Drugs & Therapy Perspectives (2023) 39:249–261
https://doi.org/10.1007/s40267-023-01000-5

REVIEW ARTICLE

All-round approaches to increase adverse drug reaction reports: a scoping review

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Accepted: 14 May 2023 / Published online: 16 June 2023

Abstract

Introduction Medicines are among the most effective technologies for reducing mortality and morbidity. Adverse drug reactions (ADRs) are a well-recognised public health problem and a major cause of hospitalisation and death. Even though the evaluation of the safety of drugs is performed throughout the entire life cycle of a given compound, the postmarketing phase still displays a chief role. In this sense, the surveillance of drug reactions through pharmacovigilance (PV) systems is indispensable. Yet, underreporting is a major issue that undermines the effectiveness of spontaneous reports. This work presents a scoping review on the use of information systems and strategies used to promote ADR reporting by health professionals and patients.

Methods A scoping review was conducted under Arksey and O'Malley's framework. A search on the PubMed (MEDLINE), Scopus and Cochrane databases was conducted from 2005 until 2022. Articles with a focus on the spontaneous reporting of ADRs were included. Peer-reviewed published studies from any region in the world conducted with a qualitative, quantitative, or mixed-methods design focused on the research questions were eligible for inclusion. The reporting followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) checklist. Two independent reviewers performed standardised data extraction and synthesis.

Results This work discloses six strategies aimed to improve the collection of ADR reports, namely economic incentives, educational interventions for health professionals and patients, media attention, the use of social networks in the proactive search for ADRs, applications for smartphones and campaigns. These strategies allowed PV systems evolution, enabling the early detection of serious ADRs by industry and regulators. Creating strategies that enable patients' involvement are highlighted across PV systems.

Conclusion The future path in drug safety solely depends on proactive PV approaches carried out by all stakeholders, where patients play a vital role in ADR reporting. The implementation of innovative methods is essential to encourage ADR reporting.

Introduction

Medicines are essential to healthcare systems and have emerged as one of the most efficient tools for lowering morbidity and mortality. However, due to the significant increase of average life expectancy, the predominance of degenerative and chronic diseases, and the rising consumption of medication, particularly among the elderly, adverse drug reactions (ADRs) are inevitable [1].

ADRs are a leading cause of morbidity in developed countries and are responsible for an increase in hospital admissions (2.4–6.5%, many of which are preventable), representing a substantial burden on healthcare resources [2], with some countries spending 15–20% of their hospital budgets to treat ADR complications [3]. These have raised safety concerns among various stakeholders, particularly regulatory authorities [4], prompting increased attention from healthcare professionals [5, 6] and patient organisations [7, 8] and patients to ensure safety in drug use.

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It is considered that a large proportion of serious ADRs are detected only after drug approval since many of them are rare and/or have a long time to onset [9]. Thus, the continuous surveillance of medicine after its marketing authorisation is essential. Accordingly, detecting drug risks and defending the marketed product against inappropriate use constitutes the essence and mission of pharmacovigilance (PV) [10]. PV aggregates skills for the detection, evaluation, comprehension and prevention of ADRs or other drug-associated problems, as its ultimate purpose is to minimise risks and maximise the benefits of medicinal products [11].

The World Health Organization (WHO) has an international drug monitoring programme responsible for exchanging information between countries and promoting PV [10]. Through the Uppsala Monitoring Centre (UMC), PV is promoted through exchanging information and policies between countries. This Centre is responsible for international drug monitoring as well as the management of technical and scientific aspects of the WHO PV network [12]. In January 2023, 155 countries were part of this international programme as effective members and 21 as associates, which covers about 99% of the world's population [12].

The ADRs received by the WHO are stored in the Vigibase® database for spontaneous reporting, which contains the reports sent by the various member states enrolled in the programme. Currently, the database has over 30 million reports [13]. In Europe, supervision and promotion of PV are ensured by the European Medicines Agency (EMA) [14], and ADRs are registered in a database called EudraVigilance®, to where the national regulatory authorities of each of the European Union countries address all ADR reports [15].

One of most critical limitations of PV for years was the low rate of ADR reporting [16]. Due to poor adherence and insufficient information collected, new strategies were adapted to increase information about ADRs. In many countries, PV systems have started collecting information exclusively from health professionals. Yet, more recently, alternative reporting systems for patients were also developed, raising awareness by promoting and disseminating these systems to improve patient involvement in PV [17, 18], contributing to less underreporting [19] and reporting different ADRs and covering blindspots of PV as over-the-counter and herbal drugs, and also giving important information on the impact of ADRs on daily life [7, 20].

In 2010, due to the directive 2010/84/EC, patients were able to report directly to their country's national PV system, leading to increased ADR reports [21]. This directive contributed to the early detection of ADRs, a better understanding of the impact on the patient's life, and the capture of subjective elements in ADR narratives, promoting consumer rights and equity [22–24]. In addition, reporting by patients makes a valuable contribution to detect new signals or strengthen pre-existing ones, thus providing valuable information about the conditions of drug use [8]. Since then, several studies have shown that the contribution of patients goes beyond a quantitative contribution, providing a new dimension of PV [25].

Health professionals and patients have several methods to report ADRs to competent authorities. The most common are online or paper forms, but there are other options such as letter, mobile phone, or, in some countries, through smartphone applications [22, 25]. Each country adapted the most effective way, in order to increase the number of reports according to the resources and capacities available [8]. In a study carried out in 50 countries, 44 had spontaneous reporting systems for patients, with reports representing about 9% of the total reports received in these countries, with the remainder coming from health professionals [23]. In another international study with 144 countries, about 31.2% had implemented a reporting system specially designed for patients, typified by simplified reporting forms, with appropriate language for patients and support texts for filling out the reporting form [25]. A positive impact on PV has also been observed in all countries that have implemented patient reporting systems, such as the description of the severity of ADRs [25] and the increased understanding of the impact of ADRs on patients and the safety awareness of the population [22].

Currently, several measures promote the collection of ADRs for health professionals and patients. Of these, economic incentives stand out [26], along with educational interventions for professionals and patients [27], media attention [28], use of social networks in the proactive search for ADRs [27, 29] or smartphone applications [27].

This work scrutinises forefront evidence of the different methods used to increase the collection of ADRs, surveying the different strategies used by countries to increase the collection of reports describing the tools used to improve participation in the PV systems by professionals or patients, by presenting a review on the use of information systems and strategies used to promote ADR reporting by health professionals and patients.

Material and methods

This review was prepared using the scoping review methodology described by Arksey and O'Malley [30] to identify the different methods used to increase ADR collection. To ensure the thorough completion of this scoping review, we followed the guidelines established by the Joanna Briggs Institute. To ensure the thorough completion of this scoping review, we followed the guidelines established by the Joanna Briggs Institute, aiming to impart clarity and rigor to the review process [31, 32]. The results of this

scoping review were reported using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) checklist, which ensured a transparent and methodological approach was taken [33].

Search strategy

The search strategy aimed to find published and unpublished studies. A full search strategy using the keywords 'pharmacovigilance', 'ADR', 'medicine', and 'spontaneous reporting' was developed, including all identified keywords and related index terms, and adapted for each information source included. No geographical or cultural limitation or year of publication limits for the studies included was applied.

The PubMed (MEDLINE), Scopus and Cochrane databases were searched, and the literature exploration was supplemented by scanning the reference lists of included studies and searching grey literature sources, as well as conference proceedings and abstracts published by journals and organisations, including but not limited to, the International Society of Pharmacovigilance (ISOP) and International Society for Pharmaceutical Engineering (ISPE) annual congresses.

Literature screening and information selection

Following the search, all identified citations were collated and uploaded into the Covidence management software, and duplicates were removed. Titles and abstracts were then screened by two independent reviewers (JJ and DG) for assessment according to the inclusion criteria for the review. Potentially relevant studies were retrieved in full. Two independent reviewers assessed the full text of selected articles and documented in detail against the inclusion and exclusion criteria (JJ and DG). Any disagreements that arose between the reviewers at each stage of the study selection process were resolved through discussion with a third reviewer (CM). Reasons for the exclusion of full-text studies that did not meet the inclusion criteria were recorded and reported in the PRISMA flow diagram (Fig. 1).

Articles published in English between 2005 and 2022 that addressed the issue of ADR reporting were selected. Articles prior to 2005, which did not focus on the subject under study and whose analysis of the title and abstract do not present relevant information for the review, were excluded. For this review, information present in digital means of communication (webpage, social media, among other sources) of the Competent National Authorities were also included to obtain information about the methodologies used in promoting the reporting of adverse reactions by patients.

Data extraction and synthesis

Data were extracted from documents included in the review by two independent reviewers using a data extraction tool developed by the reviewers, as indicated by the methodology for scoping reviews proposed by the Joanna Briggs Institute.

The extracted data were sorted according to a specific strategy aimed at enhancing patient reporting. This involved organising the data based on the author's name, the country where the study was conducted, and the type of information gathered. Additionally, the main outcomes and significant findings that were relevant to the review's objective were also presented. Any disagreements between the reviewers were resolved through discussion or with a third reviewer. The results are presented in Table 1.

Critical appraisal

This scoping review aims to provide an overview of the available literature on a specific topic or research question. Consequently, this review does not focus on critically appraising the quality of individual studies or synthesizing the results in a meta-analysis. The primary objective of a scoping review is to identify the breadth and depth of the available evidence and to identify gaps in the research. To achieve this goal, a critical appraisal of individual studies is unnecessary and the focus relies on identifying all relevant studies and providing a descriptive overview of the evidence. Thus, the lack of critical appraisal in a scoping review is appropriate and justified, given the objectives and goals of this type of review.

Results

The search strategy identified a total of 102 publications. After removing duplicating records, a total of 96 publications remained, which were screened by title and abstract, excluding 18 studies that were not relevant for the review. After a deeper analysis of the full-text, 26 documents remained, some of which were presented in digital media (web page, social media, among other sources). The reasons for exclusion are provided in the Fig. 1, which demonstrates the bibliographic selection process. All the results are reported in Table 1, which is organised by strategy, placing the most relevant information about the theme, and grouping the information of the respective strategy by author, year and reference, country, and collection method.

Economic incentives

Economic incentives aim to increase the number of ADR reports through a bonus to physicians and patients [34, 35].

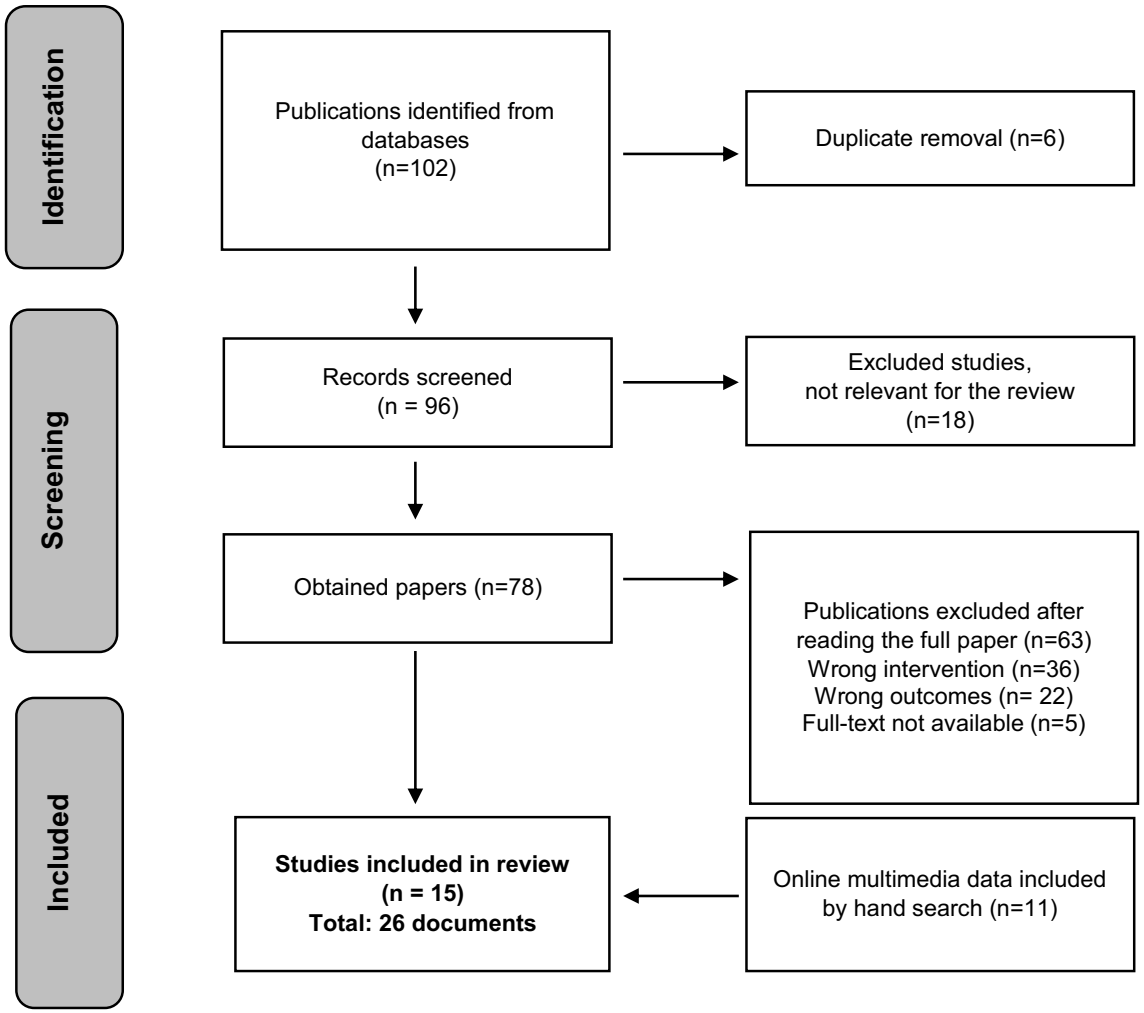

Fig. 1 Screening process and included and excluded articles

In the studies presented, there was an increase in the number of reports regarding an incentive offer when compared with the previous year and the number of serious reports, observing its use in combination with other strategies [36]. Additionally, this approach can increase the frequency of fraud and stimulate false reporting. As an advantage, they have high adherence by health professionals [35]; however, not all countries have the resources to implement this measure. In the studies presented, only countries such as Sweden [34], China [26] and Iran [36] implemented this strategy.

Educational interventions

In the studies included in this review, it was possible to observe an increase in the number of reports after educational interventions [36–39], with a multiplication of the report rate and improvement in quality [38, 39], quantity [25] and relevance [25, 39], with ADR reporting not mentioned in the summary of product characteristics [38]. Furthermore, there was an increase in the number of reports after the intervention period, with a subsequent decrease [39]. On the other hand, the combination of interventions, namely active educational interventions carried out by telephone interviews [25, 35], workshops [25, 36], group sessions [39], educational seminars [36], meetings [36, 37, 39], lectures [36], conferences, training and passive interventions such as educational material [37, 39], ADR reporting form [39], campaign promotion and e-mails [36] were suggested to have better results in both the short and long term, maintaining the number of reports for a longer period [36].

Educational interventions allowed the knowledge in drug safety and promotion of spontaneous reports, improving quality, quantity and relevance, but presented as the main disadvantage the decrease in the number of ADR reports after the intervention period [25, 38, 39].

Table 1 Schematic matrix of interventions to improve ADR reporting

Strategy	Author (year)	Country/region	Method	Main outcomes
Economic incentives	Bhatia et al. (2005) [35]	India	Research article	Lack of awareness and resources were the most important factors leading to underreporting The establishment of more ADR reporting and monitoring centres, awareness workshops, a multidisciplinary team approach to ADR reporting, and legalised monitoring of products by pharmaceutical companies were suggested for increasing ADR collection 66% of private physicians and 75% of physicians in government hospitals wanted incentives to be offered for reporting ADRs
	Bäckström et al. (2006) [34]	Sweden	Research article	In the intervention area, there was an increase in the number of ADRs reported by 59% compared with the same period in the previous year Increase in the number of serious ADR reports 15% of study participants expressed that economic incentives could be a positive
	Chang et al. (2017) [26]	China	Research article	In 2009, a bonus of 20 RMB (Chinese currency) was awarded for each spontaneous reporting of ADRs and a fine of 50 RMB for any withheld reporting Pre-intervention period: average of 29 ADR reports; first period: 277; second period: 666 The monthly number of reported ADRs was stable in the three periods: 3.56 ± 3.60/month, 21 ± 13/month in the first intervention period and 56 ± 20/month in the second intervention period 128 (pre-intervention), 753 (first), 2001 (second) reports of ADRs, where 40% were new ADRs
	Khalili et al. (2020) [36]	Iran	Research article	9 studies assessed the impact of financial rewards and incentives One study used this intervention: 4.8-fold increase in ADR reports In the remainder, prizes and financial incentives were used with other interventions (electronic registration, sending reminders and/or feedback and educational interventions), and the ADR reporting rate increased from 1.2 to 23.0 times
Educational interventions	Herdeiro et al. (2008) [39]	Portugal	Research article	Increased ADR reporting: 275.63 per 1000 pharmacists/year Multiplication of the reporting rate of ADRs: severe, 10 times; unexpected, 4 times; high causality, 9 times; and new drug reports, 9 times Reporting stimulated by a 1-h educational intervention Number of reports from pharmacists increased 5.9 times Improved reports regarding quality and relevance
	Johansson et al. (2009) [38]	Sweden	Research article	Increase in the number of reports: 89 (2006) to 111 (2007) 25% increase in the number of reports compared with 2006 ($p = 0.037$) Reports of high quality before and after the intervention were 36 and 48%, respectively, in the intervention group, and 40 and 36%, respectively, in the control group 16 reports concerned ADRs not mentioned in the SmPC (intervention group) Increase in the number of reports, but it was not possible to detect an isolated effect of the intervention
Media attention	Hunsel et al. (2009) [28]	Netherlands	Research article	Peak of ADR reporting after programme transmission Patients: 265 reports on statins with 780 ADRs (average of 3 ADRs per report) Health professionals: 833 reports with 1609 ADRs (average of 1.5 ADRs per report) Patient reports provided more information about the impact on daily life

Table 1 (continued)

Strategy	Author (year)	Country/region	Method	Main outcomes
	Rolfes et al. (2016) [42]	Netherlands	Research article	1800 reports (2013–2015) after the Thyrax packaging was transformed from glass to blister (93% from patients) Patients who reported possible ADRs showed a significant decrease in health-related quality of life Increase in the number of reports compared with the period between 2006 and 2010 85% of reports sent after attention in the media, national television coverage and communication in newspapers Patients considered the impact of an ADR on their quality of life an important issue and reported it more frequently than health professionals
	UMC (2017) [40]	Middle East	Magazine—Uppsala Reports 77: Project Report Me Kuwait	Aimed to teach how to report ADRs and increase the awareness of health professionals about the urgency of reporting ADRs Short videos, information cards and brochures on medication safety More than 2600 followers on LinkedIn, around 1300 on Instagram, and a growing presence on Facebook, Twitter, Snapchat and YouTube Featured on TV shows and local newspapers 8 reports were received, despite the absence of an official PV structure in the country
	Santoro et al. (2019) [41]	Sweden	Poster—UMC	Campaign with 32 drug regulators from the EU, Latin America, Australasia and the Middle East Sharing campaign materials on social networks The animations reached 1.4 million people on Twitter, Facebook, LinkedIn, Instagram and YouTube Have been viewed more than 360,000 times
Social networks	Marinela et al. (2011) [52]	Serbia	Research article	In 7 months, 21 ADRs were reported: 4 ADRs (19%) defined, 11 (52%) probable, and 6 (29%) possible Strong causal relationship with medications, suggesting high sensitivity of this instrument for reporting ADRs High yield of reported ADRs (2%) when compared with other interventions aimed at the general public Low cost of intervention
	UMC (2017) [57]	Europe	Magazine—Uppsala Reports 75	21 European National Competent Authorities and their national PV and regional monitoring centres launched an ADR awareness campaign on social media Disseminated messages to encourage the increase in the reporting of suspected ADRs 13% increase in reporting of ADRs (1056 reports) The messages reached 2,562,071 people through social networks: Twitter, Facebook; LinkedIn and YouTube 337,781 people viewed the animation NAMMD saw a 350% increase for ADRs from all sources, with a 67% increase (700 reports) in direct reports from consumers and healthcare professionals
	Pierce et al. (2017) [53]	USA	Research article	935,249 publications collected from Facebook and Twitter (March 2009–October 2014) 98,252 identified with Proto-AE 13 were selected for evaluation of drug–adverse event causality, leaving 6 with interest that described possible and probable cases Of the 10 safety signals identified by the US FDA, 2 were associated with the 13 publications Increased number of posts on Twitter due to advertisements in pharmacies, references to financial reports and links to articles or literature related to drugs Facebook posts offered high quality, with more detailed information

Table 1 (continued)

Strategy	Author (year)	Country/region	Method	Main outcomes
	Gattepaille et al. (2018) [45]	Sweden	Poster—UMC	Method of recognition of ADRs on Twitter developed in WEB-RADR Through the method, 316 tweets from ADRs were selected Accuracy of 36% and sensitivity of 23% Major difficulties in the method: detecting and normalising medical events and transferability of models outside the universe of main data to external datasets is low
	Dietrich et al. (2020) [54]	Germany	Research article	Benchmark database used after collecting publications on Twitter 57,473 sampled tweets, which mentioned 1 of the 6 selected drugs Publications about ineffectiveness, nervous system/psychiatric disorders or problems of use 1.8% of tweets were identified as a positive adverse event through the database Contained 1396 drug–event combinations, comprising 292 different MedDRA® Preferred Terms 83.9% of drug–event combinations were confined to 4 MedDRA® organ classes 18.5% of tweets contained indicative information, comprising 25 different Preferred Terms 95% of tweets contained a maximum of 2 adverse events Of the tweets with an adverse event, 88.3% ($n = 932$) refer to the 3 most mentioned drugs (methylphenidate, zolpidem and levetiracetam)
	Bulcock et al. (2021) [58]	UK	Research article	Social media users value public-facing pharmacovigilance schemes, even if they do not understand the current framework of pharmacovigilance within the UK Ongoing engagement with users is essential to understand views, share knowledge and respect users' privacy expectations to optimise future ADR reporting from online health communities Text-mining methods can be used to automatically detect reports of ADRs in social media discussions; however, the acceptability of applying such methods is unknown Participants were willing to share social media data about ADRs with researchers and regulators, but were more cautious about accepting automated methods of detecting ADRs
Smartphone applications	Taavola et al. (2017) [44]	Sweden	Poster—UMC	WEB-RADR developed an application based on a simplified report form Allowed subscription to news about the patient's medication Launched in the UK (July 2015), Croatia (May 2016) and The Netherlands (January 2016) 144 reports were received from the UK, 37 from Croatia and 106 from The Netherlands A significantly higher proportion of reports through applications in the UK (28%) and Croatia (32%) The proportion of at least moderate-quality reports was high in both groups in all countries, but relatively lower in-app reports: 83% vs. 92% in the UK; 78% vs. 78% in Croatia; and 85% vs. 98% in The Netherlands
	Montastruc et al. (2017) [27]	France	Research article	VigiBIP allowed the communication of data or photographs of ADRs 4102 reports, 193 (4.7%) through VigiBip and 3909 (95.3%) through other methods Patients and health professionals report more through VigiBip
	Donovan et al. (2019) [51]	UK	Research article	Yellow Card registered the largest number of reports received (8272) in 2018 2708 (88.5%) people used the internet to report ADRs, 98 (3.2%) the telephone, and 247 (8.1%) paper forms 2015 presented a huge growth in internet reporting, from 13% to 88%, compared with 2005

Table 1 (continued)

Strategy	Author (year)	Country/region	Method	Main outcomes
	UMC (2020) [47]	Worldwide	Megazine—Uppsala Reports 82	Med Safety app (WEB-RADR App) recognises ADRs Watchlist of drugs of interest and sharing of news articles on social networks Important for reports of ADRs along with other methods Access to the latest information on drug safety More than 5000 downloads
	WEB-RADR (2020) [46]	Worldwide	Website—WEB-RADR	Use of social networks and new technologies for PV purposes Development of applications that allow reporting of ADRs, and provide updated information and news alerts Launched specific applications for each country: UK (MHRA), Netherlands (Lareb) and Croatia (HALMED) Med Safety app was created and launched in Burkina Faso, Zambia, Armenia, Ghana, Ethiopia and Botswana
	IMI (2020) [50]	Europe	Website – IMI	HALMED launched the application (WEB-RADR) in Croatia More than 10,000 downloads Health professionals, health care providers, and patients directly report ADRs and receive reliable information about medications Helps drug manufacturers and regulators to detect new safety signals and intervene early Implemented to support malaria programmes (Burkina Faso and Zambia), with a positive impact 12 more countries expressed interest in the application and have already adopted it in some countries
	Kassem et al. (2022) [59]	Saudi Arabia	Research article	Need to build patient-oriented educational programmes to increase their awareness of ADR reporting and to prioritise the use of AI to be integrated in the Saudi healthcare system Highlight the need to develop future patient-friendly smartphone apps for improving both patient safety and signal detection of ADRs
Educational campaigns	HALMED (2013) [48]	Croatia	Website—HALMED	Promoted the importance of reading the information leaflet and reporting ADRs Positively influence the prevention of adverse effects Annual continuous education of pregnant women, health professionals and the public about the risks of self-medication during pregnancy and lactation Motivation of patient involvement in medication and monitoring the safe use of medication Reduction of unnecessary and inappropriate use of antibiotics Intensive public education on the rational and appropriate use of antimicrobial drugs in the treatment of milder respiratory infections
	MHRA (2018) [49]	UK	Website—MHRA	Involved 32 drug regulators The Yellow Card app allows additional questions about drug exposure during pregnancy
	UMC (2018) [43]	Worldwide	Magazine—Uppsala Reports 78	Coordinated with the media to promote recognition and reporting of suspected ADRs Participation of 27 countries Reached 2.3 million people on Twitter, Facebook, LinkedIn and YouTube 1852 new reports of ADRs during the campaign Increase of 11% compared with the 2 months before the campaign

ADR adverse drug reaction, *app* application, *AI* artificial intelligence, *EU* European Union, *FDA* Food and Drug Administration, *IMI* Innovative Medicines Initiative, *MedDRA* Medical Dictionary for Regulatory Activities, *MHRA* Medicines and Healthcare products Regulatory Agency, *NAMMD* National Agency for Medicines and Medical Devices of Romania, *PV* pharmacovigilance, *SmPC* Summary of Product Characteristics, *UMC* Uppsala Monitoring Centre

Media attention

The media revealed a powerful approach to increase ADR reporting, as people are increasingly accustomed to social media, such as social networks. Their purpose is to raise awareness of the importance of communicating suspected ADRs [40], disseminating information material and campaigns on major social networks such as LinkedIn®, Instagram®, Facebook®, Twitter® and Youtube®, reaching many views worldwide [41]. In the studies observed, there was a peak in reports after the transmission of possible ADRs in two drugs, offering the possibility for patients and health professionals to report ADRs that cause an impact on the patient's daily life. However, the massive increase in reports is verified only in the short term [28, 42].

The use of the various measures referred to is again related to each country's level of development and resources. Developed countries preferentially use social networks and smartphone applications as they are easier to access [27]. WHO, through the international drug monitoring programme, allows the exchange of information between countries regarding campaigns, educational material and videos on PV, which can later be adapted to the reality of each country. Sweden, where the WHO-UMC is located, is an example of proactivity in PV, promoting campaigns [43], educational interventions [38], publications in the media [41], publication of scientific posters [41, 44, 45] and international journals on PV [34, 38], and in the development of the smartphone applications [46, 47]. In addition to Sweden, the UK, Croatia and The Netherlands, at the European level, are also involved in various PV activities, such as campaigns [48, 49] and programmes broadcast in the media [28, 42], and have applications for smartphones for ADR reporting [44, 46, 47, 50, 51].

Social networks

Social networks play a crucial role as a promoting measure in PV and also aid in the proactive search for ADRs, with a higher number of ADRs detected through these measures than by the commonly used methods, and in a shorter period [52]. According to data observed in this study, Facebook offered more detailed and better-quality information compared with Twitter® [53]. WEB-RADR is based on a data-mining process, which has been successfully applied [45, 54]. In WEB-RADR, social media has been proposed as a potential source of data for PV, but the study found that social media is not recommended for broad statistical signal detection [55]. However, the same initiative from the Innovative Medicines Initiative (IMI) WEB-RADR (Recognising Adverse Drug Reactions) recognises that social media can be useful in specific niche areas such as exposure during pregnancy and abuse/misuse of medicines [55]. The ultimate intent of WEB-RADR was to provide policy, technical and ethical recommendations on how to develop and implement such digital tools to enhance patient safety, and from that project, recommendations relating to the use of social media in PV and the use of mobile applications for PV were published [55, 56]. Social networks can offer information about medicines, allowing the detection of signals of medicine efficacy not available in traditional sources, and enable the detection of subjective and sentimental reactions, with low cost and high agreement regarding traditional methods [52]. On the other hand, some disadvantages presented as duplications, the medical condition may not be precisely defined, the existence of privacy policies, and the difficulty in detecting and normalising medical events [45, 53]. With technological advances, social networks can be used as a source of information about ADRs in the future [50].

Smartphone applications

The strategy of collecting ADRs through smartphone applications is recent, with the first application being launched in July 2015 in the UK and later in The Netherlands and Croatia [44]. In the analysed articles, it was observed that the submission time is shorter through these options when compared with traditional methods, and the submissions were more accurate [27, 51]. Additionally, the applications allow the subscription of news about the medicines that the patient takes [44, 47, 50] and are able to be used in several countries, free to download, and important for ADR reporting, with enhanced quality for both PV and signal detection [47]. As a benefit, they have easy access to reporting forms [44] and help drug manufacturers and regulators to detect safety signals early, allowing earlier interventions [50] and a reduction of the time spent on paper reports [47]. However, they have the disadvantages of a large volume of reports received; patients may need to correctly assess causality, very limited signal detection and unclear regulation [29]. A mobile application designed for ADR reporting and product safety alerts can help to augment PV activities and extend the reach to patients and healthcare professionals. Privacy and data protection features are essential, and the application can provide user-friendly interactive graphics to learn about the safety profiles of medicines. While the uptake and use of the application seem modest, it is expected to grow in importance as a younger generation of application-literate patients matures and smartphone owners increasingly use their mobile devices to access the internet [29, 44–46, 50].

Educational campaigns

The campaigns aim to involve the public in PV actions and supervise the safe use of drugs [48], recognising and reporting suspected ADRs [43]. They are performed through billboards, press advertisements, radio, online images, posters in waiting rooms, and leaflets [48]. It was observed in one of the campaigns, coordinated with the media, to promote the recognition of ADR reporting, which reached 27 countries, reaching 2.3 million people on social networks, with 1852 new reports of ADRs during their occurrence [43]. Thus, campaigns raise awareness among patients and health professionals about the importance of reporting an ADR, allowing the acquisition of additional information about the medications and a positive influence on the prevention of adverse effects without offering any disadvantages [48].

Discussion

Despite the recent increase in patient reports, recent studies emphasize the need to raise awareness among patients and health professionals of the ongoing need to foster ADR reporting [16]. In addition, competent authorities must implement innovative methods to strengthen ADR reporting and overcome barriers such as the lack of active promotion due to the scarcity of resources to support publicity campaigns and the inability to deal with an overload of reports [25].

This scoping review consisted of an innovative search screening allowing the collection of various approaches to encourage ADR reporting. Accordingly, we found six strategies to improve the collection of ADR reports in PV, namely economic incentives, educational interventions for health professionals and patients, media attention, the use of social networks in the proactive search for ADRs, and applications for smartphones and campaigns.

The implementation by several countries of an ADR reporting system for patients allowed them to spontaneously report an ADR, providing a major advance in PV, increasing the number of ADR collections and early detection of signals [25]. Patients are more likely to report severe reactions [16], provide more information about the impact on the quality of life, and report more frequently than healthcare professionals [42]. Advances in reporting methods and more proactive promotion of PV, such as the use of smartphone applications and online forms for reporting (as is the case with the ADR reporting portal), massive use of social networks, dissemination campaigns and educational interventions, allow reporters to become more aware on the problems related to the use of the drug, accompanied by the growing number of adverse reactions reported annually [13]. By using these methods, we disclose the different reporting tools that actively involve patients. This is particularly important as many patients are unaware of the existence of a PV system in their country. Currently, only younger individuals and those with higher levels of education possess some knowledge about the possibilities of reporting [16].

Each country adopted the best strategies to encourage spontaneous ADR reporting, considering the characteristics of its population, available resources and the development of the PV system. In some countries, it has been observed that media attention to certain ADRs increased populations' attention and awareness of PV, indicating that dissemination had a positive impact on ADR collection [25, 28, 42]. In 2014, the launch of the WEB-RADR project worked on the development of a smartphone application allowing the reporting of suspected ADRs to regulators in the European Union, enabling direct and instantaneous reports for patients and health professionals and a means for regulators to communicate with interested parties the latest information on PV [25, 46, 50]. This application is already in use in several European countries, such as the UK, The Netherlands and Croatia [56], with more than 10,000 downloads [50]. According to the WEB-RADR project, it is possible to detect, extract, standardise and analyse information related to social networks, which can be used as a source of information about ADRs in the future [50]. Since advances in technology, social networks and smartphone applications are increasingly being used, it is likely that the aforesaid approaches may enclose the most successful methods for reporting adverse reactions [50].

The use of social networks is a method with high sensitivity [45] and quality [53], a greater number of ADR detections and high agreement compared with traditional methods, which allows more detailed information [54], and, above all, is a low-cost method [52]. Smartphone applications have a simplified reporting form, making it possible to subscribe to news about the medications the patient is taking, present the latest information on medication safety, and can be used in several countries [47, 50].

The international drug monitoring programme of the WHO allowed the exchange of information between countries regarding campaigns, educational material and videos on PV, which can be later adapted to the reality of each one [60]. Sweden, where the WHO-UMC is located,

is an example of proactivity in PV promoting campaigns [40, 43], educational interventions [36], publication of scientific posters [41, 45, 61], international journals on PV [40, 43, 47, 57], and also in the development of the smartphone application [46, 47]. In addition to Sweden, the UK, Croatia and The Netherlands, at the European level, are also involved in various PV activities, such as campaigns [48] and programmes broadcast in the media [28, 42], and also have applications for smartphones for the reporting of ADRs [44, 46, 47, 50, 51]

Collecting ADR reports and efficiently using that information remains an ongoing challenge. Regular interventions are necessary for the potential reporting population, especially if combined with other measures, to ensure that patients are capable of recognising, assessing causality, and properly reporting an ADR. Furthermore, adequate programming support must also be available to implement strategies with proven efficacy.

Limitations of the study

It is important to acknowledge some limitations. First, we had to include articles specifically related to economic incentives in our criteria, as some countries may require more financial resources to implement this measure. Additionally, the availability of information on the use of social networks and smartphone applications was limited in the consulted databases due to the recent adoption of these methods in PV.

Conclusion

Raising awareness among patients and health professionals is crucial for promoting ADR reporting. This review collects and synthesizes the different approaches that several counties have implemented to increase the reporting of ADRs. Several countries have adopted different strategies to encourage spontaneous ADR reporting, and international organisations, such as the WHO, are actively involved in promoting PV by exchanging information as well as dedicated campaigns. Implementing innovative methods such as economic incentives, educational interventions, media attention, social networks, and smartphone applications may help to improve the collection of ADRs in PV. The use of social networks and smartphone applications are increasingly being used as successful methods for reporting ADRs. The involvement of all stakeholders in proactive PV is crucial for ensuring the future of drug safety.

Declarations

Funding No funding was received for the publication of this article.

Conflict of interest João Joaquim, Cristiano Matos, Diana Guerra, and Ramona Mateos-Campos declare no conflicts of interest.

Ethics approval Not applicable.

Consent to participate Not applicable.

Consent for publication Not applicable.

Availability of data and material Not applicable.

Code availability Not applicable.

Authors' contributions Conceptualisation: JJ and CM. Methodology: JJ, CM and RM-C. Writing – original draft preparation: JJ. Writing – review and editing: JJ, CM, DG and RM-C. All authors have read and agreed to the published version of the manuscript.

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