Bridging Gaps in Medical Toxicology Expertise Via Instant-Messaging Technology: The Experience of Nepal's First Institution-based Poison Information Center

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INTRODUCTION

Nepal, a predominantly agrarian country, with vast topographical variation, faces a significant burden of toxicological exposures due in large part to widespread availability of unregulated hazardous pesticides.[1] In 2018–2019 the country recorded 5,754 (19.18 per 100,000 population) suicides; over 24% of these deaths resulted from poisoning, most of which involved ingestion of highly concentrated agricultural pesticides.[2] Nepal also has a high burden of snakebite mortality, especially amongst socioeconomically disadvantaged groups, with nearly 250 snakebites per 100,000 people in the flat regions.[3] Despite this pressing public health threat, Nepal lacks formal medical toxicology training programs, resulting in a scarcity of trained medical toxicologists.[4] This deficiency has historically impeded development of structured toxicological services and establishment of domestic poison information centers. In response to this critical gap, the Nepal Poison Information Center (Nepal-PIC) was established at an academic institution in Kathmandu, Nepal, employing an innovative, technology-driven model to provide expert support in a low-resource setting.[4] This commentary explores the development and implementation of this innovative support model, highlighting its components, challenges, and lessons learned.

LEVERAGING INSTANT-MESSAGING TECHNOLOGY TO SUPPORT POISON INFORMATION CENTER STAFF

The inception of the Nepal-PIC was a collaborative effort to address the urgent need for accessible toxicological information and expertise across Nepal.[4] This process began with a comprehensive needs assessment, which underscored the high incidence of poisoning cases and concomitant lack of specialized medical toxicology services.[4] Recognizing these challenges, a multilateral international partnership was formed, bringing together a government academic institution (Tribhuvan University Teaching Hospital Clinical Pharmacology Department), a local non-profit organization (ASK Foundation), and an international academic department (Brown University Department of Emergency Medicine) as collaborators in a pilot project.[4] This coalition aimed to create a sustainable infrastructure that delivers real-time, evidence-based toxicological support to healthcare providers nationwide.

A critical component of the center's establishment was the development of a tiered support system designed to compensate for the limited number of local toxicology experts. This system ensures that Specialists in Poison Information (SPIs) have access to a hierarchy of expertise, facilitating effective case management. SPIs selected for the Nepal PIC were licensed medical school graduates who had not yet pursued postgraduate specialty training. Despite baseline medical knowledge commensurate with graduating medical school, SPIs possessed no previous medical toxicology training. Prior to initiation, SPIs underwent training with a database of recorded toxicology lectures, and received synchronous training. In addition, some SPIs received scholarships from NIHR Right 4 to attend training sessions at the Asian Pacific Association of Medical Toxicology (APAMT) and the Middle East and North Africa Clinical Toxicology Association (MENATOX) annual conferences.[5] To independently and safely provide medical advice commensurate with level of training, SPIs utilized a just-in-time toxicology database called TOXBASE.[6] TOXBASE is a clinical toxicology resource developed by the UK National Poisons Information Service, which provides comprehensive information on various toxic substances, aiding SPIs in the initial assessment and management of poisoning cases. As a second line of support to help SPIs with their remote care of poisoned and envenomated patients, a local expert group was formed, comprising clinical and non-clinical experts from Emergency Medicine, Critical Care, Botany and Clinical Pharmacology, as well as snake and plant identification experts. This group was connected with the SPIs through WhatsApp®, a widely used messaging platform in Nepal, allowing SPIs to seek prompt advice when needed. The use of WhatsApp® facilitated rapid communication and decision-making, which is essential in time-sensitive poisoning cases.

Recognizing the need for a third and final line of support in select cases, an international expert group was also established. The international expert group consisted initially of four volunteer medical toxicologists from various countries and time zones, and eventually expanded to 17 medical and clinical toxicologists [**Figure 1**]. This global network ensures 24/7 availability of specialized knowledge in cases for SPIs

Figure 1. Geographic distribution of international experts supporting the Nepal Poison Information Center (PIC). The Nepal-PIC relies on a global network of toxicology experts spanning over eight time zones and enables near 24/7 expert consultation via WhatsApp®. This ensures timely guidance on poisoning cases in a setting with limited in-country toxicologic care capacity.

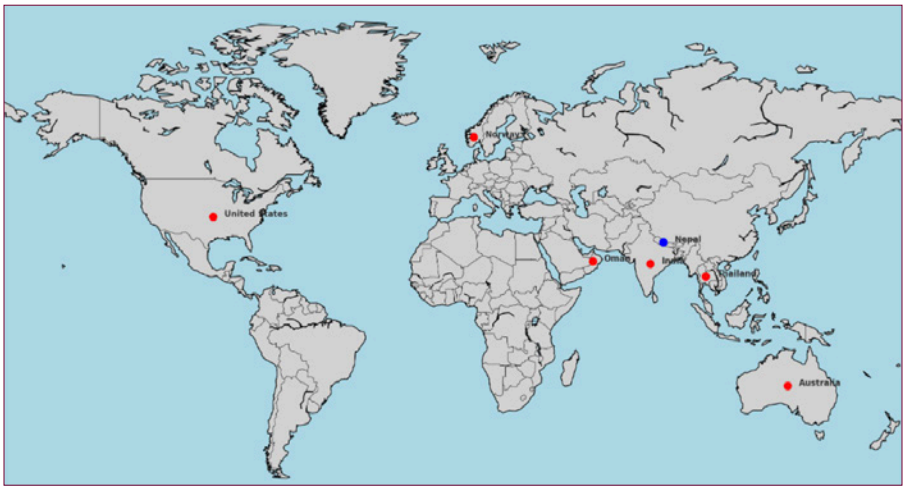
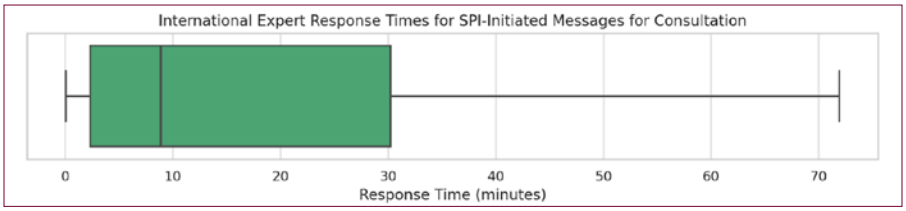


Figure 2: Boxplot showing international expert response times to SPI-initiated messages for consultation via WhatsApp®.



when necessary. During the pilot phase of establishing the Nepal-PIC, approximately 28% of cases needed input from international experts. The average response time from these experts was prompt, with median response time of 8.9 minutes, underscoring the efficacy of this collaborative approach [**Figure 2**].

The integration of WhatsApp® to support SPIs exemplifies how technology can overcome resource limitations. WhatsApp's® features, including encrypted messaging and multimedia sharing, enabled SPIs to securely transmit laboratory test results, de-identified images, electrocardiograms, and case details. This capability facilitated accurate and timely consultations and served as a valuable educational tool, enhancing the SPIs' knowledge and confidence in managing complex cases.

EDUCATION AND CAPACITY BUILDING THROUGH TARGETED TRAINING

Beyond case consultations, structured educational programs designed to build capacity among its SPIs and local providers were conducted by the Nepal-PIC. The selection of topics is driven by real-time data and needs assessments. For example, as snakebite-related inquiries increased during the monsoon season, a lecture on snake identification and envenomation management was prioritized. Similarly, mushroom poisoning lectures were scheduled during peak foraging seasons.

Once a topic is identified, an international expert is approached to deliver the session. Upon confirmation, flyers are designed, and invitations are disseminated across WhatsApp® groups and professional networks through social media. Each session follows a hybrid teaching model that includes both international expertise and a local presenter for local contextualization. Alongside the international expert lecturer, a local physician with experience in managing toxicological cases provides insight into region-specific challenges, treatment availability, and case studies from Nepal.

Following the live sessions, the recorded lectures are uploaded to an open-access platform on YouTube®, ensuring continued availability for future reference. This system has created a repository of high-quality toxicology education tailored to Nepal's unique epidemiological profile.

CHALLENGES AND CONSIDERATIONS

While the model has been successful, several challenges were encountered. Ensuring the confidentiality of patient information shared over WhatsApp® required strict adherence to data protection protocols. Messages were encrypted, and patient identifiers were removed to maintain privacy. Inconsistent internet access, especially in remote areas, occasionally hindered real-time communication. Maintaining the engagement of international experts, all of whom are volunteers, is crucial to the sustainability of this model. Anecdotally, international experts have appreciated the opportunities to participate in toxicology infrastructure building at the Nepal-PIC through teaching, as well as through consultations regarding toxic exposures rarely encountered in their respective countries. Another challenge has been integrating toxicology training into Nepal's medical education system, which will require continued advocacy effort.

LESSONS LEARNED AND GLOBAL RELEVANCE

This innovative experience, which established a system of local and international expert groups providing remote support via a text-based messaging service to the Nepal-PIC, offers valuable insights for similar low-resource settings. Utilizing widely available platforms like WhatsApp® can bridge gaps in SPI knowledge, provide timely backup, and enhance patient care. Engaging both local and international experts fosters a robust support system, combining global expertise with local context. Similar phone-based models have been used previously in Lebanon as well.[7]

The education model of combining international expertise with local perspectives has been particularly effective in making training sessions more relevant and applicable, with the end goal of increasing local toxicology expertise and clinical practice autonomy. This approach can be replicated in other regions with similar resource constraints. The open-access lecture repository serves as a knowledge hub for ongoing medical education, further strengthening the sustainability of this initiative.

Furthermore, this PIC's tiered support system – leveraging databases like TOXBASE, local specialists, and international experts – demonstrates a scalable solution for addressing medical/clinical toxicology gaps in low- and middle-income countries. This model could be adapted for other subspecialties, such as infectious diseases and trauma care, where specialist availability remains limited.

CONCLUSION

The innovative model implemented by Nepal-PIC demonstrates how leveraging technology and fostering international collaboration can effectively address the shortage of toxicology expertise in low-resource settings. By integrating platforms like WhatsApp® for real-time consultations and education, the center has bridged the gap in the availability of expert support for poisoning cases in Nepal. This approach serves as a replicable model for other regions facing similar challenges, highlighting the potential of technology to transform healthcare delivery in resource-limited environments.

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Disclosures

None.

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