

BMJ Open Stage-specific harm in early-stage hospitals in South Korea: a retrospective analysis using the healthcare complaints analysis tool

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ABSTRACT

Objectives To analyse patient complaints from an early-stage hospital in South Korea using the Healthcare Complaints Analysis Tool, identify harm patterns across care stages and provide insights for resource allocation and risk management.

Design Retrospective analysis of patient complaints (22 March 2022–28 June 2024).

Setting A newly established general hospital with approximately 700 beds in the metropolitan area of Gyeonggi-do, South Korea, which was established during the COVID-19 pandemic.

Participants A total of 1113 patient complaints comprising 1952 discrete complaint issues were collected, with submissions originating from patients themselves (64%), family members or friends (21%) and individuals with unclear relationships to patients (15%).

Primary and secondary outcome measures Primary outcome measures comprised occurrence and severity of patient harm. Secondary outcome measures included distribution of complaints across clinical, management and relationship domains, and identification of healthcare stages with concentrated harm using hotspot analysis and logistic regression.

Results Of the complaints, 78% did not result in harm. Among those that did, 52%, 40% and 7% were of low, moderate and high severity, respectively. Hotspot analysis indicated that harm was concentrated during diagnosis (stage 2), ward care (stage 3) and operation/procedure (stage 4) stages, with stage 4 exhibiting the highest Pearson residual value of 9.56. Logistic regression indicated that clinical domain complaints had the strongest association with patient harm (OR=32.25, 95% CI=20.88 to 51.01, $p<0.001$), while the operation/procedure stage exhibited the highest stage-specific risk (OR=30.62, 95% CI=9.80 to 93.93, $p<0.001$).

Conclusions This study highlighted the critical care stages in which harm was concentrated, emphasising the need for proactive risk management particularly during operations and procedures. The findings provide valuable insights into resource allocation and underscore the importance of patient complaints in improving healthcare quality and safety across healthcare institutions.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ Patient complaints were coded in the original Korean using the validated Healthcare Complaints Analysis Tool, yielding excellent inter-rater reliability (Gwet's AC1=0.93).
- ⇒ A full census of 1113 formal complaints from a newly established 700-bed hospital was analysed, and stage-specific risk was quantified through Pearson residual hotspot mapping and multivariable logistic regression.
- ⇒ Combining complaint complexity, domain and care-stage indicators in the models provided a granular assessment of factors most strongly associated with harm.
- ⇒ Harm severity was inferred solely from patient narratives without corroborating clinical records, making misclassification and reporting bias possible.
- ⇒ Findings may not be generalisable beyond this single-institution, retrospective data set and cannot establish causal relationships.

INTRODUCTION

Patient complaints are formal grievances raised by patients or their families regarding healthcare services. Beyond expressions of dissatisfaction, they offer unique insights into patient experiences and highlight issues healthcare providers may overlook.^{1–3} As critical indicators of health system responsiveness—the ability to meet patients' legitimate non-medical expectations—complaints promote social accountability and help align services with community needs and values. Systematic analysis of patient feedback can effectively identify areas requiring attention and guide quality improvement efforts.^{4 5} However, complaints often drive isolated departmental responses instead of systemic improvements,⁶ making systematic analyses essential for enhancing healthcare quality.

The Healthcare Complaints Analysis Tool (HCAT), developed by Gillespie and Reader,⁷

systematically classifies complaints into three domains: clinical, management and relationship (CMR). Each domain addresses distinct aspects of healthcare quality: clinical issues (quality and safety), management processes (institutional operations and environment) and relationship matters (communication and patient rights). The HCAT has been rigorously validated across diverse healthcare settings, consistently demonstrating reliability and effectiveness in identifying care-stage-specific harm patterns.^{7 8}

HCAT application in European countries such as the UK and Ireland has successfully identified harm hotspots—specific care stages with heightened risks—enabling targeted and efficient resource allocation^{9 10} and informed interventions to improve patient safety and service quality.

However, HCAT studies remain scarce in South Korea, where cultural and structural elements influence patient-provider interactions and complaint-handling processes.¹¹ Furthermore, this study focuses on an early-stage hospital established during the COVID-19 pandemic, providing a valuable perspective on complaint management amidst healthcare system challenges during rapid and unprecedented changes. It aims to systematically evaluate patient complaints using the HCAT in this distinctive context to identify care-stage-specific harm patterns, informing strategic resource allocation and proactive risk management tailored to early-stage healthcare institutions.

METHODS

The data analysis procedure for this retrospective study was designed to systematically categorise patient-reported narrative complaints using the HCAT framework and assess the patterns of harm across different stages of care. This process comprised five steps: data preparation, descriptive statistical analysis, inter-rater reliability assessment, hotspot analysis and logistic regression.

Study setting and data collection

This study analysed 1113 patient complaints collected from a general hospital in the metropolitan area of Gyeonggi-do, South Korea, between 22 March 2022 and 28 June 2024. Complaints were received through the hospital's patient relations department via online submissions and documented verbal reports. Patient complaints consisted of narrative descriptions of healthcare experiences, which were systematically categorised by independent coders using the validated HCAT framework. The sample size included all formal complaints submitted during this period, providing a comprehensive analysis. This hospital, which opened during the COVID-19 pandemic, has approximately 700 beds and has dealt with various complaints arising from the complexities imposed by the pandemic. Complaints defined as formal expressions of dissatisfaction made by patients, their families or representatives, regarding healthcare services

were analysed, whereas those submitted as feedback for improvement were excluded from this study.

All complaints were originally documented in Korean. For this analysis, narrative descriptions were analysed in their original language to preserve cultural nuances and contextual meanings. The HCAT categorisation was applied directly to Korean text by Korean-speaking researchers familiar with the local healthcare context, avoiding potential translation-related distortions.

Complaint categorisation and harm evaluation

This study employed deductive content analysis using the HCAT framework to systematically analyse patient complaint narratives. Deductive content analysis is an established qualitative research method that applies pre-existing theoretical frameworks to classify textual data.¹² The HCAT framework classifies complaints into three major domains—clinical (quality and safety issues), management (institutional processes and environment) and relationship (communication and patient rights)—and six predefined care stages: admissions (stage 1), examination/diagnosis (stage 2), care in the ward (stage 3), operation/procedure (stage 4), discharge/transfers (stage 5) and unspecified/unclear (stage 6).

The analysis involved attentive reading of each complaint narrative in its original Korean language to preserve cultural and contextual nuances. Two trained coders (YGK and SHP) systematically identified relevant content units within each narrative and categorised them according to the HCAT's predefined domains and stages. A single complaint can contain multiple issues across different domains and stages, reflecting the complex nature of patient experiences.

For harm assessment, we employed a dual analytical approach. First, harm was evaluated within each individual domain (CMR) to identify domain-specific patterns. Second, we conducted an aggregate analysis (total CMR) that assessed harm collectively across all domains, regardless of where complaints originated. This combined approach—validated in previous HCAT studies⁷—enabled us to capture both the overall harm patterns across the entire complaint data set and the unique contributions of each domain to patient harm. Detailed descriptions of the HCAT coding framework, severity assessment scale, and coding principles used in this study are provided in the online supplemental table S1.

Variable definition

The analytical framework incorporated four key variable categories. 'Number of issues' represented the count of discrete problems within each complaint, while 'Number of stages' captured the count of care stages involved. Domain involvement was operationalised through binary indicators for CMR domains. The primary outcome variable, patient harm, was recorded across six severity levels ranging from no harm to catastrophic harm. The HCAT harm classification encompasses all types of patient

harm including physical injury, psychological distress, prolonged suffering and, in extreme cases, death. To ensure adequate statistical power considering sample size constraints, this variable was dichotomised into a binary variable distinguishing between presence and absence of harm. This transformation approach aligns with established methodological practices in healthcare complaint analysis,¹³ maintaining statistical reliability while preserving the essential distinction between harmful and non-harmful events.

Inter-rater reliability

Prior to the main analysis, inter-rater reliability was assessed to ensure consistent coding of patient narratives using the HCAT framework. Gwet's AC1 statistic was employed to assess the inter-rater reliability of complaint categorisation using the HCAT. Gwet's AC1 is a robust method for measuring agreement in categorical data, as it more effectively adjusts for the possibility of chance agreement than Cohen's Kappa.¹⁴ In this study, 10% of the complaints were double-coded by two of the authors (YGK and SHP) for reliability testing. These same raters subsequently evaluated all 1113 complaints for both HCAT categorisation and harm severity assessment, with disagreements resolved through discussion and, when necessary, arbitration by the principal investigator (CWK). This method was utilised in previous studies involving the HCAT,^{7 10} and the present study followed the same procedure to ensure the reliability of the results. The results of this reliability testing indicated a high level of agreement, with an AC1 coefficient of 0.93 (95% CI: 0.81 to 1.00, $p < 0.001$). Inter-rater reliability was statistically significant and that the HCAT framework could be reliably applied to the complaint data.

Descriptive statistical analysis

Descriptive statistical analysis was conducted on the entire data set to determine each variable's frequency and distribution. The analysis examined the proportion of complaints across the CMR domains as well as the severity of harm and distribution of complaints across different stages of care.

Hotspot analysis

Hotspot analysis was conducted using Pearson residuals to identify the stages of care where patient harm was concentrated. A hotspot refers to a stage in which issues occur at a higher-than-expected frequency. This method was selected for its effectiveness in identifying disproportionate concentrations of harm across categories, highlighting systemic patterns instead of isolated incidents.¹⁵ In this study, the difference between observed and expected harm at each stage of care was analysed, with Pearson residual values of >2 considered indicative of a statistically significant difference, thus defining the stage as a hotspot.¹⁶

Logistic regression

Logistic regression analysis was employed to examine the influence of independent variables on the binary

outcome of patient harm.¹⁷ This statistical technique is particularly suitable for modelling binary outcomes and interpreting the effects as ORs.¹⁸

To address the potential multicollinearity issues identified during preliminary analyses, we developed separate modelling approaches for each research question. For patient harm by domain, we constructed three models with increasing complexity. Model 1 examined the effect of complaint complexity using the total number of issues as a continuous predictor. Model 2 assessed domain-specific effects using three binary indicators (CMR), where each variable indicated whether at least one complaint existed within that domain. This binary coding approach minimised multicollinearity while preserving interpretability. Model 3 extended model 2 by including respondent characteristics (author and patient age) to test the stability of domain-harm associations across respondent groups.

For patient harm by stages, we employed a parallel two-model approach. Model 1 utilised the number of stages as a continuous variable, while model 2 employed binary indicators for each stage presence (stages 1–6). We did not include respondent characteristics in the stage-specific analysis for two reasons: (1) care stages represent objective locations within the healthcare journey (eg, operating room and ward) that are less subject to interpretive variation compared with complaint domains; and (2) maintaining model parsimony was essential, considering the already complex model structure with six stage indicators.

Model performance was evaluated using multiple fit statistics including Akaike Information Criterion (AIC), Bayes Information Criterion and McFadden's pseudo- R^2 . All analyses were conducted using R (V.2025.05.1) with significance set at $\alpha = 0.05$.

RESULTS

Descriptive statistics

A total of 1113 patient complaints were collected from hospital A, located in the metropolitan province of Gyeonggi-do, South Korea, between 22 March 2022 and 28 June 2024. The proportion of complaints associated with harm was 22%. Figure 1 illustrates the monthly distribution of complaints across the CMR domains. Notably, the number of management and relationship complaints demonstrated a sharp increase at the beginning of the data collection period, stabilising later in 2022. The relationship domain consistently exhibited higher complaint counts, peaking in mid-2023 and again in early 2024, while the clinical domain exhibited a more gradual rise.

Table 1 provides a summary of the descriptive statistics of the study. The majority of the complaints were filed by patients themselves (64%), while a significant proportion were submitted by family or friends (21%). Age-wise, adults comprised the largest group involved in the complaints, and older adults and paediatric patients accounted for smaller cohorts. The majority of

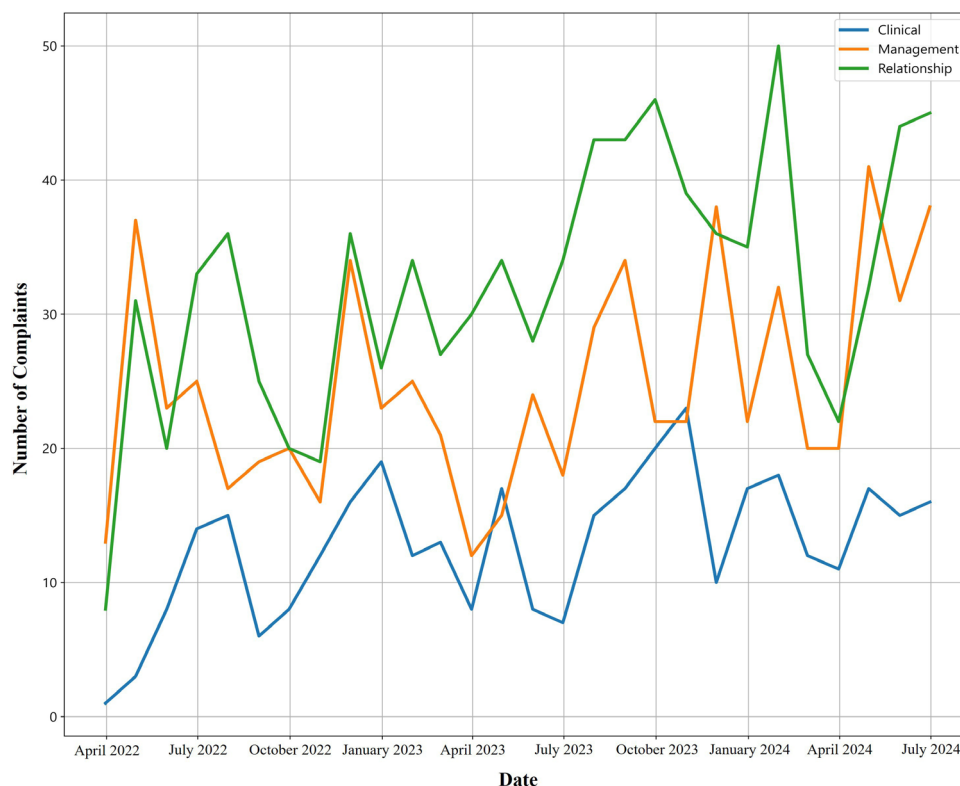


Figure 1 Temporal patterns of patient complaints in the clinical, management and relationship domains.

complaints resulted in no harm (78%). Among those associated with harm, 52% were categorised as low severity, while 40% and 7% were moderate and high severity, respectively, indicating that the most severe cases were relatively rare.

In the domain-specific analysis, the most frequent issues were communication in the relationship domain (22%), institutional process issues in the management domain (22%), and patient safety concerns in the clinical domain (11%). Regarding stages of care, the examination/diagnosis stage accounted for the highest number of complaints (40%), followed by care in the ward (25%).

Hotspot analysis

Harm in the clinical domain was predominantly concentrated in the examination/diagnosis (stage 2), care in the ward (stage 3) and operation/procedure (stage 4) stages (figure 2A). Among these, stage 4 had the highest Pearson residual value of 12.00, indicating a significant concentration of harm. Harm was less pronounced in the management domain compared with the clinical and relationship domains. However, some instances of harm were observed, particularly in stage 3 (care in the ward), where the Pearson residual was close to the expected value (0.05), indicating that the frequency of harm in this stage was aligned with the expected outcome (figure 2B). A similar pattern was observed in the relationship domain, wherein hotspots were identified in stages 3 and 4 (figure 2C), with stage 4 exhibiting a Pearson residual value of 3.96, confirming that it was a significant hotspot for harm. In general, stages 3 and 4 emerged as key harm

concentration areas across complaint domains, with stage 4 exhibiting a particularly high total Pearson residual of 9.56 (figure 2D). Online supplemental table S2 presents detailed observations and the expected values for the hotspot analysis, along with the Pearson residuals.

Logistic regression analysis

Logistic regression results evaluating associations between complaint characteristics, care stages and patient harm are presented in tables 2 and 3.

Table 2 shows that complaint complexity (model 1), measured as the number of issues per complaint, increased the odds of patient harm ($\beta=0.71$, SE=0.08, OR=2.02, 95% CI=1.74 to 2.36, $p<0.001$). Each additional complaint issue increased harm odds by approximately twofold. Model 2 examined domain-specific factors. Clinical domain complaints exhibited a strong association with harm ($\beta=3.47$, SE=0.23, OR=32.25, 95% CI=20.88 to 51.01, $p<0.001$), whereas management and relationship domains exhibited no significant associations. Model 3 incorporated respondent characteristics and demonstrated that the clinical domain's strong association remained robust ($\beta=3.43$, SE=0.23, OR=30.83, 95% CI=19.81 to 49.15, $p<0.001$). Notably, complaints filed by family members or friends exhibited significantly higher odds of reporting harm compared with patients themselves ($\beta=0.79$, SE=0.29, OR=2.20, 95% CI=1.25 to 3.87, $p<0.01$), whereas patient age groups demonstrated no significant differences in harm reporting. Inclusion of domain predictors substantially improved model performance (McFadden's R^2 increased from 0.08 to 0.40; AIC

Table 1 Descriptive statistics

Healthcare complaint analysis tool		N (%)
Total number of complaints		1113
Total number of issues		1952
2022	Quarter 1	13 (1%)
	Quarter 2	100 (9%)
	Quarter 3	96 (9%)
	Quarter 4	110 (10%)
2023	Quarter 1	106 (10%)
	Quarter 2	101 (9%)
	Quarter 3	152 (14%)
	Quarter 4	137 (12%)
2024	Quarter 1	128 (12%)
	Quarter 2	170 (15%)
Author	Patient	718 (64%)
	Family or friend	234 (21%)
	Unclear	174 (15%)
Patient age	Child	98 (9%)
	Adult	593 (53%)
	Older adult	250 (22%)
	Unclear	172 (16%)
Severity	Low	1020 (52%)
	Medium	788 (40%)
	High	144 (7%)
Clinical	Quality	288 (10%)
	Safety	340 (11%)
Management	Environment	290 (10%)
	Institutional	675 (22%)
Relationship	Listening	233 (8%)
	Communication	679 (22%)
	Respect and patient rights	523 (17%)
Stage of care	Admissions	86 (4%)
	Examination/diagnosis	778 (40%)
	Care in the ward	482 (25%)
	Operation/procedure	129 (7%)
	Discharge	49 (3%)
	Unspecified/unclear	428 (22%)
Harm	No harm	867 (78%)
	Minimal harm	112 (10%)
	Minor harm	69 (6%)
	Moderate harm	38 (3%)
	Major harm	18 (2%)
	Catastrophic harm	9 (1%)

decreased from 1090.44 to 717.04), reflecting enhanced explanatory power.

Table 3 presents stages of care analyses. Model 1 revealed a significant association between the number

of care stages per complaint and increased patient harm ($\beta=0.78$, $SE=0.07$, $OR=2.18$, 95% $CI=1.91$ to 2.50 , $p<0.001$). Each additional stage raised the harm odds by over twofold. Model 2 examined specific care-stage indicators. Operations/procedures exhibited the highest harm risk ($\beta=3.42$, $SE=0.57$, $OR=30.62$, 95% $CI=9.80$ to 93.93 , $p<0.001$), followed by care in the ward ($\beta=1.82$, $SE=0.52$, $OR=6.15$, 95% $CI=2.16$ to 16.58 , $p<0.001$) and examination/diagnosis ($\beta=1.16$, $SE=0.52$, $OR=3.19$, 95% $CI=1.12$ to 8.64 , $p<0.05$). Admissions, discharge/transfers and unspecified stages exhibited no significant associations with harm. Model fit modestly improved with the inclusion of stage-specific predictors (McFadden's R^2 from 0.13 to 0.19; AIC from 1027.64 to 970.96).

DISCUSSION

Statement of principal findings

This retrospective study of 1113 patient complaints in an early-stage hospital demonstrated that 22% were associated with patient harm. Clinical domain complaints emerged as the strongest predictor of patient harm, whereas those concerning management and relationships were not significantly associated with harm. This relationship remained robust when respondent characteristics were included in the model, with family members or friends demonstrating a higher tendency to report harm compared with patients themselves.

The stage-specific analysis identified a notable gradient of harm risk across care stages, with the higher risk observed in complaints arising from operations/procedures, indicating approximately a 30-fold increase in harm likelihood compared with other stages. This was followed by ward care and examination/diagnosis stages. This escalation reflects increasing complexity, invasiveness and potential for adverse events inherent in procedural stages of care, underscoring the need for targeted interventions at these critical junctures.

Strengths and limitations

A major strength of this study is the systematic analysis of patient complaints using the HCAT, which demonstrated high inter-rater reliability through the involvement of multiple evaluators. This reinforces the tool's reliability even in complex healthcare settings.⁷ However, this study also has some limitations. First, the study relied on data from a single healthcare institution, which may restrict the generalisability of the findings. While our sample size provided adequate statistical power for the analyses performed, the findings should be interpreted within the specific context of an early-stage hospital in South Korea.

Second, harm assessment was based solely on patient-reported information without clinical verification, potentially introducing reporting bias. Although we included respondent characteristics in our analysis to partially address this concern, the subjective nature of harm assessment from patient or proxy perspectives remains inherent. Moreover, harm severity scoring was conducted

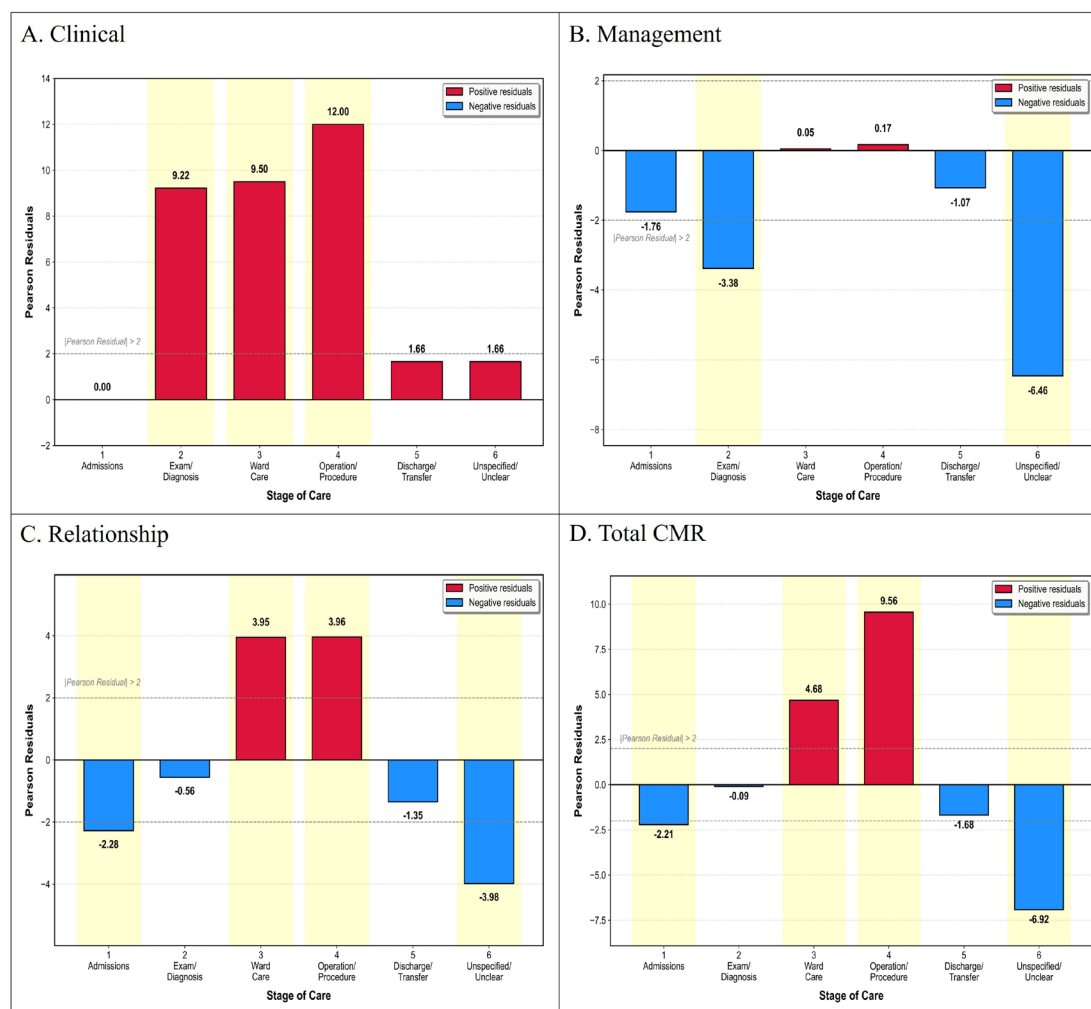


Figure 2 Hotspot analysis in the (A) clinical, (B) management and (C) relationship domains and (D) total CMR. Total CMR represents the combined analysis of the clinical, management and relationship domains. CMR, clinical, management and relationship.

retrospectively on already-logged complaints instead of in real-time, which may introduce temporal bias as complaints could have been submitted days or weeks after the actual incidents. The absence of correlation with actual medical incident reports further limits our ability to validate patient-perceived harm against clinically documented adverse events.

Third, as the focus was solely on patient complaints (subjective experiences of a limited subset of patients), the study may not fully capture the experiences of the broader patient population, particularly of those who may be unaware of their rights or hesitant to submit complaints owing to fear of negative repercussions.¹⁹ Finally, the retrospective nature of the study also limits causal interpretations of the relationships identified between complaint characteristics and harm outcomes.

Interpretation within the context of the wider literature

The high inter-rater reliability of the HCAT aligns with findings from previous studies conducted in Europe, confirming the tool's efficacy across diverse healthcare environments.^{7,8} This reliability is particularly noteworthy

considering our study context—an early-stage hospital established during the pandemic. In fact, the high proportion of stage 6 complaints possibly reflects the operational complexities of establishing standardised processes during this period, consistent with studies documenting hospital challenges during critical events such as the Middle East respiratory syndrome outbreak.²⁰

Our findings reveal distinct patterns in complaint distribution that both align with and diverge from international literature. The concentration of complaints in stage 2 differs markedly from Western healthcare systems, where complaints typically cluster in stage 1 (during admissions).¹⁰ This difference appears rooted in Korean healthcare's emphasis on efficiency and high patient volume, which may create time constraints during consultations that manifest as communication challenges and patient dissatisfaction.²¹ Similarly, the over-representation of quality issues during surgical procedures observed in this study corresponds with prior research indicating a high risk of patient harm during the surgical stage, often connected to structural or systemic deficiencies.^{22–24} These structural issues observed

Table 2 Binary logistic regression models of patient harm by complaint characteristics

	Model 1		Model 2		Model 3	
	β (SE)	OR (95% CI)	β (SE)	OR (95% CI)	β (SE)	OR (95% CI)
(Intercept)	-2.60 (0.17)***	0.07 (0.05 to 0.10)	-2.46 (0.26)***	0.09 (0.05 to 0.14)	-2.45 (0.28)***	0.09 (0.05 to 0.15)
Number of issues	0.71 (0.08)***	2.02 (1.74 to 2.36)				
Complaint domain						
Clinical			3.47 (0.23)***	32.25 (20.88 to 51.01)	3.43 (0.23)***	30.83 (19.81 to 49.15)
Management			-0.36 (0.24)	0.70 (0.44 to 1.13)	-0.40 (0.24)	0.67 (0.42 to 1.09)
Relationship			-0.07 (0.21)	0.93 (0.62 to 1.41)	-0.13 (0.21)	0.88 (0.58 to 1.34)
Respondent characteristics						
Author						
Patient (ref)						
Family or friend					0.79 (0.29)**	2.20 (1.25 to 3.87)
Unclear					0.53 (0.35)	1.70 (0.85 to 3.38)
Patient age						
Adult (ref)						
Child					-0.78 (0.40)	0.46 (0.21 to 1.00)
Older adult					-0.20 (0.26)	0.82 (0.49 to 1.35)
Unclear					-0.58 (0.38)	0.56 (0.26 to 1.17)
Model fit						
N	1113		1113		1113	
AIC	1090.44		717.04		718.67	
BIC	1100.47		737.10		763.80	
Log-likelihood	-543.22		-354.52		-350.33	
Mcfadden R ²	0.08		0.40		0.40	

*p<0.05; **p<0.01; ***p<0.001.

AIC, Akaike Information Criterion; BIC, Bayes Information Criterion; β , beta coefficient.

in the ward care process indicate long-term management challenges that require systematic improvement to mitigate recurring risks.⁹

The relationship between complaint complexity and harm risk identified through our regression analysis aligns with previous research emphasising multidimensional approaches to complaint management.²⁵ In particular, the strong association between clinical domain complaints and harm—particularly during the active treatment phases (stages 2, 3 and 4)—underscores the need for targeted risk mitigation strategies, consistent with established patient safety literature.²⁶

A particularly striking finding was family members or friends being twice as likely to report harm compared with patients themselves. This pattern is especially relevant in the Korean healthcare context, where family involvement in patient care is culturally embedded and anticipated. Family members may serve as vigilant advocates, identifying care deficiencies that patients may overlook due to cultural deference to medical authority or fear of confrontation.^{27 28} This indicates that complaint

management systems should actively engage family members as key stakeholders in patient safety initiatives. However, patient age was not significantly associated with harm reporting in the extended model. This finding may reflect data limitations, including potential inaccuracies in proxy-reported age and absence of age documentation in some complaints.

The context of the pandemic adds another layer of complexity to our findings. International evidence demonstrates that COVID-19 visitor restrictions significantly impacted patient well-being and increased family reliance on formal complaint mechanisms, with documented increases in anxiety, loneliness and communication challenges.^{29 30} Early-stage hospitals—already vulnerable due to limited resources and developing systems—faced amplified patient safety risks during this period.^{31 32} Our study demonstrates that systematic complaint analysis can illuminate these underlying healthcare system problems that traditional safety monitoring tools may miss, providing crucial insights for quality improvement in challenging operational contexts.

Table 3 Binary logistic regression models for patient harm by stages

	Model 1		Model 2	
	β (SE)	OR (95% CI)	β (SE)	OR (95% CI)
(Intercept)	−2.53 (0.15)***	0.08 (0.06 to 0.11)	−2.41 (0.52)***	0.09 (0.03 to 0.26)
Number of stages	0.78 (0.07)***	2.18 (1.91 to 2.50)		
Stage of care				
Admissions			−0.17 (0.71)	0.85 (0.19 to 3.11)
Examination/diagnosis			1.16 (0.52)*	3.19 (1.12 to 8.64)
Care in the ward			1.82 (0.52)***	6.15 (2.16 to 16.58)
Operation/procedures			3.42 (0.57)***	30.62 (9.80 to 93.93)
Discharge/transfers			−0.57 (0.82)	0.57 (0.08 to 2.35)
Unspecified/other			−0.87 (0.52)	0.42 (0.14 to 1.09)
Model fit				
N	1113		1113	
AIC	1027.64		970.96	
BIC	1037.67		1006.07	
Log-likelihood	−511.82		−478.48	
McFadden R ²	0.13		0.19	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.AIC, Akaike Information Criterion; BIC, Bayes Information Criterion; β , beta coefficient.

Implications for policy, practice and research

These findings emphasise the need to enhance communication and transparency during stage 2 (examination/diagnosis) to better manage patient expectations and improve patient satisfaction within the Korean healthcare system. Targeted resource allocation and enhanced safety management are required for complex medical procedures, particularly in stage 3 (care in the ward) and stage 4 (operations/procedures), to mitigate patient safety risks. Healthcare administrators should prioritise the proactive management of complex problems encountered by early-stage institutions. Combining patient complaint data with other relevant quality and safety metrics (such as clinical performance indicators) will render a more multidimensional analysis—thereby improving the accuracy of management strategies and safety interventions.³³

To enhance generalisability, future research should incorporate data from a diverse range of healthcare institutions, varying in size, geographical region and organisational characteristics. Cross-institutional comparisons will provide more comprehensive insights into patient complaints and allow for the development of more inclusive management strategies to improve healthcare quality and patient safety. Multicentre studies would address the limitation of our single-institution approach and provide stronger evidence for policy development at the national level. Additionally, future studies should explore alternative methods of capturing a more comprehensive range of patient experiences. Combining patient complaint data with other quality and safety metrics, such as clinical performance indicators, will render a more

multidimensional analysis, thereby improving the accuracy of management strategies and safety interventions.³⁴

Moreover, future research can explore the development of predictive models based on patient complaint data to identify potential risk factors in advance. By analysing patterns in complaints, predictive models can forecast potential issues at specific stages of care, enabling healthcare institutions to take proactive measures.³⁵ This approach will not only improve patient safety but also support the continuous enhancement of healthcare service quality.

Conclusions

This study underscores the importance of systematically analysing patient complaints as critical indicators for healthcare quality and patient safety, especially in newly established hospitals. The identification of care-stage-specific risks, particularly at high-risk procedural stages, highlights the necessity of targeted resource allocation and proactive risk management. Healthcare institutions should leverage structured complaint analyses to foster continuous quality improvement, enhance patient experiences and mitigate harm across all stages of care.

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Contributors YGK: conceptualisation; methodology; investigation; data curation; formal analysis; writing—original draft preparation; writing—review and editing. MN: conceptualisation; methodology; investigation; formal analysis; writing—review and editing. SHP: investigation; data curation; writing—review and editing. MKK: writing—review and editing. JCC: conceptualisation; methodology; writing—review and editing. DJ: conceptualisation; methodology. CWK: conceptualisation; methodology; writing—review and editing; supervision. CWK is responsible for the overall content as guarantor. Our research team used AI to assist with the translation of patient complaint data from Korean to English. The process required careful consideration of cultural and contextual nuances to ensure accurate representation in an international academic context. AI technology, specifically a large language model, was employed as a supplementary tool to help maintain linguistic clarity and contextual appropriateness during this cross-cultural translation. All translations were subsequently reviewed and edited by the research team to ensure accuracy and alignment with the original meaning of the complaints.

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Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval The Institutional Review Board (IRB) of Chung-Ang University reviewed the data—originally approved by the IRB of Chung-Ang University Gwangmyeong Hospital—and determined that this study qualified for exemption from full review. This exemption was granted because the study involved a secondary analysis of existing data, posing negligible to no risk to the participants. All procedures complied with the ethical guidelines and regulations, including those outlined in the Declaration of Helsinki (approval number: 1041078–20240817 HR-215). Patient consent for publication was not required.

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Data availability statement Data are available upon reasonable request. The dataset used in this research may be obtained from the corresponding author upon reasonable request.

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