

PHARMACEUTICAL ETHICS IN CRISIS: LESSONS LEARNED FROM THE COVID-19 PANDEMIC AND RECOMMENDATIONS FOR FUTURE PREPAREDNESS IN ROMANIA AND SIMILAR HEALTHCARE SYSTEMS

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Abstract

The COVID-19 pandemic has underscored the critical role of pharmacists in ensuring access to medicines and continuity of pharmaceutical care. Pharmacists were also among the most accessible healthcare professionals and faced medication shortages, increased workloads, occupational risks, and rapidly changing clinical information. This perspective article discusses the lessons learned from the pandemic, analysed through the ethical framework proposed by the International Pharmaceutical Federation (FIP) and the UNESCO Chair in Bioethics, which is based on the principles of non-maleficence, autonomy, justice, beneficence, truthfulness, and solidarity. The discussion is structured around the major professional responsibilities, which include clinical evaluation, preparation and dispensing, counselling and advising, and monitoring and pharmacovigilance. The article covers challenges related to medicine shortages, patient counselling, vaccination activities, pharmacovigilance, digital health solutions, and workforce resilience, based on the Romanian experience and international literature. The pandemic has highlighted the need for better integration of pharmacists into healthcare systems and emergency preparedness planning. Future work will focus on enhancing pharmaceutical services, increasing supply chain resilience, supporting pharmacovigilance activities, expanding digital pharmaceutical care, and protecting the well-being of pharmacy staff.

Rezumat

Pandemia de COVID-19 a evidențiat rolul esențial al farmaciștilor în asigurarea accesului la medicamente și a continuității îngrijirilor farmaceutice. Fiind printre cei mai accesibili profesioniști din domeniul sănătății, farmaciștii s-au confruntat cu lipsuri de medicamente, cu creșterea volumului de muncă, cu riscuri profesionale și cu informații clinice aflate într-o schimbare continuă. Acest articol de perspectivă analizează lecțiile învățate în timpul pandemiei prin prisma cadrului etic propus de Federația Internațională Farmaceutică (FIP) și de Departamentul de Bioetică al UNESCO, bazat pe principiile non-maleficienței, autonomiei, justiției, binefacerii, veridicității și solidarității. Discuția este organizată în jurul principalelor responsabilități profesionale ale farmacistului: evaluarea clinică, prepararea și eliberarea medicamentelor, consilierea pacienților și activitățile de monitorizare și de farmacovigilență. Pe baza experienței din România și a literaturii internaționale, sunt evidențiate provocările legate de deficitul de medicamente, consilierea pacienților, vaccinare, farmacovigilență, soluțiile digitale de sănătate și reziliența personalului farmaceutic. Pandemia a demonstrat necesitatea unei integrări mai eficiente a farmaciștilor în sistemele de sănătate și în planurile de pregătire pentru situații de urgență. Consolidarea serviciilor farmaceutice și a farmacovigilenței poate contribui la o gestionare mai bună a viitoarelor crize sanitare.

Keywords: COVID-19, pharmacists, pharmaceutical ethics, Romania

Introduction

On 11 March 2020, the World Health Organisation (WHO) declared COVID-19 a pandemic, marking the beginning of an unprecedented challenge for healthcare systems worldwide (1, 2). Healthcare professionals were required to adapt rapidly to changing clinical

circumstances, increased patient demand, shortages of medicines and medical supplies, and a continuously evolving body of scientific information (3, 4).

During the pandemic, pharmacists played an important role in maintaining access to medicines and healthcare services (5, 6). Community pharmacies were often

among the few healthcare settings readily accessible to the public during the COVID-19 crisis. Pharmacists, in addition to supplying medicines, gave practical advice, responded to patients' concerns and helped individuals with limited access to medical consultations (7, 8). Pharmacists in hospitals were active players in ensuring the availability of medicines, adapting to rapidly changing therapeutic protocols and monitoring the safe use of medication in a very demanding clinical environment (9).

The pandemic highlighted both the strengths and the limitations of pharmaceutical systems. Issues such as medicine shortages, increased workload, patient counselling needs, pharmacovigilance activities, and the protection of healthcare professionals became particularly visible during this period (10, 11). Although many of these challenges were observed internationally,

the Romanian experience illustrates many of the ethical, professional and organisational challenges encountered during the pandemic and may provide useful lessons for healthcare systems with similar characteristics (10).

In October 2020, the International Pharmaceutical Federation (FIP) and the UNESCO Chair in Bioethics published the Guidelines on Pharmacy Ethics Related to the COVID-19 Pandemic (12). These guidelines are based on six core ethical principles: non-maleficence, autonomy, justice, beneficence, truthfulness, and solidarity. They also describe key areas of professional responsibility, including prescribing, clinical evaluation, preparation and dispensing, counselling and advising, and monitoring and pharmacovigilance (Figure 1) (12).



Figure 1.

Ethical and professional framework for pharmaceutical practice during public health emergencies

The COVID-19 pandemic provided valuable lessons regarding the role of pharmacists during public health emergencies. At the same time, it highlighted weaknesses in health-care systems and identified several areas in which pharmaceutical services could be

developed in the future to improve preparedness for future public health crises (13).

This article aimed to discuss the lessons learned from the COVID-19 pandemic through the ethical framework proposed by FIP and the UNESCO Chair

in Bioethics and to explore possible directions for the development of pharmaceutical services and healthcare preparedness. Attention is given to the Romanian experience, while recognising that many of the challenges and lessons described are also relevant to other healthcare systems facing similar conditions.

The Ethical Framework: Six Principles Guiding Pharmaceutical Practice During Public Health Emergencies

The FIP/UNESCO Chair in Bioethics Guidelines on Pharmacy Ethics Related to the COVID-19 Pan-

demic are based on the principles of the Universal Declaration on Bioethics and Human Rights (12, 14). The document identifies six core ethical principles that should guide pharmacists during public health emergencies: non-maleficence, autonomy, justice, beneficence, truthfulness, and solidarity (12). Although these principles apply to healthcare practice in general, the COVID-19 pandemic highlighted their relevance for pharmaceutical services. These principles are presented in Table I and will be detailed in the following sections.

Table I
Ethical challenges highlighted by the COVID-19 pandemic

<i>Ethical principle</i>	Challenges observed during the pandemic	Example from pharmaceutical practice	References
<i>Non-maleficence</i>	Rapidly changing evidence and treatment protocols	Safe use of repurposed medicines	(15, 16)
<i>Autonomy</i>	Vaccine hesitancy and misinformation	Supporting informed patient decisions	(17, 18)
<i>Justice</i>	Limited availability of medicines and healthcare resources	Allocation of medicines during shortages	(19-22)
<i>Beneficence</i>	Maintaining continuity of care under difficult conditions	Access to pharmaceutical services	(20, 23, 24)
<i>Truthfulness</i>	Dissemination of unreliable information	Evidence-based patient counselling	(25, 26)
<i>Solidarity</i>	Need for collaboration among healthcare professionals	Interprofessional cooperation during the pandemic	(27-29)

Non-maleficence

Non-maleficence refers to the obligation to avoid causing harm to patients. During the COVID-19 pandemic, pharmacists were required to make decisions in a context characterised by rapidly evolving evidence, changing treatment recommendations, and occasional medicine shortages. In such circumstances, preventing harm required not only professional judgement, but also access to updated treatment protocols, reliable scientific information, and adequate medicine supply systems (15, 30, 31).

Autonomy

The principle of autonomy emphasises the right of individuals to participate actively in decisions affecting their health. During the COVID-19 pandemic, pharmacists were frequently asked to clarify information related to vaccination, treatment options, preventive measures, and self-care. Given the widespread circulation of contradictory and sometimes unreliable information, effective communication became essential for enabling patients to make informed choices based on trustworthy scientific evidence rather than misinformation (16).

The ethical tension between individual autonomy and collective responsibility has been brought to the fore by the COVID-19 pandemic, particularly in relation to vaccination policies, vaccine certificates and access restrictions (32). International organisations, such as UNESCO and WHO, have highlighted that such measures should be necessary, proportionate, non-discriminatory and grounded in solidarity (33). These debates for pharmacists translated into practical issues such as providing counselling to vaccine-

hesitant patients, checking vaccination certificates and endorsing public health measures while respecting patient autonomy. The pharmacy ethics literature suggests that pharmacists should respect individual choice but balance this with their role in protecting the health of patients and the community through evidence-based counselling, referral where appropriate, and support for justified public health interventions (34). In Romania, where vaccine uptake and trust in public institutions varied, pharmacists played an important role in maintaining this balance between autonomy and solidarity (12).

Justice

The principle of justice concerns fair and equitable access to medicines and pharmaceutical services (35). The COVID-19 pandemic revealed significant inequalities in access to drugs, vaccines, and healthcare resources across populations and health systems. In Romania, as in other healthcare systems (36), periods of increased demand and temporary shortages of medicines, disinfectants, protective equipment, and some chronic therapies emphasised the importance of transparent and ethically justified allocation strategies. These experiences demonstrated the need for better preparedness and more resilient medicine supply chains (37).

Beneficence

Beneficence requires healthcare professionals to act in the best interest of patients and to promote their well-being, particularly during times of crisis (38). Despite unprecedented pressures on healthcare systems, pharmacists continued to support patients throughout the pandemic (8). In Romania, community pharma-

cies were often among the few remaining easily accessible healthcare settings, ensuring uninterrupted access to drugs and professional advice. The pharmacist's role was not limited to dispensing but also included educating patients, promoting adherence to treatment, and participating in public health initiatives to support the population during a period of great uncertainty (8, 39).

Truthfulness

The principle of truthfulness is closely linked to preserving public trust in healthcare professionals and to the ability to make informed decisions. During the COVID-19 pandemic, patients were inundated with information, not all of it scientifically accurate. Conflicting messages about the disease, treatment methods, and vaccination presented serious challenges for patients and health care providers. In this context, pharmacists were often readily available sources of credible information to help people navigate the emerging evidence and distinguish credible advice from misinformation (40).

Solidarity

Solidarity is the recognition that effective handling of public health emergencies requires cooperation, mutual support and shared responsibility. The management of the COVID-19 pandemic required close collaboration between pharmacists, physicians, nurses, public health authorities and other health care stakeholders to ensure continuity of care and availability

of essential drugs (8). In Romania, the pandemic has revealed both the ability of healthcare personnel to work together under difficult conditions and the need for greater institutional support for frontline staff. Adequate occupational protection, access to psychological support and formal recognition of pharmacists' contribution to healthcare delivery may enhance the resilience of the workforce in future emergencies (8, 39).

Taken together, these ethical principles offer a valuable perspective for examining the challenges encountered during the COVID-19 pandemic. They also highlight areas where pharmaceutical services, healthcare organisations, and emergency preparedness strategies can be further strengthened to improve responses to future public health crises.

Lessons Learned Through the Lens of Professional Attributions

The five professional attributions defined in the FIP/UNESCO Chair in Bioethics 2020 Guidelines provide an operational structure through which the pandemic's lessons can be organised and translated into actionable recommendations (Table II). Each attribution represents a domain of pharmacist competence and responsibility, and each was challenged in distinct ways during the crisis (12).

Table II

Lessons learned and future priorities according to the professional attributions of pharmacists

Professional attribution	Lessons learned during COVID-19	Future priorities	References
Prescribing*	Pharmacists can support patient management when access to medical services is limited	Evaluation of collaborative or protocol-based prescribing models	(41, 42)
Clinical evaluation	Clinical pharmacy services improve medication safety	Greater integration of clinical pharmacists into healthcare teams	(43-45)
Preparation and dispensing	Supply chains are vulnerable during emergencies	Strategic reserves and shortage management systems	(46-48)
Counselling and advising	Pharmacists are trusted sources of health information	Development of telepharmacy and health literacy programmes	(13, 26, 49)
Monitoring and pharmacovigilance	Large-scale safety monitoring is essential during emergencies	Digital pharmacovigilance systems and improved reporting mechanisms	(50-53)
*Prescribing is not currently part of the pharmacist's legal scope of practice in Romania.			(54)

Prescribing: an international reference point

Prescribing is included among the professional responsibilities described in the FIP/UNESCO ethical framework (12). However, prescribing medicines is not currently part of the pharmacist's legal scope of practice in Romania. During the COVID-19 emergency, patients often turned to their community pharmacist for advice on symptom relief, self-care measures, vaccination and the safe use of medicines. Their role was especially critical when access to physicians was delayed or restricted. Nevertheless, in Romania, the legal framework limited the role of the pharmacist to advisory activities, without the

possibility of initiating, discontinuing, or modifying pharmacological treatments independently (55, 56). The pandemic experience has renewed interest in pharmacists' broader clinical role and their potential to improve access to healthcare. In some health care systems, including those of the United Kingdom, Canada, Australia and the United States, pharmacists are already involved in prescribing activities through collaborative agreements or protocol-driven models established for specific clinical situations (57, 58).

A pharmacist's prescription is not included in standard professional practice in Romania. However, experi-

ence in countries with mature models suggests that greater pharmacist engagement in patient management may help preserve continuity of care, particularly during periods of increased pressure on healthcare services. Any future approach to this possibility would have to be done in accordance with the national legislation, professional competencies and organisation of the Romanian medical system (59).

Clinical evaluation: for greater recognition of the clinical pharmacist

Clinical evaluation is the pharmacist's role in assessing medication therapy, identifying potential drug-related problems and encouraging safe and effective use of medicines. During the COVID-19 crisis, therapeutic recommendations changed rapidly as new evidence became available, requiring pharmacists to regularly re-evaluate treatment-related information. Special emphasis was given to the detection of pharmacologically significant drug interactions, to the surveillance of medication safety, and to the support of therapeutic decisions for patients on multiple concomitant treatments or complex pharmacological regimens (40).

In Romania, clinical pharmacy services remain heterogeneously implemented across healthcare institutions (56), a situation that exists in most countries in Central and Eastern Europe (60). The pandemic highlighted the contributions of hospital and clinical pharmacists to medication management, particularly for patients receiving multiple treatments and in situations where therapeutic protocols changed frequently. Pharmacists contributed to medication management by reviewing treatment regimens, identifying potential drug interactions and contraindications and assisting in ensuring the safe and appropriate use of medicines at a time when clinical evidence was emerging rapidly. These responsibilities also had to be managed in difficult circumstances, with increased workload, workforce shortages, and infection-control restrictions, which sometimes limited opportunities for direct patient contact and access to clinical records (40).

The COVID-19 pandemic increased awareness of the contribution of clinical pharmacists within multidisciplinary healthcare teams. Their role in medication review, therapeutic monitoring, and treatment optimisation was found to be particularly valuable in circumstances of uncertainty and changing recommendations. The experience also highlighted several areas for further development, including clearer professional responsibilities, better access to patient information and more consistent involvement of clinical pharmacists in therapeutic decision-making processes (61). Greater integration of clinical pharmacy services into routine health care delivery may help to improve safe medication use and to strengthen the capacity of health care systems to respond effectively in future public health emergencies (62, 63).

Preparation and dispensing: medicine shortages and supply chain challenges

The COVID-19 crisis placed a significant emphasis on the preparation and supply of medicines as the core of pharmacy practice. With the appearance of medicine shortages, disruption of supply chains and evolution of treatment recommendations in response to new evidence, this responsibility became increasingly demanding (5, 64).

In Romania, community pharmacies experienced periods of increased demand for personal protective equipment, disinfectants, antipyretics, and other frequently used medicines. Shortages of certain medicines, including treatments for chronic conditions, were also noted. In the early phase of the pandemic, higher demand for products such as paracetamol and concerns about the availability of medicines such as hydroxychloroquine and azithromycin caused temporary supply issues and increased pressure on pharmacy services. The situation in Hospital pharmacies was the same, as the availability of medicines included in the COVID-19 treatment protocols changed over time, and the procurement processes became more difficult. Sometimes, medicines had to be transferred from one health care institution to another to ensure continuity of treatment (55).

The pandemic-related events revealed the weaknesses of pharmaceutical supply chains at national and international levels. Many countries experienced shortages of medicines and medical products due to reliance on a limited number of manufacturers and disruptions in production and distribution. Pharmacists needed to weigh the limited availability of resources against their responsibility to ensure equitable access to treatment for those patients most in need (65, 66).

These experiences have led to several practical conclusions. Mitigating the consequences of future disruptions could be aided by strategic reserves of essential medicines, better systems for detecting and reporting shortages, diversification of supply sources, and improved cooperation among regulatory agencies, manufacturers, wholesalers, and healthcare providers. Transparent allocation policies and timely communication of changes in the availability of medicines and treatment recommendations are also important and were critical during the COVID-19 crisis (65-68).

Counselling and advising: expanding access to pharmaceutical care

The COVID-19 pandemic has increased the need for patient counselling and reliable health information. Community pharmacies often remained among the most accessible healthcare settings, while access to other healthcare services was temporarily limited or more challenging. Hence, pharmacists were frequently consulted to provide information on COVID-19 symptoms, prevention, self-medication, vaccination, potential drug interactions, and the appropriate use of medicines (5, 69-73).

Romanian pharmacists had to help patients make sense of a rapidly changing information landscape. The constant stream of new recommendations and the wide dissemination of false information made it even more necessary to communicate clearly and with evidence. In this context, pharmacists were often a trusted source of advice, helping patients understand available information and make informed decisions about their health (25, 74).

Also, the pandemic has accelerated interest in digital healthcare delivery, including telepharmacy services. Although telepharmacy is only partially implemented in Romania and there is no specific reimbursement and regulatory framework, the experience gained during this period has shown how digital tools can complement traditional pharmaceutical care. Remote consultations can simplify medication follow-up, patient counselling, and access to professional advice, particularly for chronic conditions, mobility limitations, or limited access to healthcare facilities (75, 76).

Digital pharmaceutical services could be an additional component of future preparedness strategies, rather than a replacement for face-to-face interactions. The integration of traditional counselling with telepharmacy solutions can help to maintain continuity of care and improve access to pharmaceutical services when routine healthcare delivery is disrupted (77, 78).

Monitoring and pharmacovigilance: strengthening medicine and vaccine safety surveillance

The monitoring and pharmacovigilance responsibilities of pharmacists became particularly important during the COVID-19 pandemic. The rapid introduction of new treatment protocols, together with the use of repurposed medicines and subsequently the implementation of large-scale vaccination campaigns, created an increased need for medicine safety monitoring and adverse event reporting (30, 53).

The early use of hydroxychloroquine, either alone or in combination with azithromycin, is an example of the ethical challenges presented by the use of unproven therapies in public health emergencies. Limited preliminary evidence, public demand and initial enthusiasm led to shortages of these medicines in several countries, affecting access for patients with approved indications. As higher-quality clinical evidence emerged, these treatments were found to confer no meaningful benefit in COVID-19, and the hydroxychloroquine–azithromycin combination was associated with increased risk of QT interval prolongation and potentially serious cardiac arrhythmias (79). The case illustrates the importance of the principle of non-maleficence. It highlights the role of pharmacists in promoting evidence-based medicine, supporting pharmacovigilance activities, and contributing to the prevention of harm from the premature use of inadequately evaluated therapies.

In Romania, pharmacists were actively involved in detecting suspected adverse reactions, identifying medication-related problems, and supporting the safe use of therapies introduced under evolving clinical circumstances. New evidence emerged, and treatment recommendations were often updated. Healthcare professionals had to constantly re-evaluate the information available and adapt their practice accordingly.

The vaccination campaign added a new dimension to pharmacovigilance activities. Pharmacists' contributions included discussing vaccine safety with patients, responding to their questions and concerns, and assisting in the reporting of suspected adverse events. The unprecedented scale of vaccine administration also tested existing surveillance mechanisms and highlighted the importance of timely reporting, efficient data collection, and clear communication of safety information to the public (80).

The lessons learned during the pandemic have highlighted opportunities to improve infrastructure and preparedness for future health emergencies in pharmacovigilance. In particular, the digitalisation of reporting procedures, the improvement of the interoperability of healthcare databases, continuous professional training in adverse-event reporting and communication strategies able to sustain public trust in medicines and vaccines during periods of uncertainty, deserve particular attention (50).

Protecting pharmacists: occupational safety, mental health, and institutional recognition

Pharmacists have been an integral part of healthcare delivery throughout the COVID-19 crisis. Community and hospital pharmacists continued to deliver essential services amid rapidly changing professional responsibilities, increased demand, and the need to comply with infection-control requirements. Their experience also underlined the challenges facing the pharmacy workforce and the actions needed to secure its long-term sustainability (8, 9, 81).

Occupational safety and professional recognition

Pharmacies, unlike many other sectors, were open during successive waves of the pandemic, and pharmacists had to continue their direct contact with patients under conditions of increased occupational risk (82). In Romania, as in many other countries, pharmacists had to adapt rapidly to increased workload, medicine shortages, evolving public health recommendations, and the implementation of infection prevention measures (10, 55, 56, 83).

These circumstances renewed attention to the role of pharmacists in emergency response systems. The FIP and other international organisations stressed that the provision of pharmaceutical services during a public-health crisis relies not only on the availability of medicines, but also on the adequate protection of the workforce delivering these services (84). Personal protective equipment, vaccination programmes,

occupational safety measures and institutional support should be viewed as key elements of emergency preparedness strategies involving pharmacy professionals (85, 86).

Mental health and burnout

Health care professionals faced challenges that extended far beyond clinical and organisational issues during the COVID-19 crisis. There is increasing evidence from various countries that healthcare workers, including pharmacists, have heightened levels of stress, anxiety, emotional exhaustion, sleep disturbances and concerns related to occupational exposure (81, 87-89). Romanian pharmacists from community and hospital settings faced many of the issues reported internationally. Increased workloads, frequent changes in professional guidance, uncertainty about the disease's progression, and concerns about their own and their families' safety have become part of the everyday practice of many professionals. Experiences were diverse depending on the workplace and local context, but these challenges highlighted the often-unacknowledged human side of pharmaceutical services and the need to support the well-being of those providing them (55, 56).

The COVID-19 experience also raised broader questions about workforce sustainability during prolonged health emergencies. In addition to adequate infrastructure and supplies of medicines, maintaining pharmaceutical services requires a workforce that can cope with sustained pressure. Measures such as access to psychological support, professional counselling, continuing education opportunities, and organisational policies to reduce excessive workload may help to preserve both staff wellbeing and service continuity during future crises (90).

Recommendations for Future Preparedness

The COVID-19 crisis was an opportunity to see how pharmaceutical services work under continuous pressure and uncertainty. Many of the reported challenges in Romania were also found in other healthcare systems. The experience revealed several areas where the contribution of pharmacists was evident and others that need further development. The observations made during this period offer a useful basis for reflecting on how healthcare systems can build capacity to respond to future public health emergencies.

Moreover, several of the problems identified during the pandemic are not only relevant in crises but also in regular healthcare practice. Outside the context of a public health emergency, questions related to access to medicines, continuity of pharmaceutical care, integration of pharmacists in healthcare teams, pharmacovigilance activities and workforce support remain important. Therefore, the experience gained during the COVID-19 period could catalyse the

continuous evolution of the practice of pharmacy and the development of more resilient healthcare systems (10, 55, 91-93).

Strengthening the recognition and integration of pharmaceutical services

The COVID-19 crisis led to a fresh look at the role of pharmacists in healthcare systems. Community pharmacies continued to provide patients with medicines, professional advice and health-related information at times when access to other healthcare services was limited. Pharmacists often function as the first point of contact for people seeking support, maintaining continuity of care under difficult conditions (73, 74).

The Romanian experience demonstrated that pharmacists could undertake extended responsibilities beyond the traditional dispensing role when provided with an adequate regulatory and organisational framework. The involvement of pharmacists in vaccination programmes was a striking example of how the expertise of the pharmaceutical profession can be applied to broader public health initiatives and of the profession's ability to react to developing health care needs.

These findings support an integrated approach to pharmaceutical services to be embedded within healthcare delivery. These activities include medication review, patient counselling, vaccination and pharmacovigilance. They have the potential to complement existing medical services and contribute to improved outcomes for patients. Formal recognition of these professional activities, with adequate reimbursement mechanisms, would help to ensure their long-term sustainability and encourage their wider adoption in the health care system (56).

Improving medicine availability and supply chain resilience

Medicine shortages became a common concern during the COVID-19 crisis and affected healthcare systems worldwide. Disruptions in manufacturing, procurement and distribution revealed weaknesses in pharmaceutical supply chains and underscored the degree of dependence of many countries on a handful of suppliers and manufacturing sites. As demand for specific medicines and healthcare products increased, the challenges of a stable supply became evident, putting additional pressure on healthcare providers and pharmacists, who are responsible for ensuring patient access to treatment.

The experience of the pandemic reinforced the need for approaches that focus on anticipating and mitigating shortages before they impact patient care. Early warning systems, effective reporting mechanisms, strategic reserves of essential medicines, and closer collaboration among regulatory authorities, manufacturers, wholesalers, hospitals, and community pharmacies could strengthen resilience in pharmaceutical supply chains. Meanwhile, recent European

efforts to improve medicine security and reduce vulnerabilities in the supply chain may help establish a more resilient framework that can respond to future disruptions (65, 68).

Accelerating the digital transformation of pharmaceutical care

The COVID-19 crisis has accelerated the adoption of digital tools in many health systems. Electronic prescriptions, remote consultations, and online communication platforms became important tools to maintain access to care while limiting face-to-face interactions when infection-control measures were implemented. The solutions were also a way to allow the health professionals to continue providing services in difficult conditions, and for the patients to have alternative ways of receiving medical and pharmaceutical support (94).

Romania has demonstrated the potential of digital technologies to support healthcare delivery during crises through the rapid deployment and expansion of electronic prescribing systems. But the pandemic also underscored the need for more development in digital pharmaceutical services. Although telepharmacy has the potential to improve access to pharmaceutical care, particularly for patients with chronic diseases, reduced mobility, or limited access to healthcare facilities, it is still not sufficiently regulated or implemented. Therefore, the future preparedness strategies should include the development of appropriate legal, technical and professional frameworks to support telepharmacy and other forms of digital pharmaceutical care (75).

Expanding the contribution of clinical pharmacy

Clinical pharmacy services have expanded considerably in recent years; however, their availability and level of integration continue to vary across Romanian healthcare institutions. As a result, patients do not always benefit equally from the expertise of clinical pharmacists, particularly in settings where these services remain limited or are not fully incorporated into routine clinical practice. Greater involvement of clinical pharmacists within multidisciplinary healthcare teams, together with improved access to patient information and more active participation in therapeutic decision-making, could strengthen clinical pharmacy's contribution to patient care. Beyond their relevance in emergencies, these developments may support safer medication use, optimise treatment outcomes, and enhance the overall quality of healthcare services delivered under routine conditions (56, 60, 95).

Supporting the pharmacy workforce

Pharmacists and pharmacy staff were under sustained pressure throughout the COVID-19 crisis. In both community and hospital settings, increased workload, concerns about occupational exposure, frequent updates to professional guidance and concerns about personal and family health created a

demanding working environment. These situations underscored the broader implications of protracted public health emergencies for healthcare professionals, extending beyond physical safety to encompass psychological well-being and professional sustainability.

The lessons from the pandemic reinforce that workforce support should be an integral part of emergency preparedness plans. Access to occupational health services, psychological support, continuing professional development, and organisational measures to reduce excessive workloads can help preserve both staff well-being and service continuity during prolonged crises. It is important to provide adequate support for pharmacy professionals, not only for the individuals concerned but also for the quality and reliability of pharmaceutical services when faced with exceptional demands on healthcare systems (96, 97).

Strengthening public health and pharmacovigilance activities

The COVID-19 crisis brought renewed attention to the role of clear communication, public understanding of health information, and effective medicine safety surveillance. Throughout this period, pharmacists participated in a range of public health activities, including supporting vaccination programmes, monitoring medication safety, and providing reliable health information to patients and the wider community. At the same time, large-scale vaccination campaigns highlighted the need for efficient pharmacovigilance systems capable of rapidly identifying, evaluating, and communicating safety information (51).

Future preparedness should include measures to strengthen pharmacists' roles in public health activities and pharmacovigilance programmes. Future public-health emergencies are likely to require healthcare professionals who are well prepared to communicate risks, report adverse events, and participate in vaccine safety surveillance. At the same time, closer integration between pharmacovigilance systems, electronic health records, and digital reporting platforms could facilitate more efficient collection, analysis, and communication of safety data. Together, these developments may strengthen the capacity of healthcare systems to identify emerging safety concerns, support timely regulatory and clinical decisions, and maintain public confidence in medicines, vaccines, and other healthcare interventions (98). The lessons learned during the COVID-19 pandemic suggest that pharmaceutical services should be considered an integral component of healthcare system preparedness. Strengthening pharmacists' contributions to clinical care, public health, pharmacovigilance, digital health, and emergency response planning may improve the resilience of healthcare systems and their ability to respond effectively to future public health crises (13, 50).

Conclusions

The COVID-19 pandemic highlighted the important role of pharmacists in maintaining access to medicines, ensuring continuity of pharmaceutical services, supporting vaccination activities, and contributing to medicine safety monitoring. At the same time, it exposed vulnerabilities within pharmaceutical systems, including medicine shortages, increased workload, limited emergency preparedness, and the need for better integration of pharmacists into healthcare teams. The ethical framework proposed by the International Pharmaceutical Federation and the UNESCO Chair in Bioethics provides a useful basis for analysing these challenges and identifying priorities for future action. The principles of non-maleficence, autonomy, justice, beneficence, truthfulness, and solidarity remained highly relevant throughout the pandemic and continue to guide pharmaceutical practice beyond emergency situations.

Greater integration of clinical pharmacy services, improved preparedness for drug shortages, stronger pharmacovigilance activities, wider use of digital health solutions, and better support for the pharmacy workforce emerged as important areas for future improvement. Experiences gained during the COVID-19 pandemic demonstrated the value of pharmaceutical expertise in vaccination programmes, health communication, pharmacovigilance, and patient support. Expanding these activities may strengthen healthcare systems during future crises while enhancing quality, accessibility, and continuity of care under routine conditions.

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Conflict of interest

The authors declare no conflict of interest.

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