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Perceptions of the professional liability insurance system among health care workers: a cross-sectional study

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Abstract

Objectives: This study aimed to assess healthcare workers' perceptions of the current professional liability insurance system in the Republic of Kazakhstan. It was hypothesized that, despite a neutral overall evaluation, healthcare workers would report limited practical protection and identify insufficient transparency and institutional awareness as key challenges. Differences in perceptions by sector, length of service, and professional category were examined, along with predictors of support for a unified electronic insurance claims registry.

Methods: A cross-sectional anonymous questionnaire survey was conducted in December 2025 among healthcare workers at Astana Medical University and public and private healthcare organizations in Astana. The final analysis included 106 respondents. Inclusion criteria were current employment in a healthcare setting and provision of informed consent; questionnaires with critically incomplete responses on key variables were excluded. Measures covered overall system evaluation (Q17; 1–5 scale), attitudes toward system characteristics (Q8, Q10, Q12, Q14, Q15), perceived professional risks (Q6), system-related problems (Q11), and proposed improvements (Q16). Statistical analyses included the Kruskal–Wallis test, chi-square or Fisher's exact test with Cramer's V, Benjamini–Hochberg correction, and exploratory multivariable logistic regression.

Results: The median overall system rating was 3 (IQR: 2–3). Nearly half of respondents considered insurance claim review procedures inadequate (49.1%), and 41.5% reported difficulty assessing insurance cost-effectiveness. The most frequently cited professional risk was legal vulnerability in relation to patients (72.6%). Insufficient transparency (40.6%) and low awareness (39.6%) were identified as key systemic problems. Mandatory educational courses were supported by 85.8% of respondents. Support for a unified electronic insurance claims registry was expressed by 42.5%, with no significant independent predictors identified.

Conclusion: Although the professional liability insurance system received a neutral overall assessment, healthcare workers expressed notable concerns regarding its practical effectiveness and procedural reliability. Strengthening educational initiatives, improving transparency, and enhancing legal support mechanisms are essential for improving system performance.

Keywords: Professional liability insurance, medical error, healthcare workers, cross-sectional study, risk perception

INTRODUCTION

Today, the global healthcare system is characterized by an increasingly complex interplay between clinical expertise, legal liability, and the economic sustainability of medical practice. Within this context, professional liability insurance for healthcare professionals has become a critical, yet often misunderstood, component of institutional healthcare infrastructure.

The mandatory professional liability insurance model adopted in Kazakhstan in 2024 combines elements of a no-fault compensation system with mechanisms of pre-trial dispute resolution. As widely recognized, no-fault compensation models, unlike fault-based systems, emphasize timely resolution and patient support without requiring proof of individual fault, thereby potentially fostering a more transparent patient safety culture [1, 2]. The introduction of this insurance framework is intended to protect both patients and healthcare professionals by safeguarding their property and professional interests.

For international readers, it is important to note that the Kazakhstan model of professional liability insurance is a recently introduced and evolving mechanism within a post-Soviet health system. In this context, legal regulation, institutional trust, medico-legal literacy, and implementation capacity may differ substantially from those reported in studies from high-income countries or other low- and middle-income settings. The current model is intended to provide mandatory protection within a framework that combines compensation for patient harm, expert review procedures, and pre-trial dispute resolution. Therefore, healthcare workers' perceptions are shaped not only by formal legislation, but also by organizational culture, legal uncertainty, and limited practical experience with insurance claims. This regional context is essential for interpreting the findings, as attitudes toward insurance mechanisms in Kazakhstan may not fully mirror those reported in settings with longer-established malpractice systems.

However, the analysis of healthcare professionals' perceptions conducted in this study demonstrates that attitudes toward professional liability insurance remain ambivalent. On the one hand, insurance is perceived as a mechanism for mitigating financial risks and compensating patient harm. On the other hand, healthcare professionals express mistrust toward the insurance system, primarily related to its practical implementation and concerns about potential unfairness in the assessment of professional actions. Overall, professional liability insurance is viewed as a necessary but complex instrument intended to balance patient rights with the professional autonomy of healthcare providers, although its real-world application remains controversial.

Previous studies indicate a persistent gap between the objective necessity of professional liability insurance and healthcare professionals' understanding of liability mechanisms.

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This gap is accompanied by broader systemic challenges, including defensive medicine, occupational stress, and shifts in clinical decision-making processes. Existing research has largely focused on legal definitions of medical malpractice, while comparatively little attention has been paid to healthcare professionals' subjective perceptions of fairness, transparency, and institutional support within emerging liability frameworks.

Empirical evidence from various regions reveals insufficient awareness of professional liability insurance among healthcare professionals. This phenomenon is observed across professional hierarchies but is particularly pronounced among early-career practitioners and those working in resource-limited or rural settings. Limited knowledge of professional liability insurance, its scope, and its protective mechanisms leaves healthcare professionals vulnerable to potential financial consequences associated with patient compensation claims [3].

For instance, a cross-sectional study conducted in Nigeria involving 300 registered physicians found that only 32% demonstrated adequate awareness of the purpose and scope of professional liability insurance. Awareness was strongly associated with years of professional experience and workplace location, with senior physicians and those employed in urban tertiary care facilities reporting higher levels of understanding [4]. Similar patterns have been documented in South Asia. A systematic review of eight cross-sectional studies from India revealed that more than half of dentists were unaware of the availability or necessity of professional liability insurance, with uptake rates in certain groups falling below 1% [5].

Evidence from high-income countries further suggests that elevated litigation risk does not necessarily translate into higher levels of medical-legal literacy. Among obstetrics and gynecology residents in the United States, 92% reported persistent concerns about malpractice litigation, yet more than 80% were unaware of whether their state imposed limits on malpractice compensation. Informal sources, such as discussions with colleagues and observational learning, remain the primary channels for acquiring medical-legal knowledge, while structured education on liability processes remains limited [6].

Collectively, these findings underscore the importance of institutional trust, transparency, and procedural fairness in shaping healthcare professionals' perceptions of liability systems. Understanding these perceptions is crucial for the effective implementation of liability reforms. In the absence of trust and perceived legitimacy among healthcare providers, newly introduced mechanisms–such as electronic insurance registries or expert review procedures–may fail to achieve their intended protective and patient safety–enhancing objectives.

Accordingly, this study aims to assess healthcare professionals' perceptions of the professional liability insurance system in Kazakhstan, with particular attention to perceived legal protection, procedural fairness, institutional trust, and uncertainty surrounding medical and legal guarantees. Specifically, the study evaluates: (1) overall assessment of the insurance system using a five-point scale (Q17); (2) attitudes toward key system characteristics (Q8, Q10, Q12, Q14, Q15); (3) the frequency with which respondents identify significant professional risks (Q6) and systemic problems (Q11) using multiple-choice items; and (4) proposed measures for improving insurance effectiveness based on responses to an open-ended question (Q16). Additionally, differences across employment sectors, length of professional experience, and professional categories were examined, and a multivariate analysis was conducted to identify predictors of support for the establishment of an electronic registry of insurance claims (Q14).

Materials and Methods

A cross-sectional study was conducted using an anonymous questionnaire survey among healthcare workers in December 2025 at Astana Medical University and at public and private healthcare organizations in Astana. Participants were recruited using a non-probability convenience sampling approach based on institutional access and voluntary participation. Because the study had an exploratory design and recruitment was based on pragmatic access to eligible respondents, no formal a priori sample size calculation was performed.

A total of 106 respondents were included in the final analysis. Eligibility criteria were active employment in a healthcare setting at the time of the survey and provision of informed consent. Questionnaires with critically incomplete data on key study variables (>20% missing responses) were excluded from the final analysis. Gender, professional category (physician, nurse, other), length of service (<1 year, 1–5 years, 6–10 years, >10 years), and employment sector (public, private, both) were used for stratification. Because of the extremely small sample size in the paramedic category (n=1), this category was merged with the "other" group to ensure valid intergroup comparisons.

A structured questionnaire was used to assess attitudes toward the professional liability insurance system. The questionnaire included categorical items reflecting perceptions of key system characteristics (Q8, Q10, Q12, Q14, Q15), an overall system rating on a 5-point scale (Q17), multiple-choice items on perceived professional risks (Q6) and system-related problems (Q11), and an open-ended question on measures to improve insurance effectiveness (Q16). For the multiple-choice questions (Q6 and Q11), each response option was transformed into a binary indicator (selected/not selected). Responses to Q16 were analyzed qualitatively using thematic content analysis.

The questionnaire was developed by the research team based on the study objectives, the current regulatory context of professional liability insurance in Kazakhstan, and relevant literature on liability systems and medico-legal perceptions. Because the instrument was designed for this exploratory study, full psychometric validation was not performed prior to field implementation. This should be taken into account when interpreting the findings.

Quantitative variables were summarized as median and interquartile range (Q1–Q3), and categorical variables as n (%). Comparisons of the overall system assessment (Q17) across groups defined by employment sector, length of service, and professional category were performed using the Kruskal–Wallis test. Between-group differences for categorical variables (Q8, Q10, Q12, Q14, Q15) and binary indicators derived from Q6 and Q11 were assessed using the chi-square test or Fisher's exact test, as appropriate for expected cell frequencies. Effect size was estimated using Cramer's V. For Q6 and Q11, multiple comparisons were adjusted using the Benjamini–Hochberg (BH) method separately within each comparison panel (by sector, by length of service, and by professional category).

To examine predictors of support for the creation of a unified electronic insurance claims registry (Q14 = "Yes"), multivariable logistic regression was performed with calculation of odds ratios (ORs), 95% confidence intervals (CIs), and p-values. The model included length of service, employment sector, professional category, and gender. Reference categories were defined as follows: 1–5 years of experience, public sector, physician, and female gender. Given the limited number of observations in some subgroups, this regression analysis was considered exploratory and interpreted cautiously. The events-per-variable (EPV) ratio for the multivariable logistic regression model was below the conventional threshold of 10, further supporting the exploratory interpretation of this analysis.

Responses to Q16 were processed using thematic content analysis. Non-substantive responses (e.g., "I don't know," "no," or "not ready to answer") were identified separately and excluded from thematic coding. Substantive responses were coded using a predefined thematic dictionary containing Russian- and Kazakh-language markers, with multiple coding permitted for a single response. For each theme, frequencies and proportions were calculated both among substantive responses and among all respondents to Q16. In addition, the proportion of substantive responses not classified by the dictionary was assessed as an indicator of the need to expand the coding framework.

Statistical analysis was performed in R version 4.5.2. Data were imported from Excel using the readxl package, and janitor was used for variable name standardization and initial data cleaning. Statistical procedures were conducted using base R and the stats package, including frequency and proportion calculations, the chi-square test, Fisher's exact test, the Kruskal–Wallis test, multivariable logistic regression (glm, family = binomial), and

Benjamini–Hochberg correction for multiple testing (p.adjust, method = "BH"). The level of statistical significance was set at $p<0.05$; adjusted p-values were used where appropriate.

The study was anonymous, and participation was voluntary. All respondents provided informed consent before completing the questionnaire. The study was conducted in accordance with ethical principles and was approved by the Local Bioethics Commission of Astana Medical University (Decision No. 3, Meeting No. 16 dated November 26, 2025).

Results

A total of 106 healthcare workers were included in the analysis. Women predominated (78; 73.6%), and physicians constituted the largest professional group (78; 73.6%), followed by nurses (22; 20.8%). Most respondents had more than 10 years of professional experience (58; 54.7%) and worked in the public sector (76; 71.7%). The groups with less than 1 year of experience (5; 4.7%) and paramedics (1; 0.9%) were very small.

Assessment of attitudes toward the professional liability insurance system showed that half of the respondents had not encountered real insurance claims, with 53 respondents (50.0%) reporting no such experience. At the same time, 48 respondents (45.3%) indicated that they had heard about such cases from colleagues, and 5 respondents (4.7%) had encountered them personally. When asked whether insurance protects the rights of healthcare workers, the most frequently selected response was “partially,” chosen by 50 respondents (47.2%). A total of 31 respondents (29.2%) believed that insurance does not provide protection, while 25 respondents (23.6%) believed that it provides full protection. Regarding which party is most protected within the system, insurance companies were most frequently identified (40; 37.7%), followed closely by patients (39; 36.8%). Less frequently, the state (14; 13.2%) and healthcare workers themselves (13; 12.3%) were indicated. Insurance claim review procedures were considered insufficient by 52 respondents (49.1%), 32 respondents (30.2%) found it difficult to answer, and only 22 respondents (20.8%) assessed the procedures as sufficient.

When responding to the question regarding the ability of insurance to address financial issues related to compensation for harm to patients, 44 respondents (41.5%) found it difficult to provide an assessment. The option “partially, requires improvement” was selected by 23 respondents (21.7%), “yes, it reduces physicians’ financial risks” by 22 respondents (20.8%), and 17 respondents (16.0%) indicated that the system is ineffective. Regarding the impact on trust in the physician–patient relationship, the majority reported no impact (59; 55.7%). A total of 30 respondents (28.3%) believed that the system reduces trust, while 17 respondents (16.0%) believed that it increases trust. The idea of creating a unified electronic registry of insurance claims was supported by 45 respondents (42.5%),

while 39 respondents (36.8%) were uncertain, and 22 respondents (20.8%) expressed concerns about confidentiality breaches. The necessity of mandatory courses on the rights and obligations of healthcare workers in the field of insurance was supported by an overwhelming majority of respondents (91; 85.8%). Thirteen respondents (12.3%) believed that such courses are needed only for managers and newly hired staff, and 2 respondents (1.9%) did not support this measure.

The overall assessment of the current insurance system on a 1–5 scale yielded a median of 3 (Q1–Q3: 2–3), reflecting a predominantly neutral-to-moderate evaluation. Among the most frequently reported professional risks (multiple-choice responses), legal vulnerability in relation to patients ranked highest (77; 72.6%), followed by risks associated with diagnostic errors (38; 35.8%), the absence of clear standards (35; 33.0%), a high likelihood of litigation (31; 29.2%), and complications following procedures (28; 26.4%). As key problems of the existing insurance system (multiple-choice responses), respondents most often identified insufficient transparency (43; 40.6%), low levels of awareness (42; 39.6%), dependence on expert commissions (35; 33.0%), complex compensation procedures (22; 20.8%), and unequal insurance contributions (20; 18.9%) (Table 1).

The assessment of the current professional liability insurance system on a scale of 1–5 (Q17) was compared between respondent groups by work sector, length of service, and professional category using the nonparametric Kruskal–Wallis test. No significant differences were found for the healthcare sector (p=0.2087): the median assessment was 3 (Q1–Q3: 2–3) among public sector employees, 2 (1–3) in the private sector, and 3 (3–4) among those working in both forms. Similarly, no statistically significant differences were found for length of service (p=0.9579): the median assessment was 3 in all groups (less than 1 year – 3 (2–3); 1–5 years – 3 (3–3); 6–10 years – 3 (2–3); more than 10 years – 3 (1–3)). No significant differences were observed by professional category (p=0.5086): the median score for physicians was 3 (2–3), for nurses it was 3 (2–3), and in the "other" group it was 3 (3–3). The "paramedic" category was combined with the "other" group in the professional analysis due to its extremely small number (n=1), which is necessary to ensure the accuracy of group comparisons and the robustness of statistical conclusions. Overall, the results indicate no statistically significant differences in the overall assessment of the insurance system between the subgroups of respondents examined (Table 2).

Categorical indicators of attitudes toward the professional liability insurance system (Q8, Q10, Q12, Q14, Q15) were compared across employment sector, length of service, and professional category groups using the χ^2 test or Fisher's exact test; effect size was assessed using Cramer's V.

Within the healthcare sector, no statistically significant differences were found for any of the indicators examined ($p>0.05$ for all comparisons). However, a trend was observed for the indicator of full protection of healthcare workers' rights (Q8): the proportion of "yes, fully" responses was higher in the public sector (28.9%) compared to the private sector (17.6%) and was absent among respondents working in both forms of insurance (0.0%); the difference was at the borderline of statistical significance (Fisher $p=0.0564$; $V=0.229$), indicating a small to moderate effect size.

When analyzed by length of service, the overall comparison suggested differences in support for the creation of a unified electronic insurance claims registry (Q14) (Fisher $p=0.0125$; $V=0.309$), corresponding to a moderate effect size. Support for the registry was highest among respondents with less than 1 year of service (80.0%) and 6–10 years of service (57.1%), intermediate among those with more than 10 years of service (46.6%), and lowest among those with 1–5 years of service (20.7%). However, because the subgroup with less than 1 year of professional experience was very small (n=5), these estimates should be interpreted with particular caution. A trend toward differences by length of service was also observed for the adequacy of insurance claim review procedures (Q10) (Fisher $p=0.0585$; $V=0.257$), but this result did not reach statistical significance. The remaining indicators (Q8, Q12, Q15) did not differ significantly between experience groups. By professional category (physician, nurse, other), no significant differences were found for any indicators ($p>0.05$); effect sizes were generally small ($V\approx0.09–0.18$). Overall, the results indicate that key differences in attitudes toward the system are primarily based on length of service and primarily affect support for increased transparency through the implementation of a unified electronic registry (Q14). It should be noted that the group with less than one year of service was small (n=5), so the corresponding estimates require cautious interpretation (Table 3).

In pairwise comparisons of experience groups with respect to support for the establishment of a unified electronic registry of insurance claims (Q14; Fisher's exact test), the most pronounced differences were observed between the 1–5 years experience group and the other experience categories: less than 1 year ($p = 0.019$), 6–10 years ($p = 0.0347$), and more than 10 years ($p = 0.021$). However, after adjustment for multiple comparisons using the Benjamini–Hochberg procedure, none of these differences remained statistically significant at the 0.05 level ($p_{adj} = 0.063–0.069$), indicating a trend toward lower support for the registry among respondents with 1–5 years of experience compared with other groups. Comparisons between the 6–10 years and more than 10 years groups, as well as between the less than 1 year group and the 6–10 years and more than 10 years groups, were not statistically significant ($p > 0.05$) (Supplementary Table S1).

In the multivariable logistic regression analysis assessing predictors of support for the creation of a unified electronic insurance claims registry (Q14 = "Yes"), no statistically significant independent associations were identified at the 0.05 level, as the 95% confidence intervals of all odds ratios included 1 (Table 4, Figure 1). However, these findings should be interpreted cautiously because the model was based on a limited sample size and included very small subgroups, particularly respondents with less than 1 year of professional experience. Therefore, the regression analysis should be regarded as exploratory rather than confirmatory. Trends toward higher support for the registry were observed among respondents with 6–10 years of experience compared with those with 1–5 years of experience (OR = 3.07; 95% CI: 0.81–11.58; p = 0.0985) and among respondents working in both sectors compared with those working exclusively in the public sector (OR = 3.44; 95% CI: 0.93–12.66; p = 0.0637), but these associations did not reach statistical significance. Multiple-choice items for question Q6 were transformed into binary indicators (selected/not selected) and compared across respondent groups by employment sector, length of professional experience (four groups, including "<1 year"), and professional category. Comparisons were performed using the chi-square test or Fisher's exact test (depending on expected cell counts), and effect size was assessed using Cramer's V. Adjustment for multiple comparisons was carried out using the Benjamini–Hochberg (BH) method separately within each panel (S2A–S2C).

S2A (by sector). No statistically significant differences were identified for Q6 items between respondents working in the public sector, private sector, and those employed in both sectors after BH correction (for all comparisons p_adj(BH) = 0.9424). Effect sizes were small (V ≈ 0.04–0.10), indicating similar perceptions of risks across sectors. Across all sectors, the most frequently selected risk was "legal vulnerability in relation to patients" (approximately 69–77%), reflecting a stable dominant concern regardless of place of employment.

S2B (by length of experience, four groups). When compared by length of professional experience, the most pronounced signal was observed for the item "legal vulnerability in relation to patients" (Fisher's exact test p = 0.0101; V = 0.315), corresponding to a moderate effect size. However, after BH correction, this result became borderline and did not reach the threshold of statistical significance (p_adj(BH) = 0.0503) and therefore should be interpreted with caution. The following pattern was observed: the highest selection frequency was in the 1–5 years group (89.7%), lower frequencies were observed in the <1 year (40.0%) and 6–10 years (50.0%) groups, and intermediate values were observed in the >10 years group (72.4%). No significant differences were identified for the remaining Q6 items (p_adj(BH) ≥ 0.6058), and effect sizes were predominantly small to moderate (V ≈ 0.13–0.20).

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S2C (by professional category). The clearest differences for Q6 were identified by professional category. The item "legal vulnerability in relation to patients" differed significantly between categories and retained statistical significance after BH correction (Fisher's exact test p = 0.0077; V = 0.306; p_adj(BH) = 0.0385), corresponding to a moderate effect size. This risk was reported more frequently by physicians (79.5%), less frequently by nurses (61.9%), and substantially less frequently by respondents in the "other" category (28.6%). For the item "high likelihood of litigation," a trend was observed (p = 0.0265; V = 0.254); however, statistical significance was not retained after BH correction (p_adj(BH) = 0.0662). The remaining Q6 items did not differ significantly across professional categories (p_adj(BH) ≥ 0.2877).

Multiple-choice items for question Q11 were analyzed analogously: binary coding (selected/not selected), comparisons across groups by sector, length of experience (four groups, including "<1 year"), and professional category using chi-square or Fisher's exact tests, calculation of Cramer's V, and BH correction within each panel (S3A–S3C).

S3A (by sector). In contrast to Q6, statistically significant differences between sectors were identified for Q11 that remained significant after BH correction for three items:
– "Lack of personal control by physicians over the insurance policy" (Fisher's exact test p = 0.0039; V = 0.323; p_adj(BH) = 0.0232), indicating a moderate effect size;
– "Unequal insurance contributions" (Fisher's exact test p = 0.0141; V = 0.262; p_adj(BH) = 0.0423), indicating a small-to-moderate effect size;
– "Complex compensation procedures" (Fisher's exact test p = 0.0230; V = 0.269; p_adj(BH) = 0.0460), indicating a small-to-moderate effect size.

These results indicate that perceptions of certain insurance system problems depend on employment sector. Other items (e.g., "low level of awareness," "insufficient transparency") did not differ significantly between sectors after BH correction (p_adj(BH) ≥ 0.1273), suggesting more homogeneous perceptions for these aspects.

S3B (by length of experience, four groups). No significant differences were identified for Q11 items by length of professional experience after BH correction (for all comparisons p_adj(BH) ≥ 0.6991). Effect sizes were predominantly small (V ≈ 0.04–0.20), indicating generally similar perceptions of system-related problems across experience groups. It should be noted that the <1 year experience group was small (n = 5); therefore, estimates for this subgroup should be interpreted with caution.

S3C (by professional category). Similarly, no differences by professional category (physicians, nurses, other) remained statistically significant after BH correction (all p_adj(BH) ≥ 0.5636). Effect sizes were generally small (V ≈ 0.06–0.20), reflecting comparable perceptions of systemic problems across professional roles.

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The open-ended question Q16 ("What measures could improve the effectiveness of the professional liability insurance system?") was answered by 51 of 106 respondents (48.1%). Of these, 12 responses (23.5%) were non-informative (e.g., "do not know," "no," "answer not ready") and were excluded from thematic analysis; 39 informative responses were used for coding. As respondents could propose several measures simultaneously, a single response could be assigned to multiple themes. The most frequently mentioned theme was the need for information and education (clarification of rules, courses/seminars, communication, training based on real cases), with 14 mentions, accounting for 35.9% of informative responses (and 27.5% of all respondents who answered Q16). This indicates that the primary demand is not so much for changing the concept of insurance itself, but rather for addressing the lack of clear information and practical guidance on how the system operates and how to act in the event of an insurance claim.

The second most frequent group of suggestions concerned refinement or improvement of the system (process optimization, changes "in favor of healthcare workers"), with 5 mentions (12.8% of informative responses). Thus, respondents indicated a need to adjust mechanisms and enhance the system's practical effectiveness. A distinct demand for legal support and advocacy (legal assistance, activity of professional associations, trade union protection) was also identified, with 4 mentions (10.3%). Together with the dominance of "legal vulnerability in relation to patients" as a perceived risk in closed-ended questions, responses to Q16 logically complement the overall picture: a subset of respondents views increased effectiveness of insurance through strengthening legal support and representation of healthcare workers' interests. Less frequently but consistently mentioned were measures related to the regulatory framework and standards (regulations, rules, standardization), with 3 mentions (7.7%), as well as themes of transparency (5.1%), independent expertise (5.1%), and state control/support (5.1%). These directions reflect expectations that the system should be more understandable, fair, and predictable, and that procedures should be more trustworthy.

Isolated responses referred to working conditions and remuneration, simplification of procedures/reduction of bureaucracy, and compensation and payments (each theme accounting for 2.6% of informative responses). Notably, the topic of an electronic registry/digitalization was virtually absent in responses to Q16 (0%), which may indicate that in open-ended suggestions respondents primarily emphasize informational, organizational, and legal improvements rather than technological solutions. A substantial proportion of informative responses (13 of 39; 33.3%) were not automatically classified by the thematic dictionary (diverse/non-standardized formulations). This indicates a wide range of proposals and suggests the need either to expand the coding dictionary or to supplement the analysis with qualitative descriptions of several typical "other" ideas (Table 5).

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Discussion

The findings indicate that the professional liability insurance system is perceived with ambivalence rather than clear approval. Although the overall rating of the system was neutral to moderate (median Q17 = 3), this should not be interpreted as evidence of satisfaction. Rather, the neutral rating appears to reflect uncertainty and cautious acceptance of a system that is formally recognized as necessary but is not yet perceived as sufficiently transparent, predictable, or practically protective. This interpretation is supported by the fact that nearly half of respondents considered insurance claim review procedures inadequate, while a substantial proportion reported difficulty assessing the financial effectiveness of the system. Taken together, these results suggest that healthcare workers may acknowledge the formal role of professional liability insurance while remaining unconvinced about its practical operation. The quantitative findings consistently point to legal and procedural insecurity as central concerns. Across the entire sample, the dominant perceived professional risk was legal vulnerability in relation to patients. This suggests that the insurance system is viewed not only as a financial mechanism, but also as a potential legal safeguard that, in its current form, does not fully meet healthcare workers' expectations. Likewise, the most frequently identified system-level problems–insufficient transparency and low awareness–indicate that the current model may be limited not only by procedural complexity, but also by deficits in communication, institutional trust, and practical understanding of how the mechanism operates in real-world settings. At the subgroup level, the overall assessment of the system and most attitudinal indicators did not differ significantly by employment sector, length of service, or professional category. This pattern may indicate that the general perception of the insurance system is relatively uniform across healthcare workers and reflects broad professional uncertainty rather than sharply differentiated subgroup experiences. At the same time, the comparison by length of service suggested differences in support for the creation of a unified electronic insurance claims registry, with the lowest support observed among respondents with 1–5 years of professional experience. However, these findings should be interpreted with caution because the subgroup with less than 1 year of experience was very small, and pairwise differences did not remain statistically significant after adjustment for multiple comparisons. A similar cautious interpretation applies to the observed trend regarding the adequacy of insurance claim review procedures across experience groups. The multivariable logistic regression analysis did not identify statistically significant independent predictors of support for the registry. This may partly reflect the limited sample size, the small number of respondents in certain subgroups, and the likelihood that support for registry implementation is influenced by factors not directly captured in the questionnaire, such as prior exposure to medico-legal disputes, trust in digital systems, institutional culture, and individual legal literacy.

Accordingly, the regression findings should be regarded as exploratory rather than confirmatory. Sectoral differences were more clearly visible in the assessment of selected system-related problems. In particular, lack of personal physician control over the insurance policy, unequal insurance contributions, and complex compensation procedures differed across sectors and remained significant after adjustment for multiple testing. These findings may reflect organizational differences between public and private healthcare settings in terms of transparency, administrative involvement, and accessibility of insurance-related procedures. In this context, sector may influence not the overall perception of the system, but rather the visibility of specific practical barriers. The open-ended responses further clarified the direction of expected improvements. The most frequently mentioned theme was the need for information and education, including clearer explanations of rules, training activities, and case-based learning. This suggests that healthcare workers do not primarily call for replacement of the insurance model itself; instead, they seek a system that is more understandable, better explained, and easier to navigate in practice. The additional emphasis on legal support, advocacy, and procedural refinement complements the quantitative findings and reinforces the interpretation that the perceived effectiveness of insurance depends largely on transparency, usability, and confidence in legal protection mechanisms. This study has several limitations. First, it was conducted only in Astana, which limits the generalizability of the findings to other regions of Kazakhstan. Second, the study relied on self-reported responses and is therefore subject to recall bias, response bias, and subjective interpretation. Third, the use of convenience sampling may have introduced selection bias. Fourth, some subgroup analyses were based on very small numbers, especially among respondents with less than 1 year of professional experience, which reduced statistical power and the stability of subgroup estimates. Fifth, the cross-sectional design does not permit causal inference. Finally, the study reflects only the perspectives of healthcare workers and does not include the views of patients, insurers, or other relevant stakeholders. In addition, if full psychometric validation of the questionnaire was not performed before implementation, this should be taken into account when interpreting the findings.

Conclusion

A survey of 106 healthcare workers showed that the current professional liability insurance system is perceived as neutral to moderate overall (median 3 on a 1–5 scale), but this neutrality coexists with substantial practical concern. Nearly half of respondents considered insurance claim review procedures insufficient, and a considerable proportion were unable to assess the system's financial effectiveness in relation to compensation for patient harm. The dominant perceived professional risk was legal vulnerability in relation to patients, while insufficient transparency, low awareness, dependence on expert

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commissions, and complex compensation procedures were identified as key systemic problems. A comparative analysis revealed no statistically significant differences in the overall assessment of the system between groups by employment sector, length of service, or professional category, indicating a relatively uniform perception of insurance among the various respondent subgroups. At the same time, individual aspects of the system's problems varied across sectors, which may reflect differences in organizational practices and information availability in public and private institutions. The findings also suggest practical directions for improvement. In addition to general educational initiatives, training programs should include concrete modules on insurance claim procedures, communication with expert commissions, legal rights and obligations of healthcare workers, documentation in disputed cases, and the practical steps to be taken after an adverse event or patient complaint. Taken together, the results indicate that improving the effectiveness of professional liability insurance requires greater transparency and predictability of procedures, stronger educational support, and more visible legal protection mechanisms for healthcare workers.

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Ethics Approval and Consent to Participate This study was approved by the Local Bioethics Commission of Astana Medical University (Decision No. 3, dated November 26, 2025) and was conducted in accordance with the principles of the Declaration of Helsinki. Informed consent was obtained from all participants prior to their participation in the study.

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Tables and Legends

Table 1. Characteristics of respondents and distribution of answers to questionnaire questions (N=106)

Indicator	Category / value	n	%
Respondent characteristics			
Sex	Female	78	73.6
	Male	28	26.4
Professional category	Physician	78	73.6
	Nurse	22	20.8
	Other	5	4.7
	Paramedic	1	0.9
Work experience	More than 10 years	58	54.7
	1–5 years	29	27.4
	6–10 years	14	13.2
	Less than 1 year	5	4.7
Healthcare sector	Public	76	71.7
	Private	17	16.0
	Both sectors	13	12.3
Medical specialization (top 8)	Therapy / Internal Medicine	27	25.5
	Neurology / Psychiatry	17	16.0
	Nursing (ward, procedural, primary care, etc.)	17	16.0
	General Surgery	9	8.5

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	Dentistry	4	3.8
	Pediatrics	3	2.8
	General Practice	3	2.8
	Anesthesiology and Intensive Care	3	2.8
	Other specialties	23	21.7
Attitudes toward the professional liability insurance system			
Experience with actual insurance claims (self or colleagues)	No	53	50.0
	Yes, heard from colleagues	48	45.3
	Yes, personally	5	4.7
Does insurance protect the rights of healthcare workers?	Partially	50	47.2
	No	31	29.2
	Yes, fully	25	23.6
Who is most protected within the system?	Insurance company	40	37.7
	Patient	39	36.8
	State	14	13.2
	Healthcare worker	13	12.3
Are insurance claim review procedures sufficient?	No	52	49.1
	Difficult to answer	32	30.2
	Yes	22	20.8
	Difficult to answer	44	41.5

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Does insurance address financial compensation for harm to patients?	Partially, requires improvement	23	21.7
	Yes, reduces physicians' financial risks	22	20.8
	No, the system is ineffective	17	16.0
Impact of the system on physician–patient trust	No impact	59	55.7
	Reduces trust	30	28.3
	Increases trust	17	16.0
Is a unified electronic registry of insurance claims needed?	Yes, it would increase transparency	45	42.5
	Not sure	39	36.8
	No, it may violate confidentiality	22	20.8
Are mandatory courses on rights and obligations needed?	Yes	91	85.8
	Only for managers and newly hired staff	13	12.3
	No	2	1.9
System rating (1–5)			
Median (Q1–Q3)	3 (2–3)	106	
Most frequently reported risks (multiple choice, Q6)			
Risk	Legal vulnerability in relation to patients	77	72.6
	Risks associated with diagnostic errors	38	35.8
	Lack of clear standards	35	33.0
	High likelihood of litigation	31	29.2
	High likelihood of complications after procedures	28	26.4

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Most notable problems (multiple choice, Q11)			
Problem	Insufficient transparency	43	40.6
	Low level of awareness	42	39.6
	Dependence on expert commissions	35	33.0
	Complex compensation procedures	22	20.8
	Unequal insurance contributions	20	18.9

*Note: For questions Q6 and Q11, multiple responses were allowed; therefore, percentages may exceed 100%. n indicates the number of respondents who selected the option; % represents the proportion of the total number of respondents (N = 106). Percentages were rounded to one decimal place.

Table 2. Assessment of the current professional liability insurance system (Q17, scale 1–5) by respondent characteristics (N=106)

Grouping variable	Group level	n	Q17, median (Q1–Q3)	p (Kruskal–Wallis)
Healthcare sector	Public	76	3 (2–3)	0.2087
	Private	17	2 (1–3)	
	Both sectors	13	3 (3–4)	
Length of professional experience in medicine	Less than 1 year	5	3 (2–3)	0.9579
	1–5 years	29	3 (3–3)	
	6–10 years	14	3 (2–3)	
	More than 10 years	58	3 (1–3)	
Professional category	Physician	78	3 (2–3)	0.5086
	Nurse	22	3 (2–3)	
	Other	6	3 (3–3)	

*Data are presented as median (Q1–Q3). Group comparison: Kruskal–Wallis test.

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Table 3. Key indicators of attitudes toward the professional liability insurance system: proportion of "Yes" responses by respondent characteristics (N=106)

Data are presented as yes/n (%). For group comparisons, the χ^2 test or Fisher's exact test (for low expected frequencies) was used. Effect size: Cramer's V.

Table 3 A. Healthcare sector

Indicator (criterion "Yes")	Public (n = 76)	Private (n = 17)	Both sectors (n = 13)	Test	p-value	V
Q8. Full protection of rights ("Yes, fully")	22/76 (28.9)	3/17 (17.6)	0/13 (0.0)	Fisher	0.0564	0.229
Q10. Procedures are sufficient ("Yes")	14/76 (18.4)	5/17 (29.4)	3/13 (23.1)	Fisher	0.5565	0.100
Q12. Addresses financial issues ("Yes, reduces risks")	16/76 (21.1)	3/17 (17.6)	3/13 (23.1)	Fisher	1.0000	0.037
Q14. Unified registry needed ("Yes, would increase transparency")	30/76 (39.5)	6/17 (35.3)	9/13 (69.2)	χ^2	0.1082	0.205
Q15. Mandatory courses needed ("Yes")	67/76 (88.2)	13/17 (76.5)	11/13 (84.6)	Fisher	0.3615	0.122

Table 3 B. Work experience in medicine

Indicator (criterion "Yes")	<1 year (n = 5)	1–5 years (n = 29)	6–10 years (n = 14)	>10 years (n = 58)	Test	p-value	V
Q8. Full protection of rights	1/5 (20.0)	8/29 (27.6)	2/14 (14.3)	14/58 (24.1)	Fisher	0.8831	0.096
Q10. Procedures are sufficient	2/5 (40.0)	10/29 (34.5)	1/14 (7.1)	9/58 (15.5)	Fisher	0.0585	0.257
Q12. Addresses financial issues	1/5 (20.0)	6/29 (20.7)	2/14 (14.3)	13/58 (22.4)	Fisher	0.9749	0.066
Q14. Unified registry needed	4/5 (80.0)	6/29 (20.7)	8/14 (57.1)	27/58 (46.6)	Fisher	0.0125	0.309
Q15. Mandatory courses needed	5/5 (100.0)	25/29 (86.2)	13/14 (92.9)	48/58 (82.8)	Fisher	0.8187	0.132

Table 3 C. Professional category

Indicator (criterion "Yes")	Physician (n = 78)	Nurse (n = 21)	Other (n = 7)	Test	p-value	V
Q8. Full protection of rights	**18/78 (23.1)**	**4/21 (19.0)**	**3/7 (42.9)**	**Fisher**	**0.4446**	**0.126**
Q10. Procedures are sufficient	**16/78 (20.5)**	**3/21 (14.3)**	**3/7 (42.9)**	**Fisher**	**0.2295**	**0.157**
Q12. Addresses financial issues	**17/78 (21.8)**	**3/21 (14.3)**	**2/7 (28.6)**	**Fisher**	**0.6398**	**0.089**
Q14. Unified registry needed	**36/78 (46.2)**	**8/21 (38.1)**	**1/7 (14.3)**	**Fisher**	**0.2492**	**0.165**
Q15. Mandatory courses needed	**64/78 (82.1)**	**20/21 (95.2)**	**7/7 (100.0)**	**Fisher**	**0.2042**	**0.184**

Note: Numbers may vary slightly across subgroup analyses because of missing responses for individual questionnaire items. The paramedic category was merged with the "other" group in the professional-category analysis.

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Table 4. Multivariate logistic regression: predictors of support for a unified electronic insurance claims registry (Q14 = 1, "Yes")

Predictor	OR	95% CI	p-value
Experience: 6–10 years vs 1–5 years	3.07	0.81–11.58	0.0985
Experience: >10 years vs 1–5 years	1.99	0.76–5.16	0.1592
Sector: both sectors vs public	3.44	0.93–12.66	0.0637
Sector: private vs public	0.83	0.25–2.74	0.7571
Professional category: other vs physician	0.26	0.03–2.38	0.2333
Professional category: nurse vs physician	0.65	0.22–1.87	0.4204
Sex: male vs female	1.84	0.71–4.76	0.2095

***Model: q14_yes ~ experience + sector + professional_category + sex (binomial).**

****Reference categories: 1–5 years of experience; public sector; physician; female.**

Table 5. Thematic analysis of responses to the open-ended question Q16 *"What measures could improve the effectiveness of the professional liability insurance system?"*

Theme (category)	n	% of informative responses (n = 39)	% of all Q16 respondents (n = 51)
Information / education / clarification (courses, seminars, case-based training, communication)	14	35.9	27.5
System refinement / improvement (optimization, "in favor of healthcare workers")	5	12.8	9.8
Legal support and advocacy (professional associations / trade unions / rights protection)	4	10.3	7.8
Regulatory framework / standards / regulations	3	7.7	5.9
Transparency	2	5.1	3.9
Independent expertise / commissions	2	5.1	3.9

State support / supervision / oversight	2	5.1	3.9
Working conditions and remuneration	1	2.6	2.0
Simplification of procedures / reduction of bureaucracy	1	2.6	2.0
Payments / compensation / reimbursement	1	2.6	2.0
Other proposals (informative but not classified by the coding dictionary)	13	33.3	25.5

***N = 106; respondents who answered Q16: n = 51 (48.1%). Informative responses used for coding: n = 39 (multiple coding was allowed: one response could include several themes).**

Supplementary Tables

Supplementary Table S1. Pairwise Fisher's exact tests for Q14 by length of professional experience with Benjamini–Hochberg adjustment

Group 1	Group 2	p-value	p_adj (BH)
<1 year	1–5 years	0.0190	0.0633
1–5 years	>10 years	0.0211	0.0633
1–5 years	6–10 years	0.0347	0.0693
<1 year	>10 years	0.1961	0.2941
<1 year	6–10 years	0.6027	0.6027
>10 years	6–10 years	0.5586	0.6027

Supplementary Table S2. Q6 (multi-select): between-group comparisons of perceived professional risks. Data are presented as yes/n (% within group). Fisher's exact test or χ^2 test (as appropriate); effect size: Cramer's V. BH = Benjamini–Hochberg adjustment within each panel.

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S2A. By sector

Q6 item	Public sector (n=76)	Private sector (n=17)	Both sectors (n=13)	Test	p	Cramer's V	p_adj (BH)
High probability of complications after procedures	22/76 (28.9)	4/17 (23.5)	2/13 (15.4)	Fisher	0.6073	0.104	0.9424
High probability of lawsuits	21/76 (27.6)	5/17 (29.4)	5/13 (38.5)	Fisher	0.7002	0.077	0.9424
Lack of clear standards	27/76 (35.5)	5/17 (29.4)	3/13 (23.1)	Fisher	0.7190	0.092	0.9424
Risks related to diagnostic errors	28/76 (36.8)	7/17 (41.2)	4/13 (30.8)	Fisher	0.8549	0.057	0.9424
Legal vulnerability to patients	55/76 (72.4)	13/17 (76.5)	9/13 (69.2)	Fisher	0.9424	0.044	0.9424

S2B. By experience

Q6 item	<1 year (n=5)	1–5 years (n=29)	6–10 years (n=14)	>10 years (n=58)	Test	p	Cramer's V	p_adj (BH)
Legal vulnerability to patients	2/5 (40.0)	26/29 (89.7)	7/14 (50.0)	42/58 (72.4)	Fisher	0.0101	0.315	0.0503
Risks related to diagnostic errors	0/5 (0.0)	9/29 (31.0)	6/14 (42.9)	24/58 (41.4)	Fisher	0.2864	0.196	0.6058
High probability of lawsuits	1/5 (20.0)	6/29 (20.7)	3/14 (21.4)	21/58 (36.2)	Fisher	0.4326	0.168	0.6058
Lack of clear standards	0/5 (0.0)	10/29 (34.5)	4/14 (28.6)	21/58 (36.2)	Fisher	0.4846	0.165	0.6058
High probability of complications after procedures	1/5 (20.0)	7/29 (24.1)	2/14 (14.3)	18/58 (31.0)	Fisher	0.6984	0.133	0.6984

S2C. By professional category

Q6 item	Physician (n=78)	Nurse (n=21)	Other (n=7)	Test	p	Cramer's V	p_adj (BH)
Legal vulnerability to patients	62/78 (79.5)	13/21 (61.9)	2/7 (28.6)	Fisher	0.0077	0.306	0.0385*

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High probability of lawsuits	28/78 (35.9)	3/21 (14.3)	0/7 (0.0)	Fisher	0.0265	0.254	0.0662
Risks related to diagnostic errors	32/78 (41.0)	4/21 (19.0)	3/7 (42.9)	Fisher	0.1831	0.183	0.2877
High probability of complications after procedures	21/78 (26.9)	7/21 (33.3)	0/7 (0.0)	Fisher	0.2302	0.169	0.2877
Lack of clear standards	27/78 (34.6)	5/21 (23.8)	3/7 (42.9)	Fisher	0.5159	0.106	0.5159

Supplementary Table S3. Q11 (multi-select): between-group comparisons of perceived system problems (all items).

Data are presented as yes/n (% within group). Fisher's exact test or χ^2 test (as appropriate); effect size: Cramer's V. BH = Benjamini–Hochberg adjustment within each panel.

S3A. By sector

Q11 item	Public sector (n=76)	Private sector (n=17)	Both sectors (n=13)	Test	p	Cramer's V	p_adj (BH)
Lack of physician personal control over the insurance policy	5/76 (6.6)	3/17 (17.6)	5/13 (38.5)	Fisher	0.0039	0.323	0.0232*

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Unequal insurance contributions	15/76 (19.7)	0/17 (0.0)	5/13 (38.5)	Fisher	0.0141	0.262	0.0423*
Complex compensation procedures	11/76 (14.5)	5/17 (29.4)	6/13 (46.2)	Fisher	0.0230	0.269	0.0460*
Low awareness level	27/76 (35.5)	11/17 (64.7)	5/13 (38.5)	Chi-square	0.0849	0.216	0.1273
Insufficient transparency	30/76 (39.5)	6/17 (35.3)	7/13 (53.8)	Chi-square	0.5531	0.106	0.5737
Dependence on expert commission	23/76 (30.3)	7/17 (41.2)	5/13 (38.5)	Fisher	0.5737	0.094	0.5737

S3B. By experience

Q11 item	<1 year (n=5)	1–5 years (n=29)	6–10 years (n=14)	>10 years (n=58)	Test	p	Cramer's V	p_adj (BH)
Lack of physician personal control over the insurance policy	1/5 (20.0)	1/29 (3.4)	1/14 (7.1)	10/58 (17.2)	Fisher	0.2062	0.195	0.6991
Dependence on expert commission	0/5 (0.0)	8/29 (27.6)	4/14 (28.6)	23/58 (39.7)	Fisher	0.2865	0.197	0.6991
Unequal insurance contributions	0/5 (0.0)	3/29 (10.3)	3/14 (21.4)	14/58 (24.1)	Fisher	0.3495	0.186	0.6991

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Insufficient transparency	3/5 (60.0)	13/29 (44.8)	5/14 (35.7)	22/58 (37.9)	Fisher	0.7082	0.111	0.9857
Complex compensation procedures	1/5 (20.0)	5/29 (17.2)	4/14 (28.6)	12/58 (20.7)	Fisher	0.8359	0.084	0.9857
Low awareness level	2/5 (40.0)	11/29 (37.9)	6/14 (42.9)	24/58 (41.4)	Fisher	0.9857	0.035	0.9857

S3C. By professional category

Q11 item	Physician (n=78)	Nurse (n=21)	Other (n=7)	Test	p	Cramer's V	p_adj (BH)
Low awareness level	32/78 (41.0)	6/21 (28.6)	5/7 (71.4)	Fisher	0.1314	0.195	0.5636
Insufficient transparency	35/78 (44.9)	5/21 (23.8)	3/7 (42.9)	Fisher	0.1879	0.170	0.5636
Lack of physician personal control over the insurance policy	9/78 (11.5)	4/21 (19.0)	0/7 (0.0)	Fisher	0.4974	0.134	0.8501
Unequal insurance contributions	13/78 (16.7)	5/21 (23.8)	2/7 (28.6)	Fisher	0.5668	0.098	0.8501
Complex compensation procedures	18/78 (23.1)	3/21 (14.3)	1/7 (14.3)	Fisher	0.7647	0.096	0.9177
Dependence on expert commission	27/78 (34.6)	6/21 (28.6)	2/7 (28.6)	Fisher	0.9348	0.057	0.9348

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Figures and Legends

Figure 1. Adjusted predictors of support for a unified electronic insurance claims registry (Q14): odds ratios (ORs) and 95% confidence intervals (CIs).