

The use of Telehealth in a Poison Control Center

Adebal de Andrade Filho

Master's Degree. Toxicological Information and Assistance Center of Minas Gerais (CIATOXMG). Coordinator of CIATOXMG. Email: Adebal.andrade@gmail.com

Juliana Sartorelo Almeida

Master's Degree. Toxicological Information and Assistance Center of Minas Gerais (CIATOXMG). Assistant Physician. Email: jsartorelo@gmail.com

Natália Dias do Nascimento

Corresponding author: Medical graduate, specialization in Internal Medicine and Medical Toxicology Toxicological Information and Assistance Center of Minas Gerais (CIATOXMG) Assistant Physician <https://orcid.org/0009-0001-7762-0828>. Email: nataliadiasdonascimento@gmail.com

Date of Receipt: June 24, 2025 | Approval Date: October 28, 2025

Abstract

This article explores the implementation of telemedicine to enhance toxicology care at a Poison Control Center. The study examines data from the Datatox database spanning 2019 to 2024, focusing on the characteristics of the care provided and identifying opportunities for improving the management of complex toxicology cases in Brazil. The findings underscore the significance of CIATox-MG as a leading clinical toxicology reference center, with remote care accounting for 76.5% of interactions, primarily conducted by physicians and other healthcare professionals (73%). The data reveals a predominant occurrence of calls related to medications and accidents involving venomous animals, alongside a decline in the number of remote care reports from 2020 to 2022. In conclusion, the study highlights the critical role of telemedicine in enhancing care for patients with poisoning, particularly in emergency departments and in regions lacking specialized services, while also pointing to the need for improved data collection practices.

Key-words: telehealth, telemedicine, toxicology, Poison Control Centers.

Resumen

La utilización de la Telesalud en un Centro de Intoxicaciones

Este artículo discute la implementación de la telemedicina para mejorar el atendimento toxicológico en un centro de intoxicaciones. El estudio analiza datos del banco de datos Datatox de 2019 a 2024, enfocado en las características del atendimento prestado y en las oportunidades de mejoría en la gestión de casos complejos relacionados con la asistencia toxicológica en Brasil. Los resultados destacan la relevancia del CIATox-MG como un centro de referencia en toxicología clínica, el uso predominante de atendimento remoto (76,5%), principalmente por médicos y otros profesionales de la salud (73%). Hay prevalencia de llamados relacionados con medicamentos, accidentes con animales venenosos y una disminución en el número de atendimientos remotos registrados de 2020 a 2022. En conclusión, el estudio enfatiza la importancia de la telemedicina para mejorar el atendimento a pacientes intoxicados, especialmente en emergencias y en áreas sin servicios especializados, y la necesidad de mejorar la recolección de datos.

Palabras clave: telesalud, telemedicina, toxicología, centros de control de intoxicaciones.

Resumo

A utilização da Telessaúde em um Centro de Intoxicações

Este artigo discute a implementação da telemedicina para aprimorar o atendimento toxicológico em um Centro de Intoxicações. O estudo analisa dados do banco de dados Datatox de 2019 a 2024, focando nas características do atendimento prestado e nas oportunidades de melhoria na gestão de casos complexos relacionados à assistência toxicológica no Brasil. Os resultados destacam a relevância do CIATox-MG como um centro de referência em toxicologia clínica, o uso predominante de atendimento remoto (76,5%), principalmente por médicos e outros profissionais de saúde (73%). Há prevalência de chamados relacionados a medicamentos, acidentes com animais peçonhentos e uma diminuição no número de atendimentos remotos registrados de 2020 a 2022. Em conclusão, o estudo enfatiza a importância da telemedicina para melhorar o atendimento a pacientes intoxicados, especialmente em emergências e em áreas sem serviços especializados, e a necessidade de melhorar a coleta de dados.

Palavras-chave: telessaúde, telemedicina, toxicologia, Centros de Controle de Intoxicações.

INTRODUCTION

According to data from the World Health Organization (WHO), approximately 1.5% to 3.0% of the global population suffers from exogenous poisoning annually. In Brazil, approximately 4.8 million cases occur annually, and approximately 0.1% to 0.4% of poisonings result in death¹.

Poison control centers are sources of expertise in the diagnosis and treatment of poisonings and offer urgent and emergency advice to the general public and healthcare professionals. The first poison information center opened in the

Netherlands in 1949², and since then, the United States, the United Kingdom, and France have historically pioneered this model of care^{2,3}. These initiatives have led to an expansion in the number of poison information centers in countries throughout the Americas, Europe, and Australasia^{2,3}.

In this context, telehealth has emerged as an effective complementary tool to support toxicology care, enabling the expansion of poison control centers' reach, especially in remote or hard-to-reach areas. Because poison control centers are generally located in capital cities or large cities,

specialized care is provided in other regions using models other than direct care. Thus, it is possible to perform remote diagnoses, clinical monitoring, health education, and clinical decision support, offering rapid and accurate guidance to healthcare professionals, expanding the dissemination of toxicological knowledge through telehealth⁴.

Remote care at CIATOX centers is generally provided in the form of teleconsultations, and information is provided to both healthcare professionals and laypeople. Currently, in addition to providing emergency advice on the management of poisoning cases, poison control centers compile data on exposures and toxic substances, playing an important role in chemical safety and public health.^{5,6}

The Toxicological Information and Assistance Center of Minas Gerais (CIATox-MG) provides assistance, information, teaching, and research in the field of toxicology. It offers in-person and telephone care to victims of acute poisoning, with a specialized medical team available 24 hours a day, both for healthcare teams from other services and for the general public, providing guidance on poisoning and accidents caused by venomous animals.

This study aims to present data on the use of telehealth at CIATox-MG through a descriptive analysis, seeking to evaluate the profile of the services provided and identify opportunities for improvement in the management of complex cases related to toxicological care in Brazil.

METHODOLOGY

Study Design and Location

This study uses a descriptive analysis of secondary data to characterize trends and patterns in toxicology consultations managed by CIATox-MG. CIATox-MG has had a solid track record of implementing telehealth practices combined with toxicology care since the 1970s. Currently, CIATox-MG provides approximately 26,000 in-person and remote consultations annually related to exposure to medications, chemicals, pesticides, and accidents with venomous animals.

Data were retrospectively extracted from the Datatox database, supplemented with demographic information from CIATox-MG's internal records. The study period covers all consultations recorded on the digital platform from January 1, 2019, to December 31, 2024. The study was conducted in compliance with relevant ethical guidelines, ensuring data anonymization and protecting patient confidentiality.

The project was submitted and approved by the Fhemig Research Ethics Committee: CAAE: 89698525.9.0000.5119 and opinion number: 7.646.694.

Inclusion and Exclusion Criteria

The study population included all consultations recorded in the Datatox database during the aforementioned period, regardless of the route of exposure, patient age, or outcome. Because the objective of the analyses was to profile telephone consultations, in-person consultations were not included in the main analyses.

Data Sources and Management

The primary data source for this study was the Datatox database, a computerized data recording, monitoring, and retrieval system maintained by the Brazilian Association of Toxicological Information and Assistance Centers (ABRACIT). The system enables clinical and epidemiological studies and assessments of the impact of toxic agents on population health. Additional data, including patient demographics, were obtained from CIATox-MG's internal records. All data were anonymized and aggregated before analysis to protect patient privacy.

Variáveis

The analysis included quantitative and qualitative variables extracted from the Datatox database. Quantitative variables included the total number of consultations, number of teleconsultations, number of teleconsultations per day of the week, municipality of origin of the incident, toxicant, category of the requester, shift of care, gender, and age of the patient.

Statistical Analysis

Data analysis was conducted using R statistical software. Descriptive statistics were calculated to summarize the characteristics of the study population and consultation patterns. Continuous variables were presented as means, medians, and standard deviations, while categorical variables were presented as frequencies and proportions. Time series analysis and line graphs were used to visualize trends in the number of consultations over time. Chi-square tests were used to assess the distribution of categorical variables, and standardized residuals were used to determine the difference between groups if the chi-square test was significant. Statistical significance was defined as a p-value less than 0.05.

RESULTS

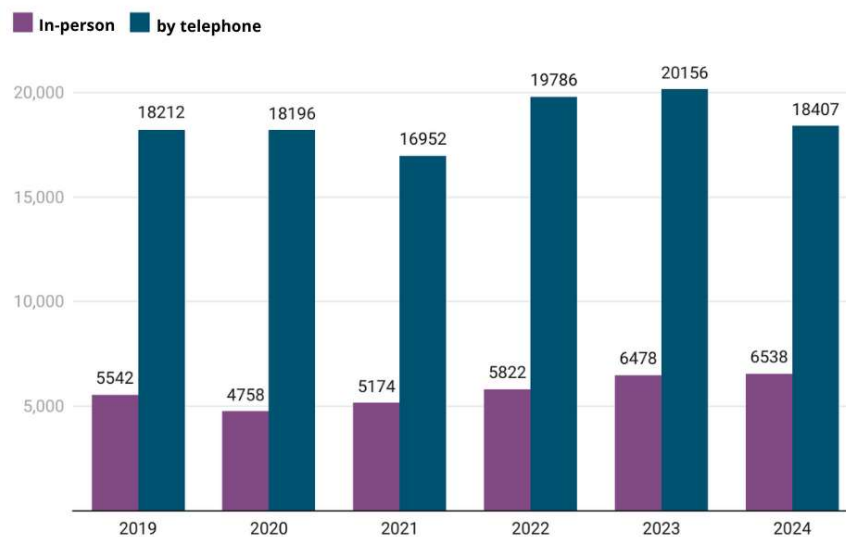
From 2019 to 2024, the total number of cases treated at CIATox-MG was 146,021, with the majority of cases being handled by telephone (76.5%, 111,709) compared to in-person (23.5%, 34,312). Telephone consultations predominated for female patients (49.6%), and the age group with the highest frequency of consultations was 1-4 years old (24,616, 22.04%), although the young adult group (20-39 years old) also had a significant number of cases, comprising over 24% of consultations. When analyzing the callers for telehealth services, most calls were made by physicians, representing 70.27% of the total, although telephone assistance to laypeople represented 19.57% of cases, highlighting the significant role of non-health professionals in the overall context of care. The data are shown in Table 1.

Table 1. Distribution of CIATox-MG telephone services (2019-2024) by category, sex, age group, location and applicants.

Category	Number of appointments	Percentage (%)
Type of service		
Remote	111,709	76.5
In-person	34,312	23.5
Gender		
Female	55,363	49.56
Male	49,337	44.17
Not indicated	7,009	6.27
Age (Years old)		
<1	6,331	5.67
1-4	24,616	22.04
5-9	7,738	6.93
10-14	5,784	5.18
15-19	7,414	6.64
20-29	15,037	13.46
30-39	11,981	10.72
40-49	9,728	8.71
50-59	7,153	6.40
60-69	5,031	4.50
70-79	3,154	2.82
>=80	1,465	1.31
Not indicated	6,277	5.62
Location		
Minas Gerais	78,612	70.3
Other States	19,894	17.81
Ignored/Not indicated	13,203	11.82
Applicant		
Nurse	2,132	1.91
Medical Student	1,175	1.05
Pharmacist	150	0.13
Doctor	78,527	70.27
Patient	8,225	7.36
Family Member/Caregiver	13,635	12.21
Pet Owner	192	192 (0.17)
Veterinarian	116	0.1
Not indicated	7,557	6.76

The distribution of cases over the years revealed a significant variation in the number of telephone consultations carried out by CIATox-MG (chi-square = 378.69, $p < 0.0001$). The number of cases attended to by telephone did not remain constant during the analyzed period, suggesting fluctuations in the demand for this type of service over the years, as can be seen in Figure 1.

Figure 1. Cases attended by CIAToxMG – 2019 to 2024

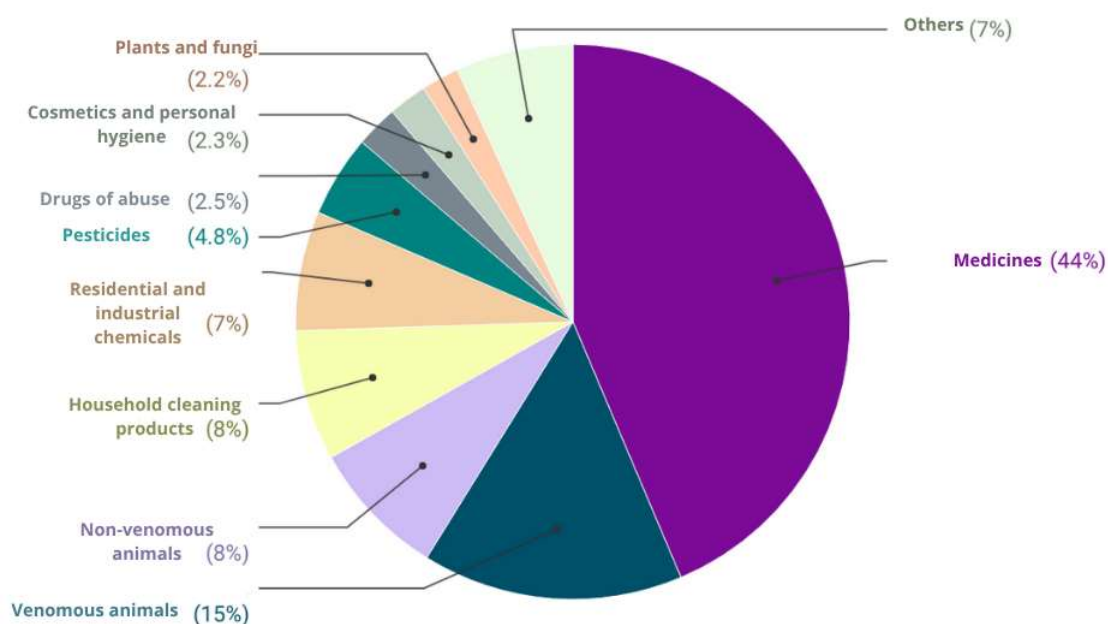


Regarding call times, most telephone calls occurred between 12:00 PM and 5:59 PM, followed closely by 6:00 PM to 11:59 PM, with both periods together accounting for approximately 70% of calls. Analyzing weekdays, the chi-square test identified a difference in the number of calls. To identify which days of the week presented significant deviations from the expected distribution of remote services, a post-hoc analysis using standardized residuals was performed. It was observed that Tuesdays (standardized residual = 4.76) and Mondays (standardized residual = 2.95) exhibited a significantly higher number of remote services than expected under a uniform distribution. In contrast, Fridays (standardized residual = -7.66)

presented a significantly lower number of remote services. The remaining days of the week (Sunday, Wednesday, Thursday, and Saturday) showed no statistically significant deviations after Bonferroni correction. These results indicate that the demand for remote services varies throughout the week, peaking on Tuesdays and Mondays and declining on Fridays ($p < 0.0001$).

Considering the type of agent involved, medications represented the most prevalent class of calls (48,733 cases, 43.63%), followed by accidents with venomous animals (16,997 cases, 15.22%), as detailed in Figure 2.

Figure 2. Distribution by agent type – telephone cases 2019 to 2024



Regarding geographic distribution, most calls to CIATox-MG originated in Minas Gerais (70.3%, mainly from the Central macro-region) and Rio de Janeiro (11.3%). However, the service received calls from one-third of the country's municipalities. The geographic distribution is detailed in figures 3, 4, and 5.

Figure 3. Distribution of calls to CIAToxMG by State – 2019 to 2024

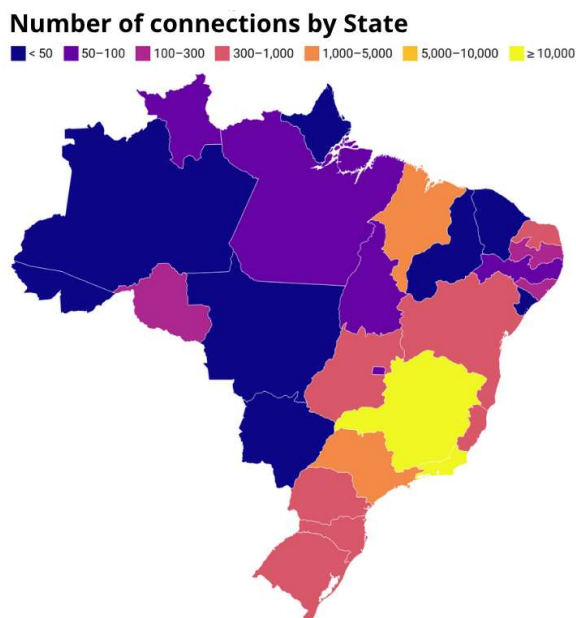


Figure 4. Distribution of connections by municipality – Brazil – 2019 to 2024

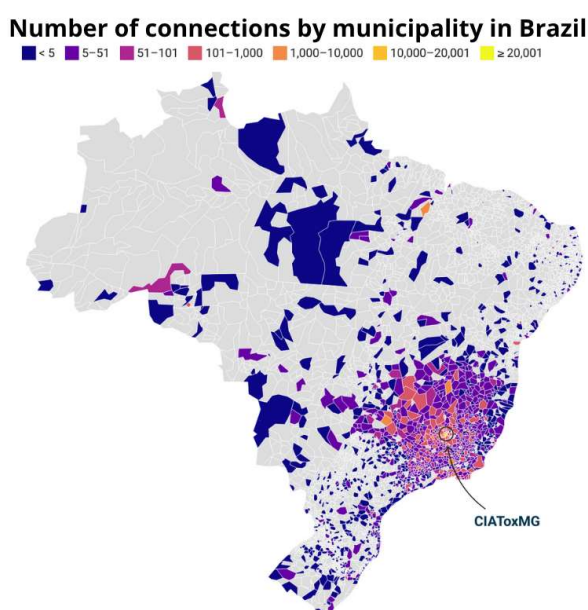
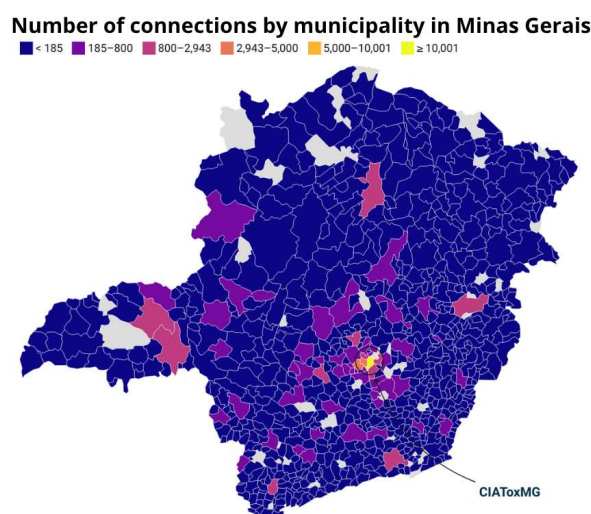


Figure 5. Distribution of connections by municipality – Minas Gerais – 2019 to 2024



Analyzing the cases according to severity, it was observed that the majority were classified as mild (62,885, representing 56.29% of the total), followed by cases without severity or no severity (16,640, 14.89%) and moderate (10,379, 9.29%). Severe cases totaled 3,622 (3.24%), while fatal cases were 142 (0.13%). A considerable portion of the cases (18,041, 16.15%) did not have the severity specified.

DISCUSSION

The results presented reflect the relevance of CIATox-MG over the years, establishing it as a reference center for clinical toxicology in Brazil, not only due to the significant volume of consultations provided, but also due to its strategic use of telehealth in addressing exogenous poisonings. The predominance of consultations conducted remotely (76.5%) emphasizes the importance of telehealth as a viable care model, especially for populations far from specialized centers.

In this analysis, a slight predominance of telephone calls related to female patients was observed (49.6%). International studies⁸ also observe a similar trend, with women predominating in cases of poisoning, especially those related to drugs, and suicide attempts. Therefore, when comparing these findings with the profile of the Brazilian population and international literature, it is clear that the female predominance in calls is not an isolated finding, especially in cases where there is greater involvement of medications, psychiatric disorders, or suicidal behavior.

In this study, pediatric patients aged 1–4 years were the most frequent, accounting for over 22% of calls. Although analyzing SINAN data, these calls account for an average of 7% of calls in the country and 9% globally. The predominant age group for patients treated for poisoning and intoxication is young children, especially those

under 5 years of age, usually accidental, and in the home.^{10,11} On the other hand, calls to adults aged 20–39 years, who accounted for 24% of the total in this study and approximately 45% in SINAN, generally have a higher proportion of intentional poisonings (attempted self-harm) and are the group most frequently involved in poisonings related to illicit substance use or medication abuse.^{8,9}

The National Health Surveillance Agency (ANVISA)'s drug and consumer product labeling regulations require contact information for consumer service, including poison control centers, especially for products with potential health risks. CIATox-MG has a toll-free number (0800-7226001) that is displayed on product leaflets and technical sheets, often facilitating access to the service for laypeople. This study showed that although the majority of CIATox-MG's remote service requesters are physicians and other healthcare professionals (73%), the service is also sought by patients, caregivers, and family members. This facilitated access to information helps reduce unnecessary demand for in-person evaluations in healthcare services and directs patients to the appropriate care location, favorably impacting the use of healthcare resources and clinical outcomes in poisoning cases.

Regarding the type of agent, similar to what we found in national statistics, remote care was predominant for cases of drug poisoning (44%) during the period evaluated. According to data from SINAN⁹, of the more than 229,000 cases of exogenous poisoning in 2023, among the poisoning agents, 56% were drug-related. The large proportion of remote care for accidents involving venomous animals (15%) should also be analyzed; also considering SINAN data from 2023⁹, of the 342,255 reported accidents, 40% were in the Southeast region, with 16.6% (57,064) in Minas Gerais. This may explain the high demand for remote care at CIATox-MG for cases caused by these agents.

Regarding the number of remote consultations performed year over year, there was a reduction in the total number of consultations recorded between 2020 and 2022. This decrease may be related to multiple factors, including the direct and indirect effects of the COVID-19 pandemic. During this period, measures such as social distancing, movement restrictions, and changes in the operation of health services impacted the population's behavior regarding seeking care and medical advice.¹² Consequently, mild cases of poisoning possibly stopped reaching hospitals, as part of the population avoided seeking care for fear of exposure to the coronavirus.

Regarding the days of the week, the analysis revealed that Mondays and Tuesdays differed from other days, with the number of calls

being higher on these days. On Fridays, the analyses showed a lower number of calls. These trends may vary depending on the population profile, the local health system, and cultural factors. International literature shows that, despite cultural variations, emergency department service patterns often include peaks on Mondays, especially for less urgent cases^{13,14}. These findings have direct implications for staffing and the organization of care flows in emergency services.

An analysis of the data presented reveals the broad scope of CIATox-MG's services, covering municipalities across different regions of Minas Gerais, as well as throughout Brazil. This geographic diversity demonstrates the service's extensive coverage, establishing itself as a national benchmark for treating cases of poisoning and accidents with venomous animals. The distribution of services provided among municipalities reveals significant variation, which can be explained by multiple factors: population differences, local incidence of poisoning and accidents with venomous animals, geography, biome, and climate, as well as the level of accessibility to the service, all contribute to this heterogeneity.

Another relevant factor concerns the existence of clinical protocols in certain hospitals, which advise or regulate contact with CIATox-MG whenever a patient with suspected poisoning is admitted. Such institutional practices may contribute to an increase in the number of visits in certain locations, regardless of the actual incidence of cases.

Regarding the municipalities that do not have records of remote access to CIATox-MG, we can hypothesize several causes, such as: lack of or limited access to the internet and other devices (computers, smartphones) in rural and peripheral areas, low population density, lower income, lower education levels, and higher unemployment. All of these factors are associated with reduced access to the internet and in-person medical services, creating pockets of "double exclusion."^{13,14,15} This also explains the higher density of phone calls in the metropolitan region of large centers, which may reflect a higher level of awareness among professionals, access to information, and education.^{13,14}

Regarding the severity of cases, CIAToxMG data corroborates international literature. It is believed that a significant portion of calls are due to accidental ingestions, particularly in children, with most of these cases classified as mild or non-serious.¹⁷ This data once again reinforces the importance of CIATOX in preventing unnecessary referrals to emergency services and its role in rationalizing the use of healthcare resources.

A significant number of consultations were classified as "unspecified" across several criteria,

such as gender, age group, requester, and others. This high proportion of unspecified data may indicate challenges in collecting or filling out information during telephone consultations. This percentage of “unspecified” data impacts data assessment, limiting a complete understanding of patient profiles. Furthermore, the lack of detailed data can hinder the identification of more accurate patterns and the development of targeted strategies for service improvement. The literature in this field shows that errors related to missing or unspecified data are relatively common in the analysis of databases used in telehealth, reflecting both technical limitations and human and operational factors.¹⁶ This type of error is a recognized and recurring challenge in telehealth data analysis, requiring specific mitigation strategies, such as ongoing training, process simplification, and improvement of technological infrastructure.

Limitations: The study has some limitations. The lack of detailed data on user profiles prevents a deeper understanding of the factors that influence service patterns. Furthermore, the analysis did not consider possible external factors, such as specific events or health campaigns, which could have impacted call volume on certain days or times. Another limitation concerns the representativeness of the municipalities served, which may not reflect the full regional or national diversity. The outcomes of the cases served were not analyzed because the related data were mostly incomplete, making it impossible to assess the quality of the service provided. Finally, the presence of unspecified data reflects a likely error or limitation in the completion of the data and directly impacts the study's analyses and conclusions.

CONCLUSION

CIATox-MG's decades-long experience exemplifies how the use of telehealth can improve and improve care for poisoned patients, especially in emergency care settings and in areas lacking specialized services. The use of platforms like Datatox allows not only for case recording and management but also for the development of a relevant tool for epidemiological investigations, decision-making, and public policy formulation.

Broad coverage and 24-hour service are essential to ensure timely care in cases of venomous animal accidents and poisonings. Improving Datatox data entry is essential to reduce data identified as “unspecified.” Continuous training, streamlined processes, and program improvements strengthen Telehealth in Toxicology.

Acknowledgments: We thank the healthcare, laboratory, and administrative teams of the

Toxicology Department at João XXIII Hospital, who contributed in various ways to this study.

REFERENCES

1. Zambolim, C. M.; Oliveira, T. P.; Hoffmann, A. N.; Vilela, C. E. B.; Neves, D.; Anjos, F. R. et al. Perfil das intoxicações exógenas em um hospital universitário. *Revista Médica de Minas Gerais*, v. 18, n. 1, p. 5-10, 2008.
2. Institute Of Medicine. Committee on Poison Prevention and Control. *Historical context of poison control* [Internet]. In: Institute Of Medicine. Committee on Poison Prevention and Control. *Forging a poison prevention and control system*. Washington: National Academies Press, 2004. Disponível em: <https://www.ncbi.nlm.nih.gov/books/NBK215785/>. Acesso em: 6 set. 2023.
3. Almeida, J. S. C. B. Toxicologia como área de atuação da medicina de emergência. In: Guimarães, H. P.; Borges, L. A. A. (org.). *PROMEDE: Programa de Atualização em Medicina de Emergência: ciclo 7*. Porto Alegre: Artmed Panamericana, 2024. p. 9–58. (Sistema de Educação Continuada a Distância, v. 1).
4. Nilson, L. G. et al. Telessaúde: da implantação ao entendimento como tecnologia social. *Revista Brasileira de Tecnologias Sociais*, v. 5, n. 1, p. 33–47, 2018. DOI: <https://doi.org/10.14210/rbts.v5n1.p33-47>. Acesso em: 14 jun. 2025.
5. MINISTÉRIO DA SAÚDE. Centro de Informação e Assistência Toxicológica. Disponível em: <https://www.gov.br/saude/pt-br/composicao/svsa/saude-ambiental/vigipeq/ciatox>. Acesso em: 15 jun. 2025.
6. WORLD HEALTH ORGANIZATION. *Guidelines for establishing a poison centre*. Geneva: World Health Organization, 2020. Disponível em: <https://iris.who.int/handle/10665/338657>. Acesso em: 15 jun. 2025.
7. IBGE – Instituto Brasileiro de Geografia e Estatística. Projeção da população do Brasil e das Unidades da Federação. Disponível em: <https://www.ibge.gov.br>. Acesso em: junho de 2025.
8. Gummin DD, Mowry JB, Beuhler MC, Spyker DA, Rivers LJ, Feldman R, Brown K, Pham NPT, Bronstein AC, DesLauriers C. 2023 Annual Report of the National Poison Data System® (NPDS) from America's Poison Centers®: 41st

Annual Report. Clin Toxicol Phila. 2024;62(12):793–1027.

9. MINISTERIO DA SAÚDE. Sistema de Informação de Agravos de Notificação (SINAN). Notificações de intoxicações exógenas [Internet]. Disponível em: Disponível em: <https://dados.gov.br/dataset/sinan>

10. Brilli V, Crescioli G, Missanelli A, Lanzi C, Trombini M, Ieri A, Gambassi F, Vannacci A, Mannaioni G, Lombardi N. Exposures and Suspected Intoxications to Pharmacological and Non-Pharmacological Agents in Children Aged 0-14 Years: Real-World Data from an Italian Reference Poison Control Centre. J Clin Med. 2023;12(1).

11. Alwan IA, Brhaish AS, Awadh AI, Misnan A, Rahim NAA, Tangiisuran B, Abdul Majid MI. Poisoning among children in Malaysia: A 10-years retrospective study. PLoS One. 2022;28(17).

12. LOPES, F. F. L. *et al.* Efeitos da pandemia de COVID-19 na demanda por atendimentos de emergência no Brasil. *Revista Brasileira de Enfermagem*, Brasília, v. 74, supl. 1, e20201224, 2021. Disponível em: <https://doi.org/10.1590/0034-7167-2020-1224>. Acesso em: 16 jun. 2025.

13. Brill J, Heymann AD, Zacay G. An After-Hours Telemedicine Urgent Care Service May Not Improve Access to Care for Underserved Populations. Telemed J E Health. 2024;30(10):2573–82.

14. Turnbull J, Pope C, Martin D, Lattimer V. Management of out-of-hours calls by a general practice cooperative: a geographical analysis of telephone access and consultation. Fam Pr. 2011;28(6):677–82.

15. Nadaud J, Wofford A, Lucca C, Angelle J, Bienvenu J, Heidel E, White WM. Telehealth Use and Barriers in Non-Metropolitan Clinic Populations. Urology. 2025;S0090-4295(25).

16. Stein D, Moubarek ML, Fine J, Wajda J, Avdalic M. Demographic disparities in video visit telemetry: understanding telemedicine utilization. Am J Manag Care. 31.

17. Reid NE, Johnson-Arbor K, Smolinske S, Litovitz T. 2020 webPOISONCONTROL data summary. Am J Emerg Med. 2022 Apr;54:184-195. doi: 10.1016/j.ajem.2022.02.014. Epub 2022 Feb 7. PMID: 35158261.

Statement of responsibility: We have no conflicts of interest to declare.

Funding There was no financial support for this study.

How to cite this article: Nascimento, N. D, Andrade Filho, A., Almeida, J. S. The use of Telehealth in a Poison Control Center. Latin Am J Telehealth, Belo Horizonte, 2024; 12(1): 187–194. ISSN: 2175-2990.