



J. Empir. Soc. Sci. Stud. 7(1)

## The Role of Social Media in Enhancing Postmarketing Surveillance (PMS) in Healthcare

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### Abstract

Postmarketing (PMS) surveillance plays a critical role in monitoring the safety and effectiveness of healthcare products following their approval and widespread use. This research aims to explore the role of social media in enhancing postmarketing surveillance efforts. Social media platforms have emerged as powerful tools for collecting and analyzing real-time data on adverse events, patient experiences, disease outbreaks, and medication-related issues. Leveraging user-generated content, data mining techniques, and natural language processing, social media provides a valuable source of information for detecting potential safety concerns and identifying emerging trends earlier than traditional reporting systems. Additionally, social media enables direct engagement with patients, facilitating feedback, and understanding their perspectives on healthcare products. Furthermore, social media serves as a platform for effective communication of safety information, warnings, and updates from regulators, healthcare providers, and pharmaceutical companies. Challenges such as data quality, privacy considerations, and the need for appropriate

analysis tools persist. This research highlights the significance of social media in postmarketing surveillance and underscores the importance of addressing the associated challenges to maximize its utility in ensuring public health and safety.

**Keywords:** Postmarketing surveillance, Social media, Safety concerns, Patient experiences, Public health

## Introduction

Postmarketing surveillance, also known as postmarketing safety surveillance or simply PMS surveillance, is a crucial aspect of pharmacovigilance. It refers to the ongoing monitoring of the safety and effectiveness of a drug or medical product after it has been approved and made available to the general population. PMS surveillance plays a vital role in identifying and assessing potential risks, adverse effects, and unexpected events associated with a medication [1].

The primary objective of PMS surveillance is to ensure the ongoing safety and effectiveness of a drug in real-world settings. While clinical trials provide valuable data during the preapproval phase, they often involve a limited number of participants and may not capture the full spectrum of a drug's effects. PMS surveillance allows for the collection of data from a larger and more diverse patient population, providing a broader understanding of a drug's safety profile.

PMS surveillance systems utilize various methods to gather information. These can include spontaneous reporting systems, where healthcare professionals and patients report adverse events voluntarily, as well as active surveillance programs that proactively monitor specific populations or healthcare databases. Data from these sources are analyzed to identify potential safety signals or patterns of adverse events that may require further investigation [2].

One of the significant advantages of PMS surveillance is its ability to detect rare or long-term adverse effects that may not have been identified during clinical trials. As more patients are exposed to a medication over an extended period, previously unknown risks may emerge. PMS surveillance provides an opportunity to capture and evaluate these risks, helping regulatory authorities and healthcare professionals make informed decisions about a drug's continued use.

PMS surveillance is not limited to identifying safety concerns alone. It also plays a crucial role in evaluating a drug's real-world effectiveness and comparing it to the results observed in clinical trials. This information is valuable for healthcare professionals, regulators, and researchers to assess whether a medication is delivering the expected benefits to patients in everyday practice.

In addition to ensuring patient safety, PMS surveillance also contributes to the improvement of public health. By monitoring and reporting adverse events, regulators can take appropriate actions such as updating product labels, issuing safety communications, or even withdrawing a drug from the market if necessary. This proactive approach helps protect the public and maintain confidence in the healthcare system.

Postmarketing surveillance is an essential component of pharmacovigilance that aims to monitor the safety and effectiveness of drugs and medical products in real-world settings. By collecting and analyzing data from diverse patient populations, PMS surveillance can identify potential risks and unexpected adverse events that may not have been captured during clinical trials. It provides valuable insights into a drug's safety profile, helps evaluate its real-world effectiveness, and contributes to the overall improvement of public health. Through ongoing monitoring and proactive actions, PMS surveillance plays a vital role in ensuring patient safety and maintaining public trust in the healthcare system.

Social media has emerged as a powerful force in our interconnected world, revolutionizing the way people communicate, share information, and build relationships [3]. With the rise of platforms like Facebook, Twitter, Instagram, and LinkedIn, social media has become an integral part of daily life for billions of individuals worldwide. It has not only transformed personal interactions but has also had a profound impact on various aspects of society, including business, politics, and activism.

One of the most significant benefits of social media is its ability to connect people across vast distances, fostering global communication and breaking down geographical barriers. It allows individuals to stay connected with friends and family, regardless of their physical location. Social media platforms provide a space for people to share personal experiences, photos, and memories, enabling them to maintain meaningful connections even when they can't be together physically. Moreover, social media has facilitated the formation of virtual communities and interest groups, enabling like-minded individuals to connect, share ideas, and support each other.

### Contributions of social media in postmarketing surveillance

#### *Adverse Event Reporting:*

Adverse Event Reporting has traditionally relied on formal channels such as healthcare providers, regulatory agencies, and pharmaceutical companies to collect

and analyze data on potential safety concerns related to healthcare products [4]. However, the rise of social media platforms has introduced a new avenue for individuals to share their experiences and report adverse events in real-time. This user-generated content has the potential to significantly enhance the detection and monitoring of adverse events, providing valuable insights into the safety profiles of various healthcare products.

One of the key advantages of using social media platforms for adverse event reporting is the immediacy of information sharing. Patients can quickly and easily post about their symptoms, side effects, or other issues they have encountered directly on platforms like Facebook, Twitter, or dedicated health forums. This real-time reporting allows for the rapid identification of potential safety concerns, enabling healthcare providers and regulatory agencies to respond swiftly and take appropriate actions.

Furthermore, social media platforms provide a vast reach and accessibility to diverse populations. People from different geographic locations, socioeconomic backgrounds, and demographics can freely express their experiences and concerns about healthcare products. This broad range of perspectives can help uncover adverse events that may have been overlooked or underreported through traditional reporting channels. It allows for a more comprehensive understanding of the potential risks associated with specific medications or treatments.

The user-generated content on social media platforms also contributes to the identification of emerging trends in adverse events. By aggregating and analyzing a large volume of posts and comments, patterns and correlations can be detected. For example, a sudden increase in reports of a specific side effect associated with a particular medication could signal a previously unrecognized safety issue. These trends can be monitored in real-time, enabling proactive measures to be taken to mitigate potential risks.

In addition to identifying safety concerns, social media platforms can serve as a valuable source of information for healthcare providers and patients. Patients often turn to online communities and forums to seek support and share their experiences with others facing similar health conditions. These platforms allow patients to connect with each other, exchange information about potential side effects, and provide emotional support. Healthcare providers can also utilize social media

platforms to stay informed about patient experiences and gain insights into the real-world effectiveness and safety of certain treatments.

However, there are also challenges associated with using social media for adverse event reporting. The sheer volume of user-generated content makes it difficult to sift through and identify relevant information. There is a need for sophisticated algorithms and data mining techniques to extract meaningful insights from the vast amount of data available. Furthermore, the reliability and accuracy of user-generated content can be a concern, as information shared on social media platforms may be subjective, incomplete, or biased.

To address these challenges, collaborations between social media platforms, healthcare providers, and regulatory agencies are crucial. Efforts should be made to develop standardized processes and guidelines for reporting and analyzing adverse events from social media. This includes the establishment of data sharing agreements, the implementation of data privacy protections, and the development of algorithms and tools to facilitate the efficient monitoring and analysis of user-generated content.

#### *Data Mining and Signal Detection:*

Data mining and signal detection play a crucial role in harnessing the vast amounts of data generated by social media platforms, particularly when it comes to discussions, opinions, and sentiments related to healthcare products [5], [6]. With the advent of advanced data mining and natural language processing techniques, regulators and pharmaceutical companies now have the ability to analyze these data to detect signals of potential adverse events or other safety-related issues [7]. By monitoring social media conversations, patterns and trends can be identified earlier than traditional reporting systems, enabling timely intervention and improved public health outcomes.

One of the key advantages of utilizing data mining techniques in the context of social media is the ability to tap into real-time data [8]. Unlike traditional reporting systems, which often rely on voluntary reporting and can be subject to delays, social media platforms provide a constant stream of information that can be accessed and analyzed in near real-time. This real-time aspect is particularly valuable when it comes to identifying emerging patterns and trends related to healthcare products. By promptly detecting signals of potential adverse events or safety concerns, regulators and pharmaceutical companies can take swift action to protect public health.

Furthermore, data mining techniques allow for the extraction of valuable insights from the unstructured data found in social media conversations. Natural language processing algorithms can be employed to understand the sentiment behind user-generated content, such as tweets, posts, and comments. This sentiment analysis can help identify both positive and negative opinions regarding healthcare products, enabling regulators and pharmaceutical companies to gauge public perception and anticipate potential safety issues. By combining sentiment analysis with other data mining techniques, such as topic modeling and clustering, a more comprehensive understanding of the data can be achieved.

The vast amount of data available on social media platforms presents both opportunities and challenges. On one hand, the sheer volume of data can provide a rich source of information for signal detection. However, the challenge lies in effectively processing and analyzing this large-scale data. Data mining techniques, such as machine learning algorithms, can be employed to automatically sift through and categorize the data, enabling more efficient analysis. These algorithms can be trained to recognize patterns and anomalies, allowing for the detection of potential signals amidst the noise of social media conversations [8].

One of the notable benefits of utilizing data mining and signal detection on social media platforms is the ability to detect signals earlier than traditional reporting systems. In traditional systems, adverse events and safety concerns are typically reported by healthcare professionals or directly by consumers, and there can be significant delays in the reporting process. By leveraging social media data, regulators and pharmaceutical companies can potentially identify signals of adverse events or safety issues at an early stage, even before formal reports are submitted. This early detection can facilitate timely interventions, such as issuing safety advisories, conducting further investigations, or initiating product recalls, ultimately safeguarding public health.

It is important to note that while data mining and signal detection on social media platforms can provide valuable insights, they should not be considered a replacement for traditional reporting systems. Rather, they should be viewed as complementary tools that enhance the overall surveillance and monitoring of healthcare products. Traditional reporting systems, such as adverse event reporting databases and pharmacovigilance systems, continue to be vital for capturing detailed information, conducting in-depth investigations, and ensuring regulatory compliance.

### *Patient Experiences and Feedback:*

Patient experiences and feedback shared on social media platforms have become a valuable resource for regulators and manufacturers in the healthcare industry. These platforms offer patients a space to share their firsthand experiences with medications or medical devices, providing insights into the real-world effectiveness, tolerability, and quality of healthcare products. By actively collecting and analyzing this wealth of information, regulators and manufacturers can gain a deeper understanding of the patient perspective and potentially uncover unmet needs or safety concerns.

One of the primary advantages of utilizing patient experiences and feedback from social media platforms is the direct access to unfiltered and authentic patient voices. Traditional methods of gathering patient feedback, such as surveys or clinical trials, often involve structured questions and may not capture the full range of patient experiences. Social media, on the other hand, allows patients to express their opinions and share their stories in a more natural and spontaneous manner. This unfiltered feedback can provide valuable insights into the real-life experiences of patients, shedding light on the nuances of healthcare product usage that may not be captured through other means.

Analyzing patient experiences and feedback from social media platforms requires the use of advanced data analysis techniques. Natural language processing algorithms can be employed to extract meaningful information from the vast amount of unstructured textual data available on these platforms [9]. Sentiment analysis can be applied to categorize the sentiment expressed by patients, helping to identify positive experiences, negative experiences, and areas of concern. Topic modeling techniques can be utilized to uncover common themes and issues discussed by patients, enabling regulators and manufacturers to gain a comprehensive overview of patient perspectives.

By collecting and analyzing patient experiences and feedback, regulators and manufacturers can uncover valuable insights that may not have been apparent through traditional reporting systems. Patients often share their experiences with medications or medical devices in real-time, providing up-to-date information on the effectiveness and tolerability of healthcare products. This real-world data complements the controlled environment of clinical trials, allowing regulators and manufacturers to evaluate the performance of healthcare products in diverse patient populations and real-life situations [10].

Moreover, patient experiences and feedback on social media platforms can help identify unmet needs and safety concerns. Patients may discuss unexpected side effects, adverse events, or issues with product quality, which can be early indicators of potential safety issues. By monitoring and analyzing these conversations, regulators and manufacturers can proactively address safety concerns and take necessary measures to ensure patient safety. Additionally, patient feedback can highlight areas where improvements can be made, leading to the development of more patient-centric healthcare products that better meet the needs and preferences of individuals.

It is important to note that while patient experiences and feedback on social media platforms offer valuable insights, there are limitations to consider. The data collected from social media platforms may not represent the entire patient population and could be subject to biases. Additionally, verifying the authenticity and accuracy of the information shared on social media can be challenging. Therefore, it is crucial to combine the analysis of social media data with other sources of information, such as traditional reporting systems and clinical studies, to obtain a more comprehensive understanding of patient experiences [11], [12].

#### *Disease Surveillance and Outbreak Detection:*

Disease surveillance and outbreak detection are critical components of public health monitoring. Social media platforms have emerged as a valuable tool in this domain, offering a wealth of data that can serve as an early warning system for disease outbreaks or medication-related issues. By actively monitoring discussions, posts, and other user-generated content related to symptoms, illnesses, or adverse events, health authorities can identify clusters of cases or potential safety signals that require further investigation [13], [14].

One of the primary advantages of using social media for disease surveillance and outbreak detection is the real-time nature of the data. Traditional disease surveillance systems often rely on data that is reported by healthcare providers or collected through surveys, which can introduce delays. In contrast, social media data provides a continuous stream of information that can be accessed and analyzed in near real-time. This enables health authorities to detect early signals of disease outbreaks or adverse events, allowing for swift intervention and the implementation of appropriate public health measures.



Social media data can complement traditional surveillance systems by offering a different perspective on public health trends. While traditional systems capture data from healthcare facilities and official reporting channels, social media provides a platform for individuals to share their experiences and concerns openly. By monitoring these conversations, health authorities can gain insights into public perceptions, symptoms, and emerging patterns related to diseases or medication use. This can help fill gaps in traditional surveillance data and provide a more comprehensive understanding of public health trends.

Analyzing social media data for disease surveillance and outbreak detection requires advanced data mining and natural language processing techniques. Algorithms can be employed to sift through large volumes of data, categorize discussions based on relevant keywords or topics, and identify clusters of cases or unusual patterns [15], [16]. Sentiment analysis can also be used to gauge the public's sentiment towards symptoms, illnesses, or medication use, providing additional insights into public health trends and concerns. By combining these techniques with traditional surveillance methods, health authorities can enhance their capacity to detect and respond to disease outbreaks or medication-related issues.

Social media platforms are not representative of the entire population, and certain demographic groups may be underrepresented. Additionally, the accuracy of information shared on social media can vary, and distinguishing between reliable and unreliable sources can be challenging. Therefore, it is crucial to validate and corroborate the findings from social media data with other sources, such as official health records or reports, to ensure the accuracy and reliability of the information [17].

#### *Pharmacovigilance Communication:*

Pharmacovigilance communication plays a crucial role in ensuring the safe and effective use of healthcare products. Social media platforms have emerged as a valuable channel for regulators, healthcare providers, and pharmaceutical companies to communicate important safety information, warnings, or updates to the public [18]. The unique characteristics of social media enable rapid dissemination of information, reaching a wide audience, and facilitating real-time engagement with the public.

One of the primary advantages of using social media for pharmacovigilance communication is the speed at which information can be shared. Traditional methods

of communication, such as press releases or official statements, may take time to draft, distribute, and reach the intended audience. In contrast, social media platforms allow for immediate communication, ensuring that critical safety information reaches the public in a timely manner. This rapid dissemination of information is particularly important in situations where urgent actions or precautions are necessary to ensure patient safety [19].

Social media platforms also provide an extensive reach, allowing regulators, healthcare providers, and pharmaceutical companies to communicate with a wide audience. Social media has become increasingly ubiquitous, with billions of users worldwide. This broad user base includes patients, healthcare professionals, and the general public, making social media an effective medium for reaching diverse stakeholders. By utilizing social media, important safety messages can be delivered directly to the target audience, ensuring that the information is accessible to those who need it [20].

Engagement is another key aspect of pharmacovigilance communication on social media. These platforms offer interactive features that facilitate two-way communication between stakeholders. Users can comment, ask questions, and share their experiences or concerns, fostering an environment for dialogue and information exchange. Regulators, healthcare providers, and pharmaceutical companies can actively engage with the public, addressing inquiries, clarifying misconceptions, and providing further guidance. This real-time engagement helps build trust, enhance transparency, and empower individuals to make informed decisions regarding their healthcare.

Additionally, social media platforms offer opportunities for targeted communication. By leveraging user data and analytics, messages can be tailored to specific demographics, geographic regions, or interest groups. This targeted approach ensures that safety information reaches the intended audience effectively, maximizing the impact of the communication efforts. Moreover, social media platforms often provide tools for monitoring and measuring the reach and engagement of communication campaigns, allowing for ongoing evaluation and refinement of strategies.

While social media platforms offer numerous benefits for pharmacovigilance communication, there are certain considerations that need to be taken into account. Ensuring the accuracy and reliability of information shared on social media is of

utmost importance [21]. Misinformation or rumors can quickly spread on these platforms, potentially causing confusion or unnecessary concern among the public. Therefore, it is crucial for regulators, healthcare providers, and pharmaceutical companies to verify and validate information before sharing it on social media. Clear guidelines and protocols should be established to ensure that only accurate and verified information is disseminated. Social media platforms provide a direct and effective channel for pharmacovigilance communication. These platforms enable rapid dissemination of information, reaching a wide audience and facilitating real-time engagement with the public. By leveraging social media, regulators, healthcare providers, and pharmaceutical companies can ensure that important safety information, warnings, or updates regarding healthcare products are communicated efficiently and effectively. However, it is crucial to prioritize the accuracy and reliability of information shared on social media and establish clear guidelines to maintain the trust and confidence of the public.

## Conclusion

social media platforms have opened up new opportunities for adverse event reporting in healthcare. User-generated content on platforms like Facebook, Twitter, and health forums can provide valuable insights into potential safety concerns and emerging trends related to healthcare products. The immediacy, reach, and diversity of information available on social media make it a powerful tool for identifying and monitoring adverse events. Challenges such as data volume, reliability, and accuracy need to be addressed through collaborations and the development of appropriate tools and guidelines. With the proper infrastructure and processes in place, social media can be harnessed as a valuable resource for enhancing patient safety and improving the overall understanding of healthcare product risks.

Data mining and signal detection techniques applied to social media data offer significant potential for the timely detection of signals related to adverse events and safety issues of healthcare products. By leveraging the vast amount of data and utilizing advanced algorithms, regulators and pharmaceutical companies can gain valuable insights into public sentiment and identify emerging patterns and trends. The real-time nature of social media data, combined with sentiment analysis and other data mining techniques, allows for early identification of signals, facilitating prompt interventions and improved public health outcomes. While these techniques should not replace traditional reporting systems, they serve as powerful tools to enhance surveillance and monitoring efforts in the field of healthcare product safety.

Social media platforms provide a valuable avenue for patients to share their experiences and provide feedback on healthcare products. The insights derived from analyzing patient experiences and feedback can offer regulators and manufacturers a unique understanding of real-world effectiveness, tolerability, and quality. By tapping into the unfiltered voices of patients, regulators and manufacturers can identify unmet needs, detect safety concerns, and develop more patient-centric healthcare products. However, it is important to consider the limitations of social media data and supplement it with other sources of information for a more robust evaluation.

Social media platforms offer valuable insights for disease surveillance and outbreak detection. By monitoring discussions and posts related to symptoms, illnesses, or adverse events, health authorities can identify clusters of cases or potential safety signals in a timely manner. Social media data, with its real-time nature and ability to capture public perceptions, complements traditional surveillance systems and contributes to a more comprehensive understanding of public health trends. Advanced data mining and natural language processing techniques enable the analysis of this vast amount of data, providing valuable insights for public health interventions. However, it is crucial to validate and supplement social media data with other sources to ensure the accuracy and reliability of the findings.

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