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The Role of medical analyzes in avoiding medical errors in the Eastern Province of Saudi Arabia

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Abstract:

Objective: This study aims to evaluate the role of medical analyses in avoiding medical errors in the Eastern Province of Saudi Arabia and to assess the impact of a targeted training program on healthcare professionals' knowledge, practices, and perceptions regarding medical analyses.

Methods: A pre-and post-training survey was conducted with 100 healthcare professionals to evaluate their familiarity with medical analyses, their practices related to recommending and interpreting these analyses, and their perceptions of barriers and systemic support. The survey included questions on the frequency of recommending medical analyses, adherence to protocols, consultation practices, patient communication, and encountered barriers. Statistical analyses were performed to assess changes in responses before and after the training, using p-values to determine significance.

Results: The training program led to significant improvements in several areas. Participants showed increased familiarity with different types of medical analyses and were more likely to recommend them regularly. There was a notable improvement in the adoption of standard protocols and an increase in consulting with specialists. Participants also reported enhanced practices in reviewing analysis results with patients. However, barriers such as cost, access, and delays in receiving results remained persistent issues. Perceptions of systemic support improved slightly, but significant barriers continue to impact the effective use of medical analyses.

Conclusions: The training program effectively improved healthcare professionals' knowledge and practices related to medical analyses, contributing to better diagnostic processes and patient care. Despite these improvements, ongoing challenges related to barriers and systemic support require further attention. Addressing these issues through enhanced training, standardized protocols, and systemic changes can help in reducing medical errors and improving overall healthcare quality in the region.

Keywords: Medical analyses, medical errors, healthcare training, diagnostic practices, Eastern Province, Saudi Arabia

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Introduction:

The medical profession is one of the noblest and most significant in terms of responsibility, being inherently humanitarian. A doctor must respect the sanctity of the patient's body and preserve their life while fulfilling their duty as a lifesaver. The medical profession requires a doctor to adhere to a strict set of laws and high ethical standards, all directed towards one goal: making the utmost effort to treat patients, thereby dedicating their lives to them. [1, 2]

Medical errors are a significant concern in healthcare systems globally, often leading to adverse outcomes for patients. Medical analysis plays a pivotal role in mitigating these errors by identifying their root causes and implementing preventive measures. Various studies highlight the importance of structured medical analysis in preventing errors across multiple healthcare settings. [3-5]

The substantial advancement in medical sciences, along with the branching of its specializations, has enabled a qualitative leap in disease treatment and prevention. For example, the development of precise technologies, such as nanotechnologies, has opened new doors in treatment methods, including the invention of efficient medical devices, modern surgical and anesthesia techniques, and even the concept of gene therapy and cell cloning to replace damaged organs with new, healthy ones. [5-7]

Despite all this significant progress in medical sciences, the risks and negative impacts proportionally increase, as errors are inherent to human life. Progress is accompanied by risks, which means the number of medical errors is inevitably higher than before, as reflected in the number of complaints and lawsuits filed against doctors. Although there are no precise statistics on the number of medical errors in Algeria, the Committee for the Defense of Medical Error Victims and the Medical Association estimate that between 150 and more than 200 medical errors occur annually. [8, 9]

Thinking about the causes of medical errors directs us to consider ways to prevent them. One logical solution to ensure more safety and accuracy in medical examinations before any medical intervention is to conduct high-quality medical analyses that provide an accurate report on the patient's health condition before making any decisions. Resorting to medical analyses is essential today, as it allows specialist doctors to diagnose diseases more accurately and quickly. Despite this, medical errors do not cease even with all available means. Thus, the question

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arises as to the extent of the role that medical analyses play in preventing medical errors, which will be addressed in the following research. [10]

For instance, the application of structured Root Cause Analysis (RCA) has been shown to significantly reduce surgical errors across many subspecialties, emphasizing the effectiveness of such analyses in error prevention. Similarly, forensic pharmaceutical analysis and the development of normative measures have been found crucial in preventing medical errors during the circulation of drugs, showcasing the interdisciplinary role of medical analysis in error prevention. [11]

Moreover, the identification of medical errors through comprehensive interventions has successfully reduced medication administration errors, as evidenced in the efforts of healthcare institutions striving for Joint Commission International accreditation. [12]

RCA is a systematic process used to identify the underlying causes of errors in surgical procedures. By analyzing errors and near-misses, healthcare teams can implement targeted interventions to prevent similar incidents in the future. For example, implementing RCA has been shown to reduce surgical errors across various subspecialties by addressing factors like communication breakdowns, inadequate protocols, and equipment failures. [13]

In the multidisciplinary study of medical errors, forensic pharmaceutical analysis is used to investigate errors related to the prescription and administration of drugs. This analysis helps in developing normative measures and guidelines to prevent errors, particularly in the legal context of "Doctor-Patient-Pharmacist-Advocate" relationships. By identifying common sources of errors, such as miscommunication or incorrect dosages, preventive strategies can be implemented to minimize the risk of adverse drug events. [14]

A trend analysis conducted during the Joint Commission International accreditation process highlighted the effectiveness of comprehensive interventions in reducing medication administration errors by over 60%. Strategies included staff training, implementation of standardized procedures, and the use of technology such as barcode scanning for medication verification. [12]

Pharmacist-led interventions at the time of patient discharge have been shown to prevent medication errors. By reviewing and reconciling medications before discharge, pharmacists can identify and correct discrepancies, preventing potential harm to patients and reducing unnecessary healthcare costs. This approach was estimated to prevent significant

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patient harm and save healthcare costs by avoiding emergency or inpatient visits due to medication errors. [15]

The use of wristband barcode scanning technology in medication administration has proven to be effective in preventing errors. A meta-analysis found that this method reduces medication errors by approximately 57.5%, significantly improving patient safety by ensuring the correct medication is administered to the right patient at the correct dosage. [16]

Aim of the study

The primary aim of this study is to investigate the role of medical analyses in minimizing medical errors. This involves examining how accurate and timely medical analyses contribute to error reduction in clinical settings and identifying key factors that enhance the effectiveness of these analyses in improving patient safety and clinical outcomes.

Methodology

Research Problem:

The core research problem addressed in this study is the persistent issue of medical errors in healthcare settings and the role that medical analyses can play in mitigating these errors. Despite advances in medical technology and diagnostics, medical errors continue to pose a significant threat to patient safety, leading to preventable harm and, in some cases, fatalities. The complexity of modern healthcare systems, combined with varying levels of knowledge and practice among healthcare professionals, contributes to the occurrence of these errors.

This research specifically investigates whether a more systematic and informed use of medical analyses can effectively reduce the incidence of medical errors. It explores the current gaps in knowledge, practices, and the barriers that healthcare providers face in fully integrating medical analyses into their diagnostic and treatment processes. By identifying these issues, the study seeks to offer solutions that enhance the accuracy of medical diagnoses and improve patient outcomes, ultimately contributing to a reduction in medical errors.

Importance of the Research

The significance of this research lies in its potential to contribute to the improvement of patient safety and the reduction of medical errors through the effective use of medical analyses. In the context of modern healthcare, medical errors remain a significant challenge, often leading to adverse patient outcomes and increased healthcare costs. By focusing on the

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role of medical analyses, this study aims to highlight the critical importance of accurate diagnostic processes in preventing such errors.

The research is particularly relevant within the Saudi Arabian healthcare system, where the findings can inform best practices and policy decisions across the region. Additionally, this study provides valuable insights for healthcare professionals, administrators, and policymakers, emphasizing the need for continued education, training, and resource allocation to optimize the use of medical analyses. Ultimately, the research underscores the need for a systematic approach to incorporating medical analyses into routine clinical practice as a means of enhancing patient care and ensuring the highest standards of healthcare delivery.

Research Design

Study Period:

The study was conducted over six months, from January to June 2020. This timeframe was chosen to allow for comprehensive data collection across the selected hospitals and medical centers. The six-month duration ensured that the study could capture a wide range of medical cases and practices, providing a more thorough understanding of how medical analyses are utilized in avoiding medical errors. The extended period also allowed for the inclusion of any seasonal variations in medical practice and patient demographics, contributing to the robustness and generalizability of the study's findings.

Sample Size:

The study involved a sample size of 100 participants. This sample was carefully selected to ensure representation across the hospitals and medical centers located in the Eastern Province of Saudi Arabia. The participants were chosen to provide a balanced perspective, capturing a wide range of experiences and insights into the role of medical analyses in avoiding medical errors. The selection of 100 respondents allows for a manageable yet statistically significant analysis, providing robust data to support the study's conclusions while maintaining a focus on the quality and depth of responses.

Data Collection Instrument:

A self-administered questionnaire was used to collect data from the participants.

Questionnaire Structure:

The questionnaire had three main parts:

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Knowledge Section

The first section of the questionnaire was designed to assess the respondents' knowledge of medical analyses and their importance in preventing medical errors. This section included questions that gauged the participants' familiarity with various types of medical tests, such as blood tests, imaging, and biopsies. It also explored their understanding of the critical role these tests play in avoiding diagnostic errors. Additionally, the questions aimed to measure respondents' awareness of instances where medical errors were successfully averted due to accurate analyses and to evaluate their confidence in interpreting the results of these tests. This section provided insights into the baseline knowledge of healthcare professionals and helped identify areas where further education or training might be needed.

Practices Section

The second section focused on the current practices of healthcare professionals regarding the use of medical analyses in clinical settings. It included questions about how frequently respondents recommended medical tests to their patients as part of the diagnostic process. The section also explored whether healthcare professionals followed specific protocols for ordering tests based on symptoms and how often they consulted with specialists when interpreting complex test results. Additionally, this section examined the extent to which practitioners reviewed test results with their patients to ensure understanding and whether the outcomes of medical analyses had ever directly influenced their clinical decisions to avoid potential errors. This section aimed to capture the practical application of medical analyses in everyday clinical practice.

Barriers Section

The third section of the questionnaire sought to identify the barriers that healthcare professionals encounter when utilizing medical analyses in their practice. This section included questions about the most common challenges, such as the cost of tests, lack of access to testing facilities, time constraints, patient refusal, and uncertainty about which tests to order. Respondents were also asked how often they experienced delays in receiving test results and whether they believed the current healthcare system adequately supports the use of medical analyses in preventing errors. Additionally, this section provided an opportunity for participants to suggest additional resources or support that would help them better utilize medical analyses in their practice. Finally, the questionnaire explored patient compliance with recommendations for follow-up medical analyses. This section was crucial in understanding

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the obstacles to the effective use of medical analyses and identifying potential areas for system-wide improvement.

Methodology for Training

Knowledge Section

The methodology for enhancing participants' knowledge of medical analyses begins with a pre-training assessment designed to gauge their baseline understanding. This assessment includes questions on the various types of medical analyses, their purposes, and their role in preventing medical errors. During the training, participants are provided with comprehensive materials covering blood tests, imaging, biopsies, and genetic testing. This content is supplemented with real-world case studies illustrating how these analyses contribute to error reduction. Interactive learning methods, such as quizzes and discussions, are employed to reinforce the material and ensure thorough understanding. Following the training, a post-training assessment is administered to evaluate the knowledge gained. The comparison of pre- and post-training results enables the measurement of improvements in participants' knowledge.

Practices Section

To improve participants' practical skills in using medical analyses, a pre-training evaluation is conducted to assess their current practices and confidence levels. The training includes hands-on workshops where participants practice interpreting results from various medical analyses through simulated case scenarios. These workshops focus on developing practical skills in data analysis and result interpretation. Role-playing exercises are also used to simulate real-life situations where accurate interpretation of medical analyses is crucial for avoiding errors. After the training, participants' practical skills are evaluated through follow-up surveys or practical tests, measuring changes in their confidence and accuracy in interpreting medical analyses.

Barriers Section

Addressing barriers that participants may encounter in effectively using medical analyses involves first identifying these obstacles through pre-training surveys or focus groups. Common barriers might include a lack of resources, insufficient training, or difficulties in applying knowledge. The training addresses these issues by including specific modules aimed at overcoming identified barriers, such as providing additional resources or tools and offering practical solutions to common challenges. Support systems, such as mentoring or expert access, are established to assist participants in overcoming these barriers. A feedback mechanism is

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implemented to allow participants to report ongoing challenges and receive guidance. Post-training follow-up, through surveys or interviews, assesses whether these barriers have been mitigated and whether participants feel more capable of applying their knowledge effectively.

Informed Consent:

Verbal informed consent was obtained from the participants. They verbally expressed their commitment to cooperate with the researcher.

Theoretical Framework

This research is grounded in a thorough review of existing literature, drawing upon specialized Arabic and foreign sources, including books, peer-reviewed journals, and reputable online databases. Additionally, the study incorporates findings from previous research papers, theses, and dissertations that are directly relevant to the topic under investigation. By synthesizing these diverse sources, the research establishes a solid theoretical foundation, ensuring that the analysis is informed by the most current and comprehensive knowledge in the field. This approach not only contextualizes the research within existing academic discourse but also identifies gaps in the literature that this study aims to address.

Data Collection

The empirical data for this study were collected from ten prominent hospitals and medical centers in the Eastern Province of Saudi Arabia. These institutions were selected due to their significant role in the region's healthcare system and their diverse patient populations, which provide a robust dataset for analysis. The hospitals included in this study These healthcare facilities were chosen to represent a broad spectrum of medical services in the region, from specialized hospitals to general medical centers. Data collection involved direct collaboration with these institutions, ensuring access to relevant information while adhering to ethical research standards. This selection of hospitals and medical centers enhances the study’s generalizability and provides a comprehensive understanding of the role of medical analyses in avoiding medical errors within the context of Saudi Arabian healthcare.

Statistical analysis

The results obtained by the researchers will be displayed and analyzed, Data were fed to the pc and analyzed using IBM SPSS software package version 20.0. (Armonk, NY: IBM Corp). We will display the arithmetic means of the questionnaire responses obtained from the sample and present the standard deviations to identify the degree of variation in those responses

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by displaying the frequencies and their percentages to identify the level of responses about the variables.

Reliability and Validity of the Questionnaire:

The reliability of the questionnaire was assessed through the split-half method, which resulted in a correlation coefficient of 0.789, demonstrating substantial reliability. Additionally, the internal consistency of the questionnaire was evaluated using Cronbach's Alpha, which yielded a coefficient of 0.958. This high value reflects excellent reliability and indicates that the questionnaire is highly suitable for use in the study.

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Results

Table 1: Impact of Training on Knowledge and Perceptions of Medical Analyses.

Question	Options	Pre-Training (n=100)	Post-Training (n=100)	P value
How familiar are you with the different types of medical analyses (e.g., blood tests, imaging, biopsies)?	- Very familiar	20%	40%	0.0027
	- Somewhat familiar	30%	35%	
	- Neutral	25%	15%	
	- Not very familiar	15%	5%	
	- Not familiar at all	10%	5%	
Do you believe that medical analyses are essential in preventing medical errors?	- Strongly agree	50%	70%	0.0664
	- Agree	30%	20%	
	- Neutral	15%	8%	
	- Disagree	3%	1%	
	- Strongly disagree	2%	1%	
Which types of medical analyses do you think are most critical in avoiding medical errors?	- Blood tests	60%	75%	0.8213
	- Imaging	50%	65%	
	- Biopsies	40%	55%	
	- Genetic testing	30%	50%	
	- Other	10%	10%	
Are you aware of cases where medical errors were avoided due to accurate medical analyses?	- Yes	45%	70%	0.0006
	- No	55%	30%	
How confident are you in interpreting the results of common medical analyses?	- Very confident	15%	35%	0.00002
	- Confident	25%	40%	
	- Neutral	30%	15%	
	- Not confident	20%	5%	
	- Not confident at all	10%	5%	

The data collected before and after training reveals significant improvements in participants' familiarity with and perceptions of medical analyses. Before the training, 20% of participants reported being "Very familiar" with different types of medical analyses, such as blood tests, imaging, and biopsies, while 10% felt "Not familiar at all." Post-training, the percentage of those who were "Very familiar" increased to 40%, and the proportion of those who were "Not familiar at all" decreased to 5%. This shift is statistically significant, with a p-value of 0.0027, indicating that the training effectively enhanced participants' familiarity with these medical analyses.

In terms of the perceived importance of medical analyses in preventing medical errors, 50% of participants strongly agreed with this statement before the training, and this number rose to 70% afterward. Although there was a noticeable increase, the change was not

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statistically significant (p = 0.0664), suggesting that while training improved perceptions, the effect was not strong enough to reach conventional levels of statistical significance.

Participants' views on the most critical types of medical analyses for avoiding errors showed varied responses. While the importance of blood tests, imaging, biopsies, and genetic testing increased from pre-training to post-training, the changes were not statistically significant (p-values 0.8213). This indicates that while training may have influenced opinions on the importance of these analyses, the results did not consistently achieve statistical significance across all categories.

Awareness of cases where medical errors were avoided due to accurate medical analyses also improved significantly. Before the training, 45% of participants were aware of such cases. This figure increased to 70% post-training, with a highly significant p-value of 0.0006. This demonstrates that the training notably enhanced participants' awareness of the practical impact of medical analyses in preventing errors.

Finally, participants' confidence in interpreting the results of common medical analyses saw a considerable improvement. Initially, 15% of participants were "Very confident" in their ability to interpret these results. Post-training, this percentage increased to 35%, with a p-value of 0.00002, reflecting a significant boost in confidence. This substantial improvement suggests that the training was highly effective in enhancing participants' confidence in their interpretative skills.

Overall, the training program had a positive impact on participants' familiarity with medical analyses, their perceptions of their importance, and their confidence in interpreting results, although the effects on perceived importance and critical types of analyses varied in statistical significance.

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Table 2: ***Impact of Training on Practices Related to Medical Analyses***.

Question	Options	Pre-Training (n=100)	Post-Training (n=100)	P value
How often do you recommend medical analyses to your patients as part of their diagnostic process?	- Always	25%	40%	0.0446
	- Often	30%	35%	
	- Sometimes	25%	15%	
	- Rarely	15%	8%	
	- Never	5%	2%	
Do you have a standard protocol for ordering medical analyses based on specific symptoms?	- Yes	40%	60%	0.0183
	- No	45%	30%	
	- Not sure	15%	10%	
How frequently do you consult with specialists when interpreting complex medical analysis results?	- Always	20%	35%	0.056
	- Often	25%	30%	
	- Sometimes	30%	20%	
	- Rarely	15%	10%	
	- Never	10%	5%	
Do you review the results of medical analyses with your patients to ensure they understand them?	- Always	15%	30%	0.0084
	- Often	25%	35%	
	- Sometimes	30%	20%	
	- Rarely	20%	10%	
	- Never	10%	5%	
Have you ever encountered a situation where a medical analysis result directly influenced your decision to avoid a potential medical error?	- Yes	35%	55%	0.0069
	- No	65%	45%	

The data demonstrates significant changes in participants' practices related to medical analyses as a result of the training.

Before the training, 25% of participants reported that they "Always" recommend medical analyses as part of the diagnostic process. Post-training, this figure increased to 40%, reflecting a significant improvement with a p-value of 0.0446. This change indicates that the training was effective in encouraging more frequent recommendations of medical analyses, thereby potentially improving diagnostic accuracy and patient care.

In terms of having a standard protocol for ordering medical analyses based on specific symptoms, 40% of participants had such a protocol before the training, which increased to 60% afterward, with a p-value of 0.0183. This statistically significant change suggests that the training helped participants adopt more systematic approaches to ordering medical analyses, likely enhancing consistency and effectiveness in their diagnostic practices.

The frequency of consulting with specialists when interpreting complex medical analysis results also showed improvement. Initially, 20% of participants "Always" consulted

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specialists, but this increased to 35% post-training, though this change approached significance with a p-value of 0.056. This indicates that while the training had a positive impact, the effect on consultation practices was not as pronounced as in other areas.

Regarding the practice of reviewing medical analysis results with patients to ensure their understanding, there was a notable improvement. Before the training, 15% of participants "Always" reviewed results with their patients, and this increased to 30% afterward, with a p-value of 0.0084. This significant change reflects the training's effectiveness in promoting patient engagement and comprehension, which is crucial for effective healthcare delivery.

Finally, the data on whether participants have encountered situations where a medical analysis result directly influenced their decision to avoid a potential medical error revealed a significant improvement. Initially, 35% of participants reported such experiences, increasing to 55% post-training, with a p-value of 0.0069. This significant increase suggests that the training successfully enhanced participants' awareness of the critical role of medical analyses in preventing errors, thereby improving their overall clinical decision-making.

Overall, the training had a positive and statistically significant impact on various aspects of participants' practices related to medical analyses, including recommending analyses, implementing standard protocols, reviewing results with patients, and recognizing the role of analyses in avoiding medical errors.

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Table 3: Assessment of Barriers and Perceptions Related to Medical Analyses Before and After Training

Question	Options	Pre-Training (n=100)	Post-Training (n=100)	P value
What are the most common barriers you face when ordering medical analyses?	- Cost	40%	30%	0.9746
	- Lack of access	30%	25%	
	- Time constraints	25%	20%	
	- Patient refusal	20%	15%	
	- Uncertainty	15%	10%	
	- Other	10%	5%	
How often do you encounter delays in receiving medical analysis results?	- Very often	25%	20%	0.6069
	- Often	30%	25%	
	- Sometimes	25%	20%	
	- Rarely	15%	15%	
	- Never	5%	10%	
Do you believe that the current healthcare system adequately supports the use of medical analyses in preventing medical errors?	- Strongly agree	20%	35%	0.056
	- Agree	25%	30%	
	- Neutral	30%	20%	
	- Disagree	15%	10%	
	- Strongly disagree	10%	5%	
In your experience, do patients usually follow up on recommended medical analyses?	- Always	15%	25%	0.2154
	- Often	25%	30%	
	- Sometimes	30%	25%	
	- Rarely	20%	15%	
	- Never	10%	5%	

The data on common barriers faced when ordering medical analyses shows that the percentage of participants citing "Cost" as a barrier decreased from 40% pre-training to 30% post-training, though this change is not statistically significant with a p-value of 0.9746. Similarly, barriers related to "Lack of access," "Time constraints," "Patient refusal," and "Uncertainty" saw minimal changes. The lack of significant change across these barriers suggests that the training may not have effectively addressed these issues or that other systemic factors might be influencing these barriers.

Regarding delays in receiving medical analysis results, the frequency of encountering such delays showed no substantial change. The percentage of participants who experienced delays "Very often" decreased slightly from 25% to 20%, but this change is not statistically significant (p-value of 0.6069). Other categories, including "Often," "Sometimes," "Rarely," and "Never," also exhibited minimal variation. This indicates that the training had a limited impact on reducing delays in receiving results.

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Participants' perceptions of whether the current healthcare system adequately supports the use of medical analyses in preventing errors improved post-training. The percentage of those who "Strongly agree" with this statement increased from 20% to 35%, with a p-value of 0.056. Although this change approaches statistical significance, it suggests a positive shift in participants' views regarding systemic support for medical analyses, potentially due to the training's focus on system-related improvements.

In terms of patient follow-up on recommended medical analyses, there was a slight improvement in participants' perceptions. The percentage of those who reported that patients "Always" follow up increased from 15% to 25%, with a p-value of 0.2154. While this change is not statistically significant, it suggests a trend towards improved patient adherence to recommendations, possibly influenced by increased awareness or engagement as a result of the training.

Overall, the training had varying effects on different aspects related to medical analyses. While there were positive changes in participants' perceptions of systemic support and patient follow-up, the training had limited impact on addressing barriers to ordering analyses and reducing delays in receiving results. These findings highlight areas where further interventions might be necessary to achieve more substantial improvements.

Discussion

In recent years, the critical role of medical analyses in reducing and preventing medical errors has been increasingly recognized within the healthcare community. Medical errors, which can lead to significant patient harm, are often attributed to a lack of familiarity with medical procedures, inadequate training, and insufficient use of diagnostic tools and technologies. As healthcare systems become more complex, the ability to accurately interpret medical analyses and integrate this knowledge into clinical practice is paramount.

Our study found that training participants significantly improved their familiarity with medical analyses, perceptions of their importance, and confidence in interpreting results. Previously, 20% of participants were "Very familiar" with medical analyses, while 10% felt "Not familiar at all." Post-training, the percentage of those who were "Very familiar" increased to 40%, and the proportion of those who were "Not familiar at all" decreased to 5%. The training also increased the perceived importance of medical analyses in preventing medical errors, with 50% of participants strongly agreeing with this statement. However, the effect was

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not statistically significant, suggesting that the training may not have significantly influenced opinions on critical types of analyses.

Our study found that training participants significantly improved their familiarity with medical analyses, perceptions of their importance, and confidence in interpreting results. Previously, 20% of participants were "Very familiar" with medical analyses, while 10% felt "Not familiar at all." Post-training, the percentage of those who were "Very familiar" increased to 40%, and the proportion of those who were "Not familiar at all" decreased to 5%. The training also increased the perceived importance of medical analyses in preventing medical errors, with 50% of participants strongly agreeing with this statement. However, the effect was not statistically significant, suggesting that the training may not have significantly influenced opinions on critical types of analyses.

Our study found that post-training, the percentage of participants who were "Very familiar" with medical analyses increased significantly from 20% to 40%, while those who were "Not familiar at all" decreased from 10% to 5%. This improvement in familiarity is supported by Bari et al. (2016), who noted that pediatric medicine residents showed increased caution and improved attention to detail after being exposed to medical errors, enhancing their training and subsequent familiarity with medical procedures. This highlights the role of training in building expertise and reducing errors. [17]

The increased confidence in interpreting results, as observed in Our study, is corroborated by Ta'an et al. (2020), who found that a lack of training was a significant barrier to preventing and reporting medical errors among nurses and nursing students in Jordan. Their study suggested that improved training could enhance both confidence and competence in handling medical analyses, leading to better clinical outcomes. [18]

Despite the positive outcomes of Our training program, some barriers such as cost, lack of access, and time constraints remained unaddressed. Ahmed et al. (2019) explored similar barriers in a study conducted at a tertiary hospital in Kuwait, where high workloads and inadequate training were identified as significant factors contributing to medical errors. This suggests that while training improves familiarity and perception, systemic issues must also be addressed to fully integrate medical analyses into routine practice. [19]

The lack of statistically significant changes in participants' opinions on critical types of analyses after training indicates that more comprehensive interventions might be needed. Mansour et al. (2020) found that physicians who attended workshops on medical liability were

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more knowledgeable and influenced by legal frameworks in their decision-making regarding error disclosure, suggesting that ongoing education combined with legal and systemic support can drive more substantial changes in practice. [20]

Our study shows training significantly improved participants' practices related to medical analyses. Previously, 25% of participants recommended medical analyses as part of the diagnostic process, increasing to 40% post-training. The training also led to a standard protocol for ordering medical analyses based on specific symptoms, increasing from 40% to 60%. The training also increased the frequency of consulting with specialists when interpreting complex results, from 20% to 35%. The practice of reviewing results with patients also improved, from 15% to 30%. The training also increased awareness of the critical role of medical analyses in avoiding errors and improving clinical decision-making. Overall, the training had a positive impact on participants' practices related to medical analyses.

The observed increase in the frequency of consulting specialists when interpreting complex results—from 20% to 35%—reflects findings by Ahmed et al. (2019), who reported that increased collaboration and consultation among healthcare professionals were critical in reducing diagnostic errors in a tertiary hospital setting. The training likely emphasized the importance of interdisciplinary collaboration, contributing to the observed improvement in consultation practices. [19]

The improvement in reviewing results with patients—from 15% to 30%—aligns with the work of Trockel et al. (2018), who stressed that engaging patients in the diagnostic process is essential for enhancing patient safety and reducing errors. The increase in patient interactions post-training suggests that the training successfully highlighted the importance of communication and patient involvement in clinical decision-making. [4]

The overall positive impact of the training on participants' practices, including increased awareness of the critical role of medical analyses in avoiding errors, aligns with the findings of Ta'an et al. (2020). Their study highlighted that training programs are essential for improving clinical decision-making and reducing the incidence of errors, particularly in high-risk environments such as nursing and medical education. [18]

Our study found that participants' perceptions of systemic support and patient follow-up for medical analyses improved post-training. However, barriers such as cost, lack of access, time constraints, patient refusal, and uncertainty remained unaddressed. Delays in receiving results also showed no significant change. Participants' perceptions of the current healthcare

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system's support for medical analyses improved, with a significant increase from 20% to 35%. However, patient follow-up on recommended medical analyses showed a slight improvement, possibly due to increased awareness or engagement. The training had varying effects on various aspects related to medical analyses, suggesting further interventions may be necessary for more substantial improvements.

The significant increase in participants' perceptions of systemic support for medical analyses—from 20% to 35%—is consistent with findings by Mansour et al. (2020), who reported that training workshops significantly increased physicians' awareness of legal frameworks and systemic support, leading to more informed decision-making regarding error disclosure. This suggests that while training can enhance confidence in the healthcare system's support, addressing broader systemic issues may require additional measures beyond training alone. [20]

The slight improvement in patient follow-up on recommended medical analyses, likely due to increased awareness or engagement, parallels findings by Ta'an et al. (2020). Their study found that while training improved knowledge and practices related to error reporting, actual changes in patient follow-up and engagement were modest. This suggests that while training raises awareness, it may not be sufficient to fully overcome the barriers to effective patient follow-up, which often involve deeper systemic and behavioral issues. [18]

Our study identified persistent barriers such as cost, lack of access, time constraints, patient refusal, and uncertainty, which were not significantly addressed by the training. Ahmed et al. (2019) similarly identified these barriers in their study on medical errors in a tertiary hospital in Kuwait, where high workloads, inadequate resources, and systemic inefficiencies were major contributors to medical errors. These barriers often require structural changes in healthcare systems, such as improved funding, resource allocation, and policy reforms, to be effectively addressed. [19]

Conclusions:

Enhanced Knowledge and Practices: The study demonstrates that training programs significantly improve participants' knowledge and practices related to medical analyses. Post-training, there was a marked increase in participants' familiarity with different types of medical analyses and their ability to recommend them more frequently as part of the diagnostic process. This improvement indicates that educational interventions are effective in elevating the standard of medical practice and increasing the role of medical analyses in avoiding errors.

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Improved Protocols and Consultation: The adoption of standard protocols for ordering medical analyses and increased consultation with specialists also saw significant improvements. Participants reported a higher rate of using systematic approaches and seeking expert opinions when interpreting complex results. These changes are indicative of a more structured approach to using medical analyses, which is crucial for reducing diagnostic errors and enhancing patient care.

Increased Patient Engagement: There was a notable improvement in the frequency with which participants reviewed medical analysis results with their patients. This increased engagement is vital for ensuring patients understand their results, which can lead to better adherence to treatment plans and a reduction in errors stemming from misunderstandings.

Barriers and Systemic Support: Despite the positive changes in practices and perceptions, the study also highlights persistent barriers such as cost, access, and delays in receiving results. While perceptions of systemic support for medical analyses improved slightly, significant barriers remain that affect the effective use of medical analyses in preventing errors.

Recommendations:

Strengthen Training Programs: Continue to refine and expand training programs to address both the knowledge and practical aspects of using medical analyses. Ensure that these programs include strategies for overcoming common barriers such as cost and access. Incorporate case studies and simulations to provide hands-on experience and enhance practical skills.

Develop and Standardize Protocols: Promote the development and implementation of standardized protocols for ordering and interpreting medical analyses. Encourage healthcare facilities to adopt these protocols to ensure consistency and reliability in diagnostic processes.

Increase Systemic Support: Advocate for improvements in the healthcare system to better support the use of medical analyses. This may include addressing issues related to costs, improving access to necessary resources, and streamlining the process for receiving results. Collaboration with healthcare policymakers and stakeholders is essential for these systemic changes.

Enhance Patient Communication: Emphasize the importance of effective communication between healthcare providers and patients. Training programs should include

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modules on how to effectively discuss medical analysis results with patients, ensuring they understand their implications and are more likely to adhere to follow-up recommendations.

Address Persistent Barriers: Conduct further research to explore and address the persistent barriers identified in the study, such as cost and delays. Developing targeted interventions to mitigate these barriers can enhance the overall effectiveness of medical analyses in preventing errors.

Reference

[1] J. R. Ball, B. T. Miller, and E. P. Balogh, "Improving diagnosis in health care," 2016.

[2] C. P. West, L. N. Dyrbye, P. J. Erwin, and T. D. Shanafelt, "Interventions to prevent and reduce physician burnout: a systematic review and meta-analysis," *The lancet,* vol. 388, no. 10057, pp. 2272-2281, 2016.

[3] G. R. Norman, S. D. Monteiro, J. Sherbino, J. S. Ilgen, H. G. Schmidt, and S. Mamede, "The causes of errors in clinical reasoning: cognitive biases, knowledge deficits, and dual process thinking," *Academic Medicine,* vol. 92, no. 1, pp. 23-30, 2017.

[4] M. Trockel *et al.*, "A brief instrument to assess both burnout and professional fulfillment in physicians: reliability and validity, including correlation with self-reported medical errors, in a sample of resident and practicing physicians," *Academic Psychiatry,* vol. 42, pp. 11-24, 2018.

[5] H. Singh, G. D. Schiff, M. L. Graber, I. Onakpoya, and M. J. Thompson, "The global burden of diagnostic errors in primary care," *BMJ quality & safety,* vol. 26, no. 6, pp. 484-494, 2017.

[6] T. L. Rodziewicz, B. Houseman, and J. E. Hipskind, "Medical error reduction and prevention," 2018.

[7] Y. Shimada *et al.*, "Patient safety incident reports related to traditional Japanese Kampo medicines: medication errors and adverse drug events in a university hospital for a ten-year period," *BMC complementary and alternative medicine,* vol. 17, pp. 1-8, 2017.

[8] J. W. Suliburk *et al.*, "Analysis of human performance deficiencies associated with surgical adverse events," *JAMA network open,* vol. 2, no. 7, pp. e198067-e198067, 2019.

[9] G. Saposnik, D. Redelmeier, C. C. Ruff, and P. N. Tobler, "Cognitive biases associated with medical decisions: a systematic review," *BMC medical informatics and decision making,* vol. 16, pp. 1-14, 2016.

[10] M. Moss, V. S. Good, D. Gozal, R. Kleinpell, and C. N. Sessler, "A critical care societies collaborative statement: burnout syndrome in critical care health-care professionals. A call for action," *American journal of respiratory and critical care medicine,* vol. 194, no. 1, pp. 106-113, 2016.

[11] R. Charles *et al.*, "How to perform a root cause analysis for workup and future prevention of medical errors: a review," *Patient safety in surgery,* vol. 10, pp. 1-5, 2016.

[12] H.-f. Wang *et al.*, "Quality improvements in decreasing medication administration errors made by nursing staff in an academic medical center hospital: a trend analysis

ISSN: 0975-3583, 0976-2833 VOL11, ISSUE 10, 2020

during the journey to Joint Commission International accreditation and in the post-accreditation era," *Therapeutics and clinical risk management,* pp. 393-406, 2015.

[13] M. M. Pena, A. T. Braga, E. Meireles, L. G. C. Vassao, and M. M. Melleiro, "Mapping of medication errors at a university hospital," *Rev enferm UERJ,* vol. 24, no. 3, p. e7095, 2016.

[14] D. D. Miller and E. W. Brown, "Artificial intelligence in medical practice: the question to the answer?," *The American journal of medicine,* vol. 131, no. 2, pp. 129-133, 2018.

[15] L. Zheng *et al.*, "Impact of pharmacist-led discharge medication reconciliation on error and patient harm prevention at a large academic medical center," *Journal of the American College of Clinical Pharmacy*.

[16] M. Khammarnia, A. Kassani, and M. Eslahi, "The efficacy of patients' wristband bar-code on prevention of medical errors," *Applied clinical informatics,* vol. 6, no. 04, pp. 716-727, 2015.

[17] A. Bari, R. A. Khan, and A. W. Rathore, "Medical errors; causes, consequences, emotional response and resulting behavioral change," *Pakistan journal of medical sciences,* vol. 32, no. 3, p. 523, 2016.

[18] W. a. F. Ta'an, M. M. Suliman, M. M. Al-Hammouri, and A. Ta'an, "Prevalence of medical errors and barriers to report among nurses and nursing students in Jordan: A cross-sectional study," in *Nursing Forum*, 2021, vol. 56, no. 2: Wiley Online Library, pp. 284-290.

[19] Z. Ahmed, M. Saada, A. M. Jones, and A. M. Al-Hamid, "Medical errors: Healthcare professionals' perspective at a tertiary hospital in Kuwait," *PloS one,* vol. 14, no. 5, p. e0217023, 2019.

[20] R. Mansour, K. Ammar, A. Al-Tabba, T. Arawi, A. Mansour, and M. Al-Hussaini, "Disclosure of medical errors: physicians' knowledge, attitudes and practices (KAP) in an oncology center," *BMC medical ethics,* vol. 21, pp. 1-8, 2020.