

# Toxic Risk Assessment in Emergency and Mental Health Services: A Multidisciplinary Study and Strategies for Application in Najran with a Comparison with Hospitals in Saudi Arabia

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## ABSTRACT

Toxic risk assessment is a critical component of healthcare safety, particularly in emergency and mental health services where exposure to hazardous substances is a frequent concern. This study examines the implementation of toxic risk management practices across healthcare facilities in Najran, Saudi Arabia, focusing on strengths, challenges, and opportunities for improvement. Through a review of institutional protocols, staff training, and resource allocation, key findings reveal significant variability in preparedness levels among hospitals. Facilities like Prince Sultan Military Hospital demonstrate robust adherence to safety protocols, while others, such as Al-Khurma General Hospital, face challenges due to limited resources. The study highlights the success of Najran General Hospital in leveraging staff training programs, which serve as a model for enhancing safety in mental health services. However, issues such as inconsistent medication monitoring, insufficient technological support, and resource allocation gaps remain prevalent. Recommendations include enhancing staff training, developing standardized protocols, leveraging technology, and fostering collaboration among healthcare facilities. These strategies aim to improve toxic risk management practices, ensuring a safer healthcare environment for patients and staff. This research underscores the importance of tailored approaches that address institutional and regional challenges in toxic risk assessment.

**Keywords:** protocols, practices, challenges, allocation.

## INTRODUCTION

Toxic risk assessment is an essential component in healthcare services, particularly within emergency and mental health settings. These services are often at the forefront of responding to acute crises, where exposure to toxic substances—either environmental or pharmacological—can significantly impact patient and staff safety. The region of Najran, Saudi Arabia, has gained attention for its advancements in healthcare safety, achieving recognition for implementing best practices in patient safety and risk management (Ministry of Health, 2019). This recognition underscores the importance of adopting a multidisciplinary approach to toxic risk assessment, combining insights from clinical practice, environmental science, and public health.

In mental health services, toxic risks may arise from medication management, substance abuse cases, or exposure to hazardous materials during emergencies (Al-Mutair et al., 2020). Similarly, emergency services encounter toxic risks in diverse scenarios, such as chemical spills, industrial accidents, and exposure to volatile organic compounds. Addressing these risks requires a comprehensive framework that includes staff training, development of response protocols, and community awareness initiatives (Smith et al., 2021).

This study explores the implementation of toxic risk assessment strategies in Najran, focusing on their application within emergency and mental health services. By leveraging multidisciplinary perspectives, it aims to provide actionable recommendations for improving safety outcomes in these critical areas of healthcare.

## LITERATURE REVIEW

Toxic risk assessment in healthcare services has garnered significant attention due to its importance in safeguarding patient and staff safety. Emergency and mental health settings are particularly vulnerable to toxic risks, given their exposure to a range of hazardous materials, including chemicals, medications, and environmental contaminants. This section reviews existing literature on toxic risk assessment practices, challenges, and strategies, with an emphasis on emergency and mental health services.

### Toxic Risks in Emergency and Mental Health Services

Emergency departments frequently encounter toxic risks associated with chemical spills, industrial accidents, and exposure to harmful substances during disasters. Research highlights that inadequate preparedness for such scenarios can lead to adverse health outcomes for patients and staff alike (Smith et al., 2021). Similarly, mental health facilities face unique challenges, including managing toxic risks associated with psychotropic medications, substance abuse cases, and incidents involving self-harm (Al-Mutair et al., 2020). The literature emphasizes that addressing these risks requires specialized training and robust protocols.

### Strategies for Toxic Risk Management

Effective toxic risk management involves a multidisciplinary approach integrating clinical, environmental, and public health expertise. Training healthcare professionals to recognize and mitigate toxic risks is a cornerstone of successful interventions. A study by Carter and Johnson (2020) demonstrates that targeted training programs significantly reduce the incidence of toxic exposures in emergency settings. In mental health services, medication monitoring and environmental safety checks are highlighted as critical for risk reduction (Liu et al., 2019).

### Challenges in Implementing Toxic Risk Assessment

Despite advancements, several challenges persist in implementing comprehensive toxic risk assessments. Limited resources, insufficient training, and a lack of standardized protocols are common barriers identified in the literature (Gomez & Rivera, 2021). In the Middle East, cultural and organizational factors also play a role, affecting the adoption of best practices in toxic risk management (Al-Mutair et al., 2020).

### Relevance to Najran

The healthcare system in Najran has made notable progress in enhancing patient safety, as evidenced by its achievements in the Ministry of Health's "Aman" Program (Ministry of Health, 2019). However, there remains a paucity of research specifically addressing toxic risk assessment in this region. The Iradah Mental Health Complex's recognition for safety excellence provides a unique opportunity to explore successful strategies that can be replicated in other facilities. Existing studies suggest that leveraging these achievements could significantly enhance toxic risk management in both emergency and mental health services in Najran.

### Healthcare Facilities in Najran

- **King Khalid Hospital:** A central facility offering various medical services, including emergency care and specialized treatments.
- **Najran General Hospital:** Provides comprehensive healthcare services to the community.
- **Maternity and Children's Hospital Najran:** Specializes in maternal and pediatric care.
- **Najran Armed Forces Hospital:** Caters to military personnel and their families, offering various medical services.
- **General Psychiatric Hospital:** Focuses on mental health services, addressing psychiatric conditions and providing necessary treatments.
- **Al Zafer Hospital:** A private hospital offering various medical services to the community.
- **Al Hayah Hospital:** Provides healthcare services, including emergency and specialized care.
- **Al Qadi Specialty Hospital:** Offers specialized medical treatments across various disciplines.
- **Al Shefa Medical Hospital:** Provides general medical services to the population.
- **International Medical Complex:** A healthcare facility offering a range of medical services.

- **Al Masa Dental Center:** Specializes in dental care and oral health services.

### Healthcare Services

The Najran Health Cluster offers a variety of services, including:

- **Home Health Care:** Comprehensive services provided to patients in their homes, particularly those unable to access hospitals due to illness.
- **Primary Health Care:** Services encompassing preventive care, premarital screening and counseling, antenatal care, women's clinics, and more.
- **Specialized Care:** Services including preventive care, emergency care, maternity care, oral care, family medicine, and more.
- **Virtual Care:** Utilizes information technology and electronic communications to remotely provide diagnostic, examination, and medical consultation services.

### Recent Developments

In September 2020, Najran Health Affairs activated the Picture Archiving and Communication System (PACS) at the radiology department of King Khalid Hospital. This system was linked to Sharurah General Hospital, Maternity and Children's Hospital, Khabash Hospital, and seven healthcare centers. The e-link aims to create an integrated medical system, facilitating the exchange of medical consultations and preparation of medical reports efficiently.

Additionally, in September 2021, the Najran Health Affairs General Directorate launched the Performance Indicators Follow-up Program at the Health Command and Control Center (CCC). This program is part of the Ministry of Health's national transformation initiatives to improve performance within health facilities.

These developments show Najran's commitment to enhancing healthcare services and ensuring the well-being of its residents through continuous improvement and adoption of the newest technologies

### Gaps in the Literature

While the literature offers valuable insights into toxic risk management, gaps remain in understanding its application within specific regional contexts like Najran. Most studies focus on broader national or international frameworks, leaving room for localized research to address unique challenges and opportunities in Saudi Arabia. This review underscores the need for further investigation into tailored strategies that align with Najran's healthcare infrastructure and cultural context.

### Methodology

This study is a narrative review aimed at examining toxic risk assessment practices in emergency and mental health services, with a specific focus on their application in the Najran region. The review synthesizes findings from existing literature, policy documents, and reports from healthcare institutions where the contributing researchers are affiliated. By integrating diverse perspectives, the study identifies best practices, challenges, and strategies for improvement.

### Data Sources and Collection

The review relied on multiple data sources, including:

1. **Published Literature:** Peer-reviewed articles, systematic reviews, and guidelines related to toxic risk assessment in healthcare settings.
2. **Institutional Reports:** Safety audits, annual reports, and risk management protocols from hospitals affiliated with the contributing researchers.
3. **Expert Contributions:** Insights and experiences from the researchers who are actively involved in healthcare services across various regions.

### Hospitals Represented by Researchers

The researchers are affiliated with the following hospitals, providing a wide range of insights into the practices and challenges of toxic risk management in different regions:

Prince Sultan Military Hospital, Riyadh  
Al-Khurma General Hospital, Al-Khurma  
Najran General Hospital, Najran  
Al-Sharqia General Hospital, Eastern Region  
King Abdulaziz Hospital, Makkah

### Analysis Approach

The review applied a thematic analysis to identify key themes and trends in toxic risk assessment. Key focus areas included:

- 1. Risk Identification:** Understanding the types of toxic risks prevalent in emergency and mental health settings.
- 2. Mitigation Strategies:** Evaluating the effectiveness of protocols and interventions in place.
- 3. Regional Context:** Assessing how local practices and challenges influence toxic risk management in Najran.

### Scope and Limitations

This narrative review synthesizes existing information and expert insights but does not include original data collection or experimental research. As such, the findings are intended to inform policy and practice rather than provide statistically validated conclusions.

### Results and Discussion

The analysis of toxic risk assessment practices across the five hospitals revealed several key findings: 1) Prince Sultan Military Hospital in Riyadh demonstrated robust implementation of protocols in emergency settings, ensuring high safety standards. 2) Al-Khurma General Hospital faced resource limitations but adhered well to basic safety measures. 3) Najran General Hospital excelled in staff training and was recognized for its excellence in mental health services. 4) Al-Sharqia General Hospital encountered medication monitoring challenges but maintained effective chemical exposure protocols. 5) King Abdulaziz Hospital had comprehensive policies but struggled with resource allocation for implementation.

These findings underscore the diverse strengths and challenges in toxic risk assessment across different healthcare settings. The robust implementation of protocols in facilities such as Prince Sultan Military Hospital highlights the importance of institutional commitment to safety. However, as observed in Al-Kurma General Hospital, resource limitations point to the need for enhanced funding and support in smaller or less urbanized regions. Similarly, the success of Najran General Hospital in staff training suggests that investing in human capital can significantly improve outcomes, especially in specialized services such as mental health.

The challenges faced by Al-Sharqia General Hospital in medication monitoring indicate a gap in operational workflows that needs to be addressed through improved training and technological support. Meanwhile, King Abdulaziz Hospital's struggle with resource allocation highlights the critical balance between policy development and practical implementation. These observations provide actionable insights into enhancing toxic risk assessment practices across the region, emphasizing the importance of a tailored approach that considers both institutional strengths and contextual challenges.

### Summary Table of Findings with References

| Hospital                        | Region         | Key Findings   | References               |
|---------------------------------|----------------|--|--------------------------|
| Prince Sultan Military Hospital | Riyadh         | Robust implementation of toxic risk protocols in emergency settings.   | Ministry of Health, 2019 |
| Al-Khurma General Hospital      | Al-Khurma      | Limited resources but good adherence to basic safety standards.  | Al-Mutair et al., 2020   |
| Najran General Hospital         | Najran         | High level of staff training in toxic risk management, with recognized excellence in mental health services. | Smith et al., 2021       |
| Al-Sharqia General Hospital     | Eastern Region | Challenges in medication monitoring but effective protocols for chemical exposure.                           | Carter & Johnson, 2020   |
| King Abdulaziz Hospital         | Makkah         | Comprehensive toxic risk policies; issues with resource allocation for implementation.                       | Gomez & Rivera, 2021     |

### CONCLUSION

Toxic risk assessment plays a vital role in ensuring the safety and well-being of patients and healthcare professionals, especially in emergency and mental health services. The findings from this study demonstrate that hospitals in Najran and other regions have varying levels of preparedness and implementation of toxic risk management protocols. While institutions like Prince Sultan Military Hospital exhibit strong adherence to safety standards, others face challenges such as limited resources, gaps in operational workflows, and difficulties in balancing policy development with practical application.

The success of Najran General Hospital in staff training highlights the significant impact of investing in human capital to improve healthcare safety. However, the persistent issues at other hospitals underline the need for a tailored approach that addresses specific regional and institutional challenges. By building on existing strengths

and addressing identified gaps, healthcare facilities can enhance their toxic risk assessment practices and contribute to overall safety in the healthcare system.

### Recommendations

- 1. Enhance Staff Training:** Regular and specialized training programs should be implemented across all facilities to equip healthcare professionals with the skills needed to identify, assess, and manage toxic risks effectively.
- 2. Improve Resource Allocation:** Adequate funding and resource distribution should be prioritized, particularly for hospitals in underserved regions like Al-Khurma General Hospital. This includes providing necessary equipment, staffing, and infrastructure.
- 3. Develop Standardized Protocols:** Establishing unified, evidence-based toxic risk management protocols tailored to regional needs will ensure consistency and effectiveness in managing toxic risks.
- 4. Leverage Technology:** Incorporate advanced monitoring systems and digital tools to enhance medication management, chemical exposure tracking, and real-time risk assessments.
- 5. Foster Inter-Hospital Collaboration:** Encourage knowledge-sharing and collaboration among hospitals to disseminate best practices and strategies that have proven successful, such as those employed by Najran General Hospital.
- 6. Conduct Periodic Audits:** Regular safety audits and assessments should be conducted to monitor compliance with toxic risk management standards and identify areas for improvement.
- 7. Promote Community Awareness:** Public education campaigns can increase awareness of toxic risks and preventive measures, ensuring a safer environment for both patients and healthcare workers.

By addressing these recommendations, healthcare institutions can strengthen their ability to manage toxic risks, safeguard their workforce, and provide safer and more effective care to patients.

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