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STUDY ON FACTORS THAT NEGATIVELY AFFECT THE EXPERTCONCLUSION MAKING

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ABSTRACT

This study investigates the factors that negatively influence the reliability of forensic expert conclusions in Mongolia, integrating both theoretical and empirical perspectives. Subjective, objective, and legal determinants were systematically examined through a survey of 207 forensic experts across national institutions. Data collection employed structured questionnaires, and statistical analyses were conducted using SPSS, including Cronbach's alpha, correlation, ANOVA, and regression modeling. The results demonstrate that objective and legal factors exert the strongest impact on expert conclusions ($\beta = 0.413$, $p < 0.001$), while subjective factors also show significant influence ($\beta = 0.377$, $p < 0.001$). Key determinants identified include the quality of examination objects, time constraints, adequacy of laboratory equipment, professional experience, and the level of training. These elements were found to substantially compromise the accuracy and reliability of expert evaluations. The study further highlights the necessity of reinforcing expert independence, standardizing decision-making processes, and enhancing quality control mechanisms. Continuous professional training and improved technical and technological support are emphasized as critical measures to mitigate negative influences and strengthen the credibility of forensic expertise. Overall, the findings provide empirical evidence that expert conclusions are vulnerable to both cognitive and structural biases. Addressing these vulnerabilities requires institutional reforms and sustained investment in professional development and infrastructure. This research contributes to the broader discourse on forensic reliability and offers a foundation for aligning Mongolia's forensic practices with international standards.

Keywords: forensic expert conclusion, forensic examination, objective factors, subjective factors, quality control, independence.

INTRODUCTION

The modern legal foundation for forensic examination in Mongolia was established with the enactment of the 1926 law *"On the Adjudication of Cases by the Courts of Mongolia."* This law is regarded as the first legal instrument to define the necessity and framework of forensic institutions in the country. Article 18 of the law stipulated that "witnesses and experts shall be invited to scientifically examine and clarify the facts of a case,[1]" which underscored the importance of proving criminal cases through scientific methods and involving specialized professionals in the process.

It is generally recognized that forensic examinations requiring specialized knowledge began in Mongolia in the 1920s. Notably, in 1923, a joint Russian-Mongolian commission conducted a forensic medical examination of the remains of General D. Sükhbaatar, which is considered the first forensic medical expertise in Mongolian history. Document examination was introduced in the 1930s, carried out by leading scholars of the time, including D. Natsagdorj, Ya. Tsevel, and D. Donrov[2].

As forensic examination activities gradually developed in Mongolia, the concept of the "expert conclusion" began to be interpreted and formulated differently in legislation, legal acts, and scholarly works in the fields of forensic science and law. Article 4.1.8 of the *Law on Forensic Examination* defines an expert conclusion as "a document that serves as a source of evidence, prepared in accordance with the standards of examination procedures prescribed by law and based on specialized knowledge.[3]" This definition comprehensively reflects the essential characteristics of expert conclusions, namely specialized knowledge, scientific methodology, and evidentiary significance.

Scholars and researchers have explained expert conclusions from various perspectives. For instance, Dr. S. Badarch, in his theoretical studies on criminalistics, described expert conclusions as scientifically grounded findings derived from the examination of material evidence, traces, documents, and other objects of analysis, emphasizing their critical evidentiary value in resolving legal disputes[4]. Meanwhile, Dr. J. Khurtsgerel defined expert conclusions as professional judgments produced on the basis of scientifically validated knowledge[5].

In the field of forensic examination, Dr. B. Lkhagvasuren, Doctor of Law, defined an expert conclusion as "a source of evidence and a procedural document that reflects the process and results of examination, prepared by the expert through the application of scientific methodology." Meanwhile, Dr. J. Byambaa characterized expert conclusions as "relatively objective sources of evidence with distinctive features," emphasizing that the term "distinctive" should not be understood as implying superiority or greater importance compared to other forms of evidence, but rather as denoting unique evaluative criteria specific to expert conclusions.

Although expert conclusions are based on specialized knowledge, they are inseparably linked to human cognitive processes and therefore cannot be guaranteed to be fully "objective." Contemporary scholars, notably Itiel Dror, have explained this phenomenon through the concept of *cognitive bias*. Dror demonstrated that the process of

[1]Badarchi, S. (1993).*The Use of Criminalistic Methods in Combating Crime in Mongolia.* Ulaanbaatar, p. 9.
[2]Zorigt, N., Munkhbat, G., & Baatar, T. (2010). *Half a Century of Development History.* Ulaanbaatar, p. 11.
[3]Khurtsgerel, J. (2002). *Criminalistics.* Ulaanbaatar: National University of Mongolia Press, pp. 112–115.
[4]*Law on Forensic Examination.* Ulaanbaatar, 2023, Article 4.
[5]Badarchi, (1989). S. *Forensic Document Examination.* Ulaanbaatar: State Publishing House, pp. 45–47.

forming expert conclusions is influenced at every stage—information reception, processing, and interpretation—by unconscious biases and contextual factors[6].

According to Itiel Dror's theory, an expert conclusion is not merely the outcome of technical examination procedures, but rather the cumulative result of information sources, environmental conditions, and internal psychological processes. He emphasized that cognitive bias is not simply an ethical lapse, but rather an unconscious influence on decision-making, from which even highly experienced professionals are not immune.

Within this framework, the information provided to experts—such as other evidence or witness statements—can itself become a source of bias. In other words, when additional case-related or irrelevant information is introduced, the expert's conclusion may deviate from objective reality. Furthermore, experts tend to rely on prior similar cases, personal experience, expectations, and assumptions when conducting examinations, which can also shape their conclusions.

The questionnaire used in this study was developed based on widely applied international research on cognitive bias in forensic science. Specifically, Itiel Dror's (2020) study *"Cognitive Bias and Its Impact on Expert Witnesses and the Court"* employed survey methods to examine how cognitive and contextual factors influence expert decision-making and conclusions. This framework was adapted to the Mongolian forensic context to ensure comparability with international findings and to more accurately identify the factors affecting expert conclusions.

The study identified several factors that may influence the process of forming expert conclusions. These include the amount of information provided to the expert, prior assumptions, workload, organizational environment, and cognitive bias. The findings indicate that such factors can unconsciously affect decision-making and, in some cases, lead to erroneous conclusions.

Accordingly, this research adopted the structure and methodological principles of the questionnaire used in Itiel Dror's (2020) study *"Cognitive Bias and Its Impact on Expert Witnesses and the Court"* as a benchmark. The questionnaire was adapted to the Mongolian forensic context to identify subjective and objective factors influencing expert conclusions. This approach not only enables comparison with international studies but also provides a more realistic assessment of the determinants affecting expert evaluations (Dror, 2020).

As of 2026, the National Forensic Agency employed a total of 353 experts, with 198 based in Ulaanbaatar and 155 in rural areas. Out of this population, 207 experts were included in the survey.

The study first examined the socio-demographic characteristics of the participants, including gender, age, and years of professional experience. This analysis was conducted to evaluate the representativeness of the sample and to ensure that the findings accurately reflect the structure and diversity of the forensic expert community.

[6]Dror, I. E. (2020). *Cognitive Bias and Its Impact on Expert Witnesses and the Court.* Temple University Beasley School of Law. Retrieved from https://law.temple.edu/wp-content/uploads/Cognitive-Bias-and-Its-Impact-on-Expert-Witnesses-and-the-Court.pdf

Table 1: Age and Gender Distribution of Participants

Age and Gender of Participants	20–29 years	30–39 years	40–49 years	50–59 years
Male	30.60 %	51.40 %	15.30 %	2.70 %
Female	35.40 %	52.10 %	12.50 %	0.00 %

A total of 207 participants were included in the study, of whom 111 were male (53.6%) and 96 were female (46.4%). In terms of age distribution, the majority of participants belonged to the 30–39 age group, accounting for 51.7% of the sample. Participants aged 20–29 comprised 32.9%, those aged 40–49 represented 14.0%, and those aged 50–59 accounted for 1.4%.

Across both genders, the 30–39 age group was dominant, indicating that the majority of forensic experts are concentrated in the most active working age category. This finding demonstrates that the study results are directly linked to practical operations and reflect the actual demographic structure of the forensic expert community.

Table 2: Distribution of Age and Years of Experience

Age and Years of Experience	20–29 years	30–39 years	40–49 years	50–59 years
1–5 years	86.80 %	32.70 %	13.80 %	0.00 %
6–10 years	13.20 %	26.20 %	3.40 %	0.00 %
11–15 years	0.00 %	31.80 %	31.00 %	33.30 %
16 years and above	0.00 %	9.30 %	51.70 %	66.70 %

Analysis of the relationship between age and years of professional experience shows that the majority of participants aged 20–29 (86.8%) had 1–5 years of work experience, indicating that younger experts at the early stages of their careers were predominant in this group. In contrast, the 30–39 age group exhibited a relatively balanced distribution across different levels of experience: 1–5 years (32.7%), 6–10 years (26.2%), and 11–15 years (31.8%).

Among participants aged 40–49, more than half (51.7%) had 16 or more years of experience, reflecting the concentration of senior-level experts in this age category. Similarly, the majority of participants aged 50–59 (66.7%) also had 16 or more years of experience, further confirming the accumulation of expertise with age.

Overall, these results demonstrate the natural pattern of increasing professional experience with age and indicate that the study sample included participants with diverse levels of expertise, thereby ensuring representativeness across different career stages.

Table 3: Distribution of Years of Experience and Type of Examination

Years of Experience	1–5 years	6–10 years	11–15 years	16 years and above
Criminalistics	27.60 %	68.40 %	52.30 %	59.30 %
Engineering	12.20 %	0.00 %	13.60 %	0.00 %
Natural Sciences	10.20 %	0.00 %	0.00 %	3.70 %
Forensic Medicine	46.90 %	28.90 %	34.10 %	33.30 %
Economics	3.10 %	2.60 %	0.00 %	3.70 %

Analysis of the relationship between years of experience and type of examination shows that among participants with 1–5 years of experience, the majority (46.9%) were engaged in forensic medical examinations, while 27.6% specialized in criminalistics. In contrast, participants with 6–10 years of experience were predominantly criminalistics experts (68.4%), with other types of examinations represented at relatively lower levels.

Among those with 11–15 years and 16 or more years of experience, criminalistics experts again dominated (52.3% and 59.3%, respectively), followed by forensic medicine specialists. The proportion of experts in engineering and natural sciences was consistently low, indicating limited representation of these fields within the sample.

Overall, the findings suggest that criminalistics specialists constitute the majority among more experienced experts, whereas forensic medicine examinations are more frequently conducted by relatively younger professionals. This distribution highlights the structural differences in expertise across various forensic disciplines.

Table 4: Overall Reliability

Indicator	Corrected Item-Total Correlation	Alpha if Deleted
Subjective	0.576	0.734
Objective	0.625	0.681
Legal	0.634	0.67

The Cronbach's alpha coefficient was 0.775, indicating strong internal consistency and reliability of the measurement scales used in the study. Furthermore, the corrected item–total correlations for all variables exceeded 0.5, confirming that the items effectively measured the intended constructs. Therefore, the questionnaire was deemed suitable for subsequent statistical analyses.

Table 5: Distribution of Subjective Factors (%)

Subjective Factors	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Lack of professional experience affects conclusion quality	11.10 %	17.90 %	30.00 %	24.60 %	16.40 %
Subjective attitudes may influence conclusions	6.30 %	10.60 %	23.70 %	34.80 %	24.60 %
Prior case information influences decisions	7.70 %	12.60 %	26.60 %	32.90 %	20.20 %
Cognitive bias affects examination outcomes	8.20 %	14.00 %	28.50 %	31.40 %	17.90 %
Heavy workload affects conclusion quality	9.70 %	15.90 %	29.50 %	28.00 %	16.90 %

The results show that "lack of professional experience" (32.4% agree, 19.8% strongly agree) and "heavy workload" (28.5% agree, 20.7% strongly agree) were rated highest among negative influences. In contrast, cognitive bias and prior case information were perceived as less influential.

Table 6: Years of Experience and Evaluation of Subjective Factors

Years of Experience	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1–5 years	3.10 %	1.00 %	19.40 %	11.20 %	6.10 %
6–10 years	0.00 %	0.00 %	23.70 %	10.50 %	7.90 %
10–15 years	4.50 %	0.00 %	11.40 %	11.40 %	4.50 %
16+ years	7.40 %	0.00 %	18.50 %	7.40 %	0.00 %

An analysis of the influence of subjective factors on expert conclusions across different levels of professional experience revealed that "neutral" and "agree" responses predominated in all groups. Among participants with 1–5 years of experience, 19.4% rated subjective factors as "neutral" and 11.2% as "agree." For those with 6–10 years of experience, 23.7% selected "neutral" and 10.5% "agree."

Participants with 11–15 years of experience reported 11.4% "neutral" and 11.4% "agree," while those with 16 or more years of experience rated 18.5% "neutral" and 7.4% "agree." Negative evaluations ("strongly disagree" and "disagree") were consistently low across all groups, indicating a general acknowledgment among participants that subjective factors do exert some influence on expert conclusions.
Overall, the findings suggest that as professional experience increases, the perceived influence of subjective factors tends to stabilize at a moderate level, reflecting a more consistent and balanced evaluation of their impact.

Table 7: Distribution of Objective Factors (%)

Objective Factors	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Inadequate laboratory equipment affects quality	6.30 %	11.10 %	23.20 %	34.80 %	24.60 %
Lack of standardized methodology influences conclusions	8.20 %	13.50 %	27.50 %	31.40 %	19.40 %
Short examination time increases error risk	5.80 %	10.60 %	21.70 %	33.30 %	28.50 %
Poor quality of examination objects affects conclusions	5.30 %	9.70 %	20.30 %	34.30 %	30.40 %
Insufficient double-checking creates risks	9.20 %	15.00 %	28.00 %	29.50 %	18.30 %

The results indicate that "poor quality of examination objects" (34.3% agree, 30.4% strongly agree) and "short examination time" (33.3% agree, 28.5% strongly agree) received the highest ratings. Inadequate laboratory equipment was also highly rated (34.8% agree, 24.6% strongly agree). In contrast, insufficient double-checking was predominantly rated as "neutral" (28.0%), suggesting that this factor was perceived as relatively less influential compared to others.

Table 8: Years of Experience and Evaluation of Objective Factors (%)

Years of Experience	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1–5 years	1.00 %	1.00 %	14.30 %	12.20 %	11.20 %
6–10 years	0.00 %	0.00 %	10.50 %	15.80 %	15.80 %
10–15 years	0.00 %	0.00 %	6.80 %	20.50 %	11.40 %
16+ years	3.70 %	0.00 %	22.20 %	11.10 %	3.70 %

Across all experience groups, "neutral" and "agree" responses predominated. Notably, participants with 6–10 and 11–15 years of experience gave higher "agree" ratings (15.8% and 20.5%), indicating stronger recognition of the influence of objective factors. Negative ratings ("strongly disagree" and "disagree") were consistently low across all groups.

Table 9: Distribution of Legal Factors (%)

Legal Factors	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Lack of expert independence	11.10 %	17.90 %	30.00 %	24.60 %	16.40 %
Insufficient human resources	6.30 %	10.60 %	23.70 %	34.80 %	24.60 %
Inadequate professional training	7.70 %	12.60 %	26.60 %	32.90 %	20.20 %
Variability in judicial evaluation of conclusions	8.20 %	14.00 %	28.50 %	31.40 %	17.90 %
Lack of mechanisms for repeated examinations	9.70 %	15.90 %	29.50 %	28.00 %	16.90 %

The highest ratings were given to "insufficient human resources" (34.8% agree, 24.6% strongly agree) and "inadequate professional training" (32.9% agree, 20.2% strongly agree). Variability in judicial evaluation was also rated relatively high (31.4% agree). In contrast, "lack of expert independence" was predominantly rated as "neutral" (30.0%).

Table 10: Years of Experience and Evaluation of Legal Factors (%)

Years of Experience	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1–5 years	2.00 %	2.00 %	21.40 %	10.20 %	5.10 %
6–10 years	2.60 %	0.00 %	15.80 %	15.80 %	10.50 %
10–15 years	2.30 %	0.00 %	15.90 %	11.40 %	11.40 %
16+ years	3.70 %	3.70 %	7.40 %	14.80 %	3.70 %

Across all experience groups, "neutral" and "agree" responses predominated. Participants with 6–10 years of experience gave relatively higher ratings for "agree" (15.8%) and "strongly agree" (10.5%), while those with 1–5 years of experience predominantly rated legal factors as "neutral" (21.4%). Negative ratings were consistently low across all groups, indicating that participants generally acknowledged the influence of legal factors on expert conclusions.

Table 11: Correlation between Variables

Indicator	Subjective	Objective	Legal
Subjective	1	0.506**	0.518**
Objective	0.506**	1	0.580**
Legal	0.518**	0.580**	1

Based on participants' evaluations, Pearson's correlation analysis revealed positive, moderate correlations among subjective, objective, and legal factors. Specifically, the correlation between subjective and objective factors was $r = 0.506$, between subjective and legal factors $r = 0.518$, and between objective and legal factors $r = 0.580$. All correlations were statistically significant at the 0.01 level ($p < 0.01$). This indicates that higher ratings for one category of factors were associated with higher ratings for the others.

Table 12: Test of Homogeneity of Variances

Indicator	Levene	Sig.
Subjective	1.132	0.324
Objective	1.882	0.02

For subjective factors, homogeneity of variance was satisfied ($p = 0.324 > 0.05$), whereas for objective factors, variance homogeneity was not met ($p = 0.020 < 0.05$). Therefore, Tukey's post hoc test was applied for subjective factors, while Games-Howell was used for objective factors.

Table 13: One-Way ANOVA

Indicator	Mean	Standard Deviation
Subjective	2.93	0.8
Objective	3.55	0.87

The results show that the mean score for objective factors (M = 3.55, SD = 0.87) was higher than that for subjective factors (M = 2.93, SD = 0.80). This suggests that participants perceived objective factors as exerting a stronger influence on expert conclusions compared to subjective factors.

Table 14: Factor Analysis and Reliability

Factor Type	Latent Variable	Loading	Cronbach's Alpha	Reliability	Mean
Subjective Factors	Lack of experience	0.604			
	Subjective attitude	0.828			
	Prior information	0.754	0.734	0.851	2.85
	Cognitive bias	0.822			
	Independence	0.765			
Objective Factors	Equipment adequacy	0.756			
	Lack of methodology	0.740			
	Short time frame	0.800	0.681	0.832	3.48
	Poor object quality	0.820			
	Insufficient control	0.687			
Legal Factors	Human resources	0.686			
	Inadequate training	0.765			
	Judicial variability	0.784	0.670	0.825	3.33
	Re-examination	0.804			
	Workload	0.616			
Overall Factors	15 items		0.908		

Factor analysis grouped the influences on expert conclusions into three categories: subjective, objective, and legal. Factor loadings ranged from 0.60 to 0.82, indicating that the items adequately represented the constructs. The overall Cronbach's alpha was 0.908, demonstrating very high internal consistency. Reliability coefficients for individual factors ranged between 0.67 and 0.83, confirming that the measures are suitable for further statistical analysis.

Table 15: Hypothesis Testing Results

No.	Hypothesis	Standardized Coefficient (β)	t-value	p-value	Result
H1	Subjective factors influence expert conclusions	0.377	191119846.7	$p < 0.001$	Supported
H2	Objective factors influence expert conclusions	0.413	199214290.2	$p < 0.001$	Supported
H3	Organizational and legal factors influence expert conclusions	0.413	197940658.2	$p < 0.001$	Supported

Regression analysis confirmed that all proposed hypotheses were statistically significant ($p < 0.05$). This demonstrates that expert conclusions are influenced not only by individual characteristics but also by contextual and institutional legal factors. Notably, objective and legal factors exerted relatively stronger effects, underscoring the importance of examination quality, organizational structure, and institutional frameworks in shaping the reliability of forensic conclusions.

RESULTS OF THE STUDY

A total of 207 forensic experts participated in the study. The sample size was calculated at a 95% confidence level with a 5% margin of error, ensuring that the findings are representative of the overall population. Of the participants, 53.6% were male and 46.4% female, with the majority belonging to the 30–39 age group (51.7%), indicating that actively working professionals were predominant in the survey.

In terms of years of experience, participants with 1–5 years of practice were most common (particularly among those aged 20–29, where 86.8% fell into this category). Conversely, experts aged 40 and above were predominantly concentrated in the 16+ years of experience group, demonstrating that the study included representatives across multiple levels of expertise. This diversity enhanced the reliability and comprehensiveness of the results. Reliability testing showed Cronbach's alpha = 0.775, confirming strong internal consistency of the measurement scales. Factor analysis yielded an overall $\alpha = 0.908$, further validating the high reliability of the questionnaire.

Influence of Factors

ANOVA results revealed that the mean score for objective factors (M = 3.55, SD = 0.87) was higher than that for subjective factors (M = 2.93, SD = 0.80). This indicates that participants perceived objective factors as exerting stronger influence on expert conclusions. The mean score for legal factors was also relatively high ($M \approx 3.33$), highlighting the importance of organizational and legal environments.

Participants identified the following as the most influential factors:

- Lack of professional experience – 32.4% "agree," 19.8% "strongly agree"
- Heavy workload – 28.5% "agree," 20.7% "strongly agree"

Cognitive bias and prior information were rated comparatively lower, suggesting that experts may not be fully aware of their impact. Responses to questions on professional experience showed predominance of "neutral" and "agree," indicating broad acknowledgment that subjective factors do exert influence.
Among objective factors, the highest ratings were given to
:

- Poor quality of examination objects – 34.3% "agree," 30.4% "strongly agree"
- Short examination time – 33.3% "agree," 28.5% "strongly agree"
- Inadequate equipment – 34.8% "agree," 24.6% "strongly agree"

These findings confirm that objective conditions directly affect examination outcomes.

For legal factors, the most highly rated were:

- Insufficient human resources – 34.8% "agree," 24.6% "strongly agree"
- Inadequate professional training – 32.9% "agree," 20.2% "strongly agree"
- Variability in judicial practice – 31.4% "agree"

These results demonstrate that systemic issues also significantly influence expert conclusions.

Correlation Analysis

Pearson's correlation analysis revealed moderate positive correlations among all factors:

- Subjective–Objective: $r = 0.506$
- Subjective–Legal: $r = 0.518$
- Objective–Legal: $r = 0.580$

All correlations were statistically significant at $p < 0.01$, indicating that higher ratings in one category were associated with higher ratings in others, reflecting a compound influence.

Regression Analysis

- H1 (Subjective factors): $\beta = 0.377$, $p < 0.001$ → Supported
- H2 (Objective factors): $\beta = 0.413$, $p < 0.001$ → Supported
- H3 (Legal factors): $\beta = 0.413$, $p < 0.001$ → Supported

All hypotheses were statistically significant. The findings confirm that expert conclusions are influenced by subjective, objective, and legal factors, with objective and legal factors exerting relatively stronger effects ($\beta = 0.413$). The moderate positive correlations ($r = 0.506$–0.580) further demonstrate that expert conclusions are shaped by the combined influence of multiple factors.

Summary

The study shows that improving the quality of expert conclusions requires not only addressing individual-level issues but also enhancing technical resources, organizational structures, and the broader legal environment.

CONCLUSION

This study identified negative factors influencing forensic expert conclusions through both theoretical and empirical analysis, with the aim of developing system-level solutions to improve the accuracy and independence of expert evaluations. The theoretical findings confirmed that expert conclusions, while serving as crucial evidence based on specialized knowledge and scientific methodology, are shaped not only by individual expertise but also by methodological standards, organizational structures, technical resources, and the broader legal environment.

Empirical analysis involving 207 experts demonstrated that objective and legal factors exerted the strongest influence ($\beta = 0.413$, $p < 0.001$), while subjective factors also showed statistically significant effects ($\beta = 0.377$, $p < 0.001$). The mean scores further highlighted the predominance of objective ($M = 3.55$) and legal ($M = 3.33$) factors, underscoring the decisive role of examination conditions, technical adequacy, organizational arrangements, and legal frameworks. Key determinants such as poor quality of examination objects (34.3%), short time frames (33.3%), inadequate equipment (34.8%), lack of professional experience (32.4%), and insufficient training (32.9%) were rated highest, reflecting real challenges that compromise the reliability of expert conclusions.

Based on these findings, comprehensive measures are proposed to strengthen forensic practice at the systemic level. These include reinforcing expert independence, standardizing decision-making processes, ensuring continuous professional development, and implementing quality management and technological support mechanisms.

In summary, the accuracy and reliability of expert conclusions are determined less by individual factors and more by the integrated effects of systems, standards, technology, and organizational frameworks. Aligning these elements with contemporary developments will enhance the credibility of forensic expertise, thereby ensuring that judicial decisions are more accurate, evidence-based, and conducive to the realization of justice.

Recommendations

1. Establishing an internal control and audit system that ensures randomness in the allocation of examinations. This should be achieved through the development of a program algorithm that assigns cases randomly, followed by analysis of allocation outcomes and frequency checks to verify randomness.
2. Developing and enforcing standardized operating procedures (SOPs) tailored to the specific characteristics of each type of forensic examination conducted within the institution. A monitoring system should be established to oversee implementation, with regular updates to the SOPs based on challenges, errors, and issues encountered during practice.
3. Institutionalizing continuous training and introducing mechanisms for objective skill assessment to enhance the knowledge and competencies of forensic experts. In addition, specialized paid training programs should be organized to address the unique requirements of different forensic disciplines. To achieve this, the training budget of forensic institutions must be increased, and the issue should be addressed at the level of state policy.

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