

The contribution of a Drug Information Center to improve safety in the drug chain

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Abstract

Objective: To describe the contribution of the DIC from the Federal University of Ceará (DIC/UFC) in promoting safe use of the drug chain, through the analysis of passive information stored by the service. **Method:** A retrospective and cross-sectional study was carried out to identify the profile of information requests. 100% of the information requests (IRs) made to the DIC/UFC from January 2009 to December 2022 were used. Descriptive statistics were used to present the data. **Results:** A total of 916 requests were received during the 14 years observed by the study: 70.85% of the requesters were female; 55.24% had Complete Higher Education; 58.73% were non-users of the drugs involved; 59.72% were pharmacists; and 19.65% worked in the hospital environment. According to therapeutic subgroups, the medications were as follows: psychoanaleptics (n=87; 6.99%); antibacterials for systemic use (n=82; 6.59%); and psycholeptics (n=68; 5.46%). The most frequent issues were the following: drug interactions (13.76%); adverse reactions (12.30%); administration scheme (10.09%); indication (8.83%); and stability (7.57%). Databases were used as sources for response in 50.82% of the information requests. **Conclusion:** Over the years, the DIC/UFC has contributed in a relevant way by providing good quality information to its users, notably pharmaceutical professionals who work in the hospital environment, subsidizing these professionals in their practice and contributing to rational prescription and safety of the drug chain. Faced with the reduction in the number of requests made to the DIC/UFC, an alternative for sustainability of the service is to invest in the production of informative material.

Keywords: Patient Safety; Drug Information; Services, Rational Medication Use; Evidence-Based Practice.

A contribuição de um Centro de Informações sobre Medicamentos para melhorar a segurança na cadeia medicamentosa

Resumo

Objetivo: Descrever a contribuição do CIM da Universidade Federal do Ceará (CIM/UFC) na promoção do uso seguro da cadeia medicamentosa, através da análise de informação passiva armazenada pelo serviço. **Método:** Foi realizado um estudo transversal retrospectivo para identificação do perfil das solicitações de informações. Foram utilizadas 100% das solicitações de informações (SI) feitas ao CIM/UFC, no período de janeiro de 2009 a dezembro de 2022. Utilizou-se a estatística descritiva para a apresentação dos dados. **Resultados:** Foram recebidas 916 solicitações durante os 14 anos observados pelo estudo, 70,85% dos solicitantes eram do sexo feminino, 55,24% possuíam ensino superior completo, 58,73% eram não usuários dos medicamentos envolvidos, 59,72% eram farmacêuticos, e 19,65% atuavam no âmbito hospitalar. Os medicamentos de acordo com os subgrupos terapêuticos foram: psicoanalépticos (n=87; 6,99%), antibacterianos para uso sistêmico (n=82; 6,59%), psicolépticos (n=68; 5,46%). As dúvidas mais frequentes foram: interações medicamentosas (n=13,76%), reações adversas (12,30%), esquema de administração (10,09%), indicação (8,83%) e estabilidade (7,57%). Bases de dados foram usadas como fontes para resposta em 50,82% das solicitações de informação. **Conclusão:** O CIM/UFC tem contribuído, ao longo dos anos, de forma relevante através do fornecimento de informação de qualidade aos seus usuários, notadamente os profissionais farmacêuticos que atuam no âmbito hospitalar, subsidiando estes profissionais na sua prática, contribuindo para a prescrição racional e a segurança da cadeia medicamentosa. Diante da redução do quantitativo de solicitações feitas ao CIM/UFC, uma alternativa para a sustentabilidade do serviço é investirmos na produção de material informativo.

Palavras-chave: Serviços de Informação sobre Medicamentos; Segurança do Paciente; Uso Racional de Medicamentos; Prática Clínica Baseada em Evidências.



Introduction

Drug Information Centers (DICs) are defined as operational units that provide technical and scientific information about medications in an objective, timely, updated and impartial manner, as part of a strategy to address specific information needs, representing a significant ally in promoting rational medication use¹. It is worth noting that, despite the countless information sources available today, not all of them provide adequate information based on the best available and critically evaluated evidence² and DICs are crucial in this scenario. According to the World Health Organization (WHO), they represent a central component of national programs to promote rational medication use³.

According to data from the census conducted by the Brazilian Drug Information Center, there are currently 26 Drug Information Centers and/or Services in Brazil, most of which are located within universities and hospitals, representing an important resource for professionals and the general population to access good quality information⁴.

The Drug Information Center at the Federal University of Ceara (DIC/UFC) ensures its sustainability by being integrated into the Pharmacy program at UFC, which has provided the minimum structural elements for its proper functioning.

In Brazil, since the National Drug Policy was enacted, various actions have been taken to promote rational medication use. However, the challenges persist and unsafe medication use remains a reality in many settings, particularly in the hospital environment where medication errors constitute a significant public health issue. This has repercussions not only from an economic perspective, increasing hospital costs, but also because of the impacts on safety of the medication supply chain and patient safety⁵.

At the global level, the costs related to unsafe medication practices result in estimated losses of approximately \$42 billion per year, causing at least one death a day in the United States and harms to approximately 1.3 million people annually⁶. Unsafe medication practices can be caused by factors such as failures in the medication system, human errors, poor environmental conditions and a shortage of professional staff, negatively impacting prescription, transcription, dispensing and medication administration processes, which comprise the medication chain⁷ and monitoring practices.

In this context, the commitment of health-related organizations and institutions is indispensable in promoting and encouraging evidence-based healthcare practices, given the need for reliable and impartial information about medications. The absence of this type of information, coupled with the rapid promotion of pharmaceutical products, leads to various problems such as inappropriate medication choices, exposure to mostly preventable adverse reactions, increased self-medication practices and other issues related to medication use.

It is believed that the existence of Drug Information Centers (DICs) contributes significantly to promoting safety of the medication supply chain and patient safety⁸. Consequently, interest arose in showing the contribution of a DIC to safe and rational medication use. Thus, the objective of this study is to describe the contribution of the Drug Information Center at the Federal University of Ceara (DIC/UFC) in promoting safe use of the medication supply chain.

Methods

This is a descriptive and cross-sectional study, retrospective for presenting the results corresponding to the contribution of the DIC/UFC, with a focus on medication supply chain safety, based on information requests made from January 2009 to December 2022.

The Drug Information Center at the Federal University of Ceara (DIC/UFC) began its operations in 1994 and is affiliated with the Group for the Prevention of Improper Use of Pharmaceuticals (*Grupo de Prevenção ao Uso Indevido de Medicamentos*, GPUIM). This group originated from the initiative of Pharmacy students at the institution, mobilizing the political and scientific interests of its participants and their concern for promoting safe medication use in society⁹.

The activities carried out by the DIC/UFC are divided into *passive information*, which includes responding to the requests, analyzing questions, conducting research in scientific information sources such as articles published in journals, searching databases or tertiary sources like books, and evaluating the diverse information obtained to prepare responses; and *active information*, which involves creating informational newsletters, educational materials such as booklets and brochures, and offering courses and lectures⁸.

The information requests are addressed through the receipt of inquiries via telephone, email and social media. For collection, a specific form is used, which includes data from the requester and information related to the medications involved in the requests, as well as other relevant information such as comorbidities. The variables selected for this study were as follows: number of requests per year, gender, profession and schooling level of the requester, whether the request comes from the medication user or from third parties, and source of the request. In addition to that, the types of information sources used in formulating the responses were also identified.

For the categorization of medications, the second level of the Anatomical Therapeutic Chemical Classification (ATC) from the World Health Organization was used. The doubts presented were categorized as follows: bibliography, compatibility, composition, preservation, contraindication, availability on the market, efficacy, administration regimens, stability, pharmacokinetics, pharmacodynamics, indications, drug interactions, legislation, adverse reactions, safety, teratogenicity and toxicology.

All request forms that were properly stored by year of service provided by the DIC/UFC were included in the study, even if some data were incomplete.

The data collection procedure was carried out with prior scanning of all request forms, and the data were entered into a Microsoft® EXCEL® 2016 spreadsheet containing all the selected and aforementioned variables. A descriptive analysis was performed, and the data were presented using tables and graphs.

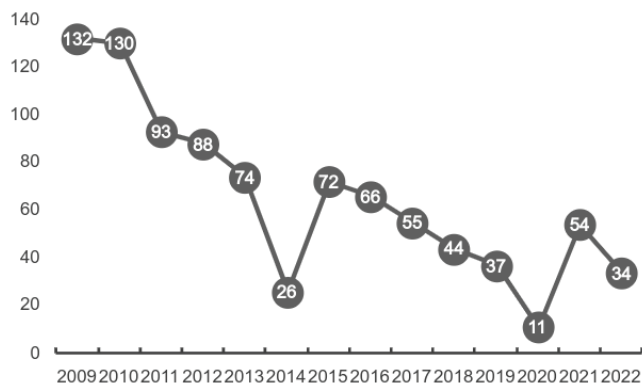
The nature of this study waives review by an Ethics and Research Committee.

Results

According to the data obtained in the survey, the DIC/UFC handled a total of 916 information requests (IRs), with a mean of 65 requests per year, which are distributed by year of occurrence in Figure 1.



Figure 1. Annual distribution of the information requests, DIC/UFC, 2009-2022. Fortaleza, CE.



In relation to the profile of the DIC/UFC requesters, most of them were female (n=649; 70.85%), had a higher education degree (n=506; 55.24%), were not users of the medications involved in the information requests (n=538; 58.73%), were pharmacists (n=547; 59.72%), and worked in a hospital setting (n=180; 19.65%), as shown in Table 1.

Table 1. Characterization of the profile of the DIC/UFC requesters, 2009-2022. Fortaleza, CE.

Variables	n (%)
Gender	
Female	649 (70.85)
Male	222 (24.23)
Not reported	45 (4.92)
Schooling level	
Higher Education	506 (55.24)
High School	21 (2.30)
Elementary School	1 (0.11)
Not reported	388 (42.35)
Medication user	
No	538 (58.73)
Yes	101 (11.03)
Not reported	277 (30.24)
Profession	
Pharmacist	547 (59.72)
Nurse	13 (1.42)
Others	356 (38.86)
Institution	
Hospital	180 (19.65)
Higher Education Institution	137 (14.96)
Home	64 (6.99)
Drug Information Center	63 (6.88)
Pharmacy	48 (5.24)
Others	424 (46.29)

As for the medications involved in the requests, they are listed in Table 2 according to the number of requests and therapeutic subgroups, as per the second level of the ATC classification.

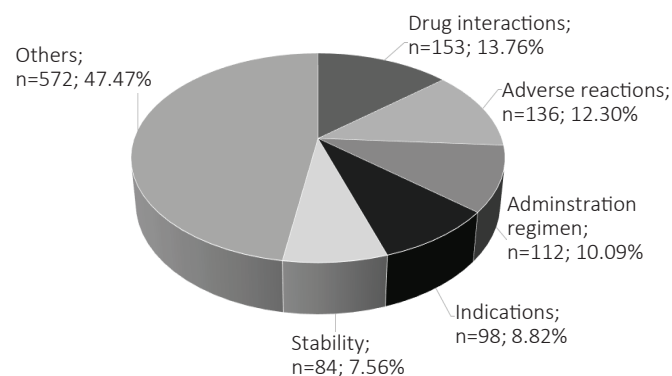
Table 2. Therapeutic Subgroups, according to the ATC classification, involved in the information requests, DIC/UFC, 2009-2022. Fortaleza, CE.

Subgrupos terapêuticos - ATC	n (%)
N06 - Psychoanaleptics	87 (6.99)
J01 - Antibacterials for systemic use	82 (6.59)
N05 - Psycholeptics	68 (5.46)
A02 - Drugs for acid related disorders	49 (3.94)
N03 - Antiepileptics	49 (3.94)
M01 - Antiinflammatory and antirheumatic products	48 (3.86)
A10 - Drugs used in diabetes	44 (3.53)
N02 - Analgesics	41 (3.29)
C09 - Agents acting on the renin-angiotensin system	36 (2.89)
H02 - Corticosteroids for systemic use	34 (2.73)

Among the 1,245 therapeutic subgroups involved in the information requests during the study period, the main ones are as follows: psychoanaleptics (n=87; 6.99%), antibacterials for systemic use (n=82; 6.59%) and psycholeptics (n=68; 5.46%).

Among the 1,110 doubts contained in the information requests sent to the DIC/UFC during the survey period, the five most recurring topics were highlighted, namely: drug interactions (n=153; 13.76%), adverse reactions (n=136; 12.30%), administration regimen (n=112; 10.09%), indications (n=98; 8.82%) and stability (n=84; 7.56%), as described in Figure 2.

Figure 2. Main topics involved in the information requests to the DIC/UFC, 2009-2022. Fortaleza, CE.

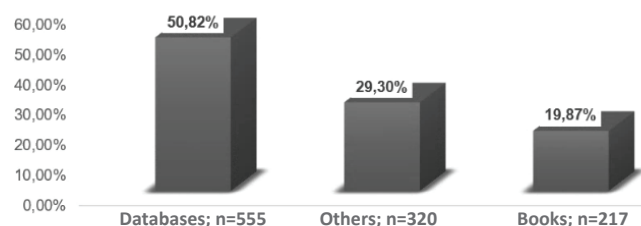


Note: The following is included in the "Others" category: bibliography, compatibility, composition, preservation, contraindication, availability on the market, efficacy, pharmacokinetics, pharmacodynamics, legislation, safety, teratogenicity and toxicology.

When addressing the 916 requests received between 2009 and 2022, a search and analysis of information from reliable sources (scientific databases, articles and books, among others) was adopted, represented according to the number of instances in which each type of source was consulted (Figure 3).

It is verified that databases were the most frequently used sources (n=558; 50.82%), with particular emphasis on Micromedex® and DynaMed®. During formulation of the response, in order to confirm accuracy or reproducibility of the information, more than one type of source was consulted when necessary.

Figure 3. Main information sources used by the DIC/UFC, 2009-2022. Fortaleza, CE.



Note: The following is included in the "Other sources" category: journal articles, theses, dissertations and websites of government organizations.

Discussion

The results presented in this article show the 14 years of operation of the DIC/UFC, highlighting the relevance of its contribution to safe medication use by its users, assisting them with good quality information for timely and informed decision-making.

In relation to the number of information requests made to the DIC/UFC, there is a clear reduction in their number over time, possibly due to the emergence and dissemination of social media platforms such as Facebook and Instagram. This trend of declining IRs was also observed in a review study conducted in Portugal¹⁰ that assessed the overall evolution of medication information centers in that country and the various factors, including the influence of the evolution of information technologies and health systems on functioning of the DICs.

The reduction in the number of requests to the DIC/UFC over time may also reflect people's need for quick access to information about medication use through Internet. The study by Moretti *et al.* (2012)¹¹ estimated that more than 10 million users regularly access health websites in Brazil. However, the quality of the information provided through this medium should be carefully analyzed. Nevertheless, the search for safe, validated and up-to-date information can be challenging for those who do not routinely consult bibliographic sources, potentially hindering or delaying favorable clinical outcomes for the patients and even posing risks to their health.

As for the low number of IRs in 2014, this can be explained by damage to the DIC/UFC database, which resulted in an unreliable count of IRs for that year.

In relation to 2020, the reduced number of IRs can be explained by the temporary closure of the service due to the COVID-19 pandemic. On the other hand, in the following year there is a noticeable recovery in the number of IRs, probably due to the need for guidelines on the proper use of medications for treating COVID-19 cases.

Disseminating good quality information proves to be one of the main tools for promoting rational medication use, especially in times of "infodemic", which is "defined by the large flow of information that spreads in the media on a specific subject matter", hindering access to reliable scientific information sources and favoring unsafe practices in medication use¹². As reliable information became available from trusted sources that are

routinely consulted during the request handling process, the DIC/UFC equipped itself to meet the requesters' demands.

As for the profile of the DIC/UFC users, there are studies with similar findings to ours, where the primary requesters are health professionals, most of them pharmacists working in hospitals¹³⁻¹⁴. These findings may indicate these professionals' interest in using DIC services, which provide its information based on secure and reliable sources processed and evaluated by specialized professionals, and addressing a particular need of the requester. Other reasons that can be mentioned include the professionals' workload in the workplace, which may not allow them time for bibliographic searches, lack of training for proper information retrieval, and difficulty accessing good quality databases and literature.

Analyzing the DIC/UFC history, a gradual shift can be observed in the requesters' profiles, moving away from medication users and laypeople to establishing a new profile focused on pharmacist professionals. In another study conducted in 2005 by Aguiar *et al.* at our DIC, a considerable number of information requests from pharmacists was already evident.

The medications involved in the IRs were mainly related to the psychoanaleptics class, with antidepressants (particularly fluoxetine) as prominent within this class.

Systemic antibacterials ranked second, with benzylpenicillin as the most frequently requested. A study¹⁶ that aimed at analyzing the profile of a DIC in Ethiopia found that antibiotics were the primary group of medications included in the IRs. The prevalence of systemic antibacterials can be related to their frequent use in hospital settings¹⁷⁻¹⁸.

Among the psycholeptics group, risperidone was the most mentioned in the IRs. Anxiolytics also stand out, as they are medications with significant consumption in the population and a growing use trend, especially after the COVID-19 pandemic¹⁹.

The most frequent topics in the IRs were drug interactions, adverse reactions, administration regimen, indications and stability. A similar profile was found in other studies²⁰⁻²¹ that evaluated DICs.

Drug-related problems exert a significant impact on patient safety and have therefore been the focus of various initiatives. In response to this serious public health issue, the World Health Organization launched the Third Global Patient Safety Challenge, with the goal of reducing by 50% the serious adverse events resulting from medication errors by 2022. Among the five steps to achieve the global challenge goals on Medication without Harms, one of them is implementing mechanisms to increase the patients' knowledge about their medication treatments²². In this context, the DIC/UFC can significantly contribute to educational and informational activities for users of the service. Another important contribution of DICs is the development and dissemination of active information, which should be strengthened as passive information requests gradually decrease.

Regarding the information sources used by the DIC/UFC team for preparing responses to the IRs, the following databases can be mentioned: Micromedex®, PubMed and Dynamed®, DynaMed® provides clinically reviewed content with recommendations based on the latest scientific evidence, covering a wide range of topics related to diseases, health conditions and abnormal findings, as well as highly focused topics on assessment, differential diagnosis and management. Micromedex® is a leading online reference database of evidence-based drug information²³.

It is worth noting that, of these databases, only PubMed provides free access to a wealth of scientific articles, especially when a DIC is integrated into the structure of federal public universities through the journals from the Coordination for the Improvement of Higher Education Personnel (*Coordenação de Aperfeiçoamento de Pessoal de Nível Superior*, CAPES). The other two databases were made available through the Ministry of Health for a limited period of time and they are no longer accessible. It is worth noting that free access to the Micromedex® database can currently be provided through the IBM® Micromedex® mobile apps from IBM® Watson Health™, although this requires a subscription.

Other information websites used can be mentioned, such as ANVISA and the Ministry of Health. In the aforementioned article by Ashenef *et al.* (2018)²⁴, the Micromedex® reference source is cited as the second most consulted source.

It is important to strengthen the role of DICs in providing information. The quality of the information about a medication is as important as the quality of the active ingredient itself. This premise was presented in the report of the 47th World Health Assembly in 1994²⁵. Since then, Drug Information Centers (DICs) in the country have been persistently working to contribute to rational prescription and safety of the medication chain.

However, as a study limitation, it is worth noting the incompleteness of the information request forms regarding the users' profiles, indicating the need for improved record-keeping. Nevertheless, the results can be used for comparative purposes with other Drug Information Centers (DICs).

Conclusion

The analysis of the data collected during the study period allows us to identify the contribution of the DIC/UFC to safe and rational medication use, strengthening both medication chain safety and patient safety.

The DIC/UFC has made a significant contribution over the years by providing good quality information to its users, especially pharmacists working in hospital settings. It has supported these professionals in their practice, contributing to rational prescriptions and enhancing safety of the medication chain. Faced with the reduction in the number of requests made to the DIC/UFC, an alternative for sustainability of the service is to increase the production of informative materials and invest in the creation of active information, as well as its dissemination through social media.

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Collaborators

JIPS took part in the following stages: choosing the topic and elaboration of the research project, survey of the data collected, data interpretation and writing of the article.

RPA collaborated in formatting the data and presenting the article.

ACBP and PRMS collaborated in the paper's statistics and in interpretation of the results. MPM contributed to writing of the article and provided a relevant critical review of the intellectual content.

Conflicts of interests

The authors declare no conflicts of interest.

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