. In the absence of a verified multivariable analysis, professional category should not be treated as a causal explanation.

The first administrative requirement is message consistency. One authorised code matrix should be used in policy documents, wall displays, orientation material, control-room scripts and digital communication. For each code, the hospital should define who may activate it, the announcement format, the escalation pathway, the responsibilities of each service and the process for cancellation or all-clear.

Years of service did not show a steady relationship with KAP. The highest descriptive overall percentage occurred among personnel with one to five years of experience, whereas the value among those with more than ten years was lower. Experience alone may not preserve rare-event skills; routine work can continue for long periods without exposure to many emergency scenarios, and procedures may change over time.

Training records should therefore be linked to performance measures. Useful indicators include induction coverage, drill participation, accuracy of the announcement, time from activation to mobilisation, role adherence, equipment availability, completion of debriefing and closure of corrective actions. Such measures would allow administrators to distinguish attendance from demonstrated readiness.

A feasible improvement cycle would begin with institutional standardisation and role mapping, followed by bilingual induction, short unit-based drills and periodic multidisciplinary exercises across shifts. Trained observers should document communication, mobilisation and first actions. Debriefing should occur promptly, and each identified deficiency should be assigned to a responsible service with a completion date. Repeat assessment can then determine whether improvement is sustained.

4.3 Strengths and limitations

The study included four professional groups and reported both domain-level and item-level findings, allowing practical gaps to be identified rather than hidden within a single composite score. Its limitations should nevertheless guide interpretation. The cross-sectional design captured perceptions at one point in time, convenience recruitment may have introduced selection bias and results from one tertiary teaching hospital may not be transferable to other settings. Practice was self-reported rather than observed, and the locally developed questionnaire lacked documented formal psychometric evaluation. Descriptive subgroup differences may also reflect unmeasured variation in role, department and training exposure.

4.4 Future research

Future studies should formally evaluate the bilingual instrument, use roster-based probability sampling where feasible and combine questionnaires with observed simulation, response-time measures and role-specific competency checklists. A prespecified before-and-after or controlled design could assess whether repeated training improves performance and whether gains persist. Multicentre work would help determine how institutional terminology, staffing arrangements and exercise frequency influence preparedness across different hospital contexts.

4.5 Evidence-to-action priorities

Table 8. Reviewer-oriented interpretation and quality-improvement priorities

Finding	Interpretation	Priority action
Near-universal awareness (98.2%)	Recognition is strong but is not equivalent to demonstrated readiness	Retain induction and add observed activation and role-execution checks
Low mock-drill participation (26.3%)	Rehearsal remains a major implementation gap	Schedule multidisciplinary drills, debriefs and corrective-action closure
Practice below knowledge by 7.5 percentage points	Translation of knowledge into behaviour is incomplete	Use role-specific competency checklists and time-based performance indicators
Low preparedness-meeting participation (16.7%)	Staff involvement in preparedness governance is limited	Include all cadres in unit meetings and emergency-planning reviews

These priorities arise from the observed gaps and accepted preparedness principles. They should be evaluated through implementation and audit rather than assumed to be effective.

5. CONCLUSION

Healthcare professionals demonstrated a sound knowledge base and generally favourable attitudes towards emergency colour codes, but self-reported operational practice remained less developed. Limited drill exposure, low participation in preparedness meetings, uneven confidence across alerts and irregular updating of protocol knowledge were the principal gaps. A single locally authorised bilingual code system, cadre-specific training and repeated performance-based simulation are needed to convert recognition into dependable emergency action.

Implications for Practice and Policy

- Maintain one institution-wide emergency-code matrix that defines activation, escalation, role responsibilities and cancellation.
- Use a consistent announcement format containing the code and precise location, subject to security and confidentiality requirements.
- Provide role-specific induction and competency review at appointment, rotation, transfer and whenever the protocol changes.
- Conduct regular unit-level and multidisciplinary drills, followed by structured debriefing and documented corrective-action tracking.
- Monitor observed performance across clinical, technical, paramedical, security, engineering, communication and logistics services.

Declarations

Ethics approval and consent to participate: The Institutional Ethics Committee approved the study (Letter No. 55, dated 21 February 2026; registration No. ECR/769/INST/JH/2015/RR-21). Written informed consent was obtained from all participants.

Consent for publication: Not applicable; no identifiable participant information is reported.

Data availability: The de-identified dataset and codebook are retained in accordance with institutional and ethics requirements. Access may be considered following an appropriate request and approval.

Funding: The study received no external financial support.

Competing interests: The authors declare that they have no competing interests.

Author contributions (CRediT): M.K. contributed to conceptualisation, methodology, investigation, data curation, formal analysis, visualisation and preparation of the original draft. S.T. contributed to supervision, methodology, validation, critical review and editing. Both authors reviewed and approved the final manuscript and accept responsibility for the work.

Patient and public involvement: Patients and members of the public were not involved in the design, conduct, reporting or dissemination planning of this workforce survey.

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