World Journal of Pharmaceutical Science and Research

www.wjpsronline.com

Review Article

ISSN: 2583-6579
SJIF Impact Factor: 5.111
Year - 2025
Volume: 4; Issue: 6
Page: 367-377

REVIEW ON MODERN PROGRESS IN PHARMACY PRACTICE: EXPLORING FUTURE DIRECTIONS

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Article Received: 21 October 2025 | | ***Article Revised: 11 November 2025*** | | ***Article Accepted: 2 December 2025***

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DOI: https://doi.org/10.5281/zenodo.17940028

How to cite this Article: Rani B. Waghmare, Yogesh B. Raut, Sanjay K. Bais (2025) REVIEW ON MODERN PROGRESS IN PHARMACY PRACTICE: EXPLORING FUTURE DIRECTIONS. World Journal of Pharmaceutical Science and Research, 4(6), 367-377. https://doi.org/10.5281/zenodo.17940028

ABSTRACT

This review examines the variables that could affect practice going forward. Three levels of transformation are possible. First of all, the pharmacist's conventional role as a medication dispenser is growing. Second, the pharmacist's work is expanding into new areas of medicine. Thirdly, happenings around the world spur other adjustments. Leaders in pharmacy and healthcare who are considering the future structure and objectives of their pharmacy services may find this review useful. The rise in chronic illnesses, changes in the global population, and technological advancements are all placing a great deal of strain on healthcare. In line with this, pharmacies are evolving from traditional drug distributors to also playing a more sophisticated clinical role. The purpose of this study was to ascertain what the research agenda for pharmacy practice would include from the perspectives of pharmacy practitioners and scholars in five high-income nations.

KEYWORDS: Industry, future, pharmacy, practice, medical, and therapy.

INTRODUCTION

Scientific discoveries, technological developments, and an increasing focus on individualized patient care are all contributing to the revolutionary change that is occurring in the healthcare industry.[1–3] The idea within pharmacy practice guided by artificial intelligence , which not Just updates Medication management practice for the technological age However also reinterprets this is fundamentals, is at the front of this development. This phrase refers to how technology, data science, and pharmacy are combined to give pharmacists the knowledge and resources they need to successfully negotiate the challenges of contemporary healthcare.[4-6]

The importance of cutting-edge technologies in healthcare is highlighted by recent research and conversations, underscoring the necessity of creative operational techniques in the field of pharmacy.[7] Nishioka along with associates used patient concerns documented In pharmacy care reporting systems to test layered algorithmic learning algorithms for identifying adverse event signals. Based on pharmacists' subjective data, these models showed that they could correctly identify pertinent adverse occurrences.[8] By effectively using patient-reported outcomes, the study highlights how AI may improve real-time patient safety monitoring and support clinical decisionmaking. AI has the potential to enhance patient safety and incident reporting, according to a recent research.[9]

The Emergency of Pharmacy

Pharmacy developed as a distinct profession throughout the 19th century, emerging from a vague backdrop where several players engaged in medical science and other facets of healthcare.[10] "There were four degrees in the medical profession, physicians, surgeons, apothecaries, and chemists and druggists," according to a statute approved by the UK parliament in 1815 at the start of the 19th century period.[11]

The establishment of the principal professional pharmacy organization operating across the United Kingdom 1841, professionals responsible for preparing, supplying, and dispensing medicinal products transitioned fully qualified pharmacy professionals following resolution, France saw similar changes in the 19th century period. The establishment first pharmacy faculties and restructuring of the profession resulted in shift in pharmacist training from during exams Registration.[12]

The conventional function of the pharmacist as a provider of medication

The Pharmacist's Conventional Function as a Medicine Dispenser Pharmacists have historically been mostly seen as medicine dispensers, in charge of correctly preparing, supplying, and labelling11 prescription drugs. In addition to confirming the correctness and legitimacy of prescriptions, their work concentrated on making sure the right medication, dosage, and formulation were supplied.[13]To ensure the quality and safety of medications, pharmacists in this position had a solid scientific understanding of pharmacology and pharmaceutics.[14] Typically, patient interactions were restricted to answering questions about prescription specifics or giving fundamental advice on how to use and store medications.[15] As a result, the position was product focused, focusing on the medication rather than patient care or clinical results.[16]

The medical field, pharmacists are experts in medicine. Medications are used to treat chronic diseases, prevent illness, alleviate acute symptoms, and counteract the negative effects of other medications. Information on medicines is derived from the PHARQA consortium's recommendations on future pharmacy education and practice, along with the PHARMINE consortium's research on existing pharmacy education and professional activities within the EU. The publication" Competences for Pharmacy Education and Practice in Europe" compiles work of these two consortia.[17]

Fig. no. 1: Overview of Modern Progress in Pharmacy Practice.

Transformation of the Conventional Responsibilities of Pharmacy Professionals in Supplying and Issuing Medicinal Products.

Evolution in Drug Development: From Low-Mass Synthetic Molecules to High-Mass Biological Therapies

The therapeutic use of high-molecular-mass biological compounds. It is gradually replacing low M. Wt. chemical substances.[18,19] The latter are frequently proteins, enzymes, antibodies, and nucleic acids. At first, the impact will be seen within advanced hospital-based pharmaceutical services, followed later by everyday community pharmacy settings. During the late 1700s and early 1800s, researchers identified the body's natural signalling chemicals and their receptor sites, which laid the groundwork for receptor theory and paved the way for creating substances that imitate hormones and neural messengers. This majority of medications created after the 1950s were tiny M. Wt. compounds, such paracetamol and aspirin. Pharmacological receptor theory was used to study these, and chemical techniques were subsequently used to create and produce them. Individual prescriptions no longer need to be prepared because these new medications came in a ready-to-use form.[18]

These days, biologics or big M. Wt. biomolecules are beginning to take the place of these medications. Although receptor theory is still used in the investigation of biologics, biomolecule Scientific areas such as immunity research, hereditary material modification, and innovations in biological technology. procedures are used in their development. For diseases that have not yet found adequate treatments, biologics hold the potential of more effective targeted therapy (viralrelated infections, blood vessel abnormalities such as central retinal degeneration, and selected types of cancerous diseases). With their creative delivery methods and unique active principle pharmacokinetics, they pose new formulation issues.[19]

The politics and economics of treatment have an impact on the growth of biologics utilization. Since pharmaceutical corporations operate in a market economy, the most lucrative and frequently priciest medications currently available on the market are those having biomolecular or biotechnological origins.[20] Anti-cancer treatment is one of the primary therapeutic classes that uses some of them. Therefore, a significant proportion of patients may be prescribed them. An initial conversation conducted before detailed analysis. Regarding balance Among the organization's various activities

recovery (significant) sum involving monetary assets spent on Investigation and innovation is required before a medicine may be approved for use. The debates surrounding the cost of the new COVID-19 mRNA vaccinations served as an illustration of this.

The utilization of substantial molecular biologic therapies that exhibit complex and detailed configuration pharmacology, novel formulations, and pharmaceutical disposition of drugs frequently supplied Via infusion will require future pharmacists to adjust. Many may need special procuration and storage facilities since they are heat-labile. Additionally, when the economy changes and treatments become more costly, pharmacists may need to adjust.[21]

Pharmacogenomics

Pharmacogenomics is a significant shift in medicinal therapy. Genomic-guided drug science focuses on investigating how an individual's DNA makeup affects their response to medications composition may influence how they react to medications. Pharmacogenomics and genetic testing are used to optimize medication selection and dose. It has the potential to be a more effective treatment with fewer adverse effects when customized for each patient.[22] Additionally, it might make it possible to reintegrate medications with useful pharmacogenomic information. Enzymes involved in metabolism were linked to traditional pharmacogenomic indicators. There is potential for such data to be used in the treatment of infectious [23], cardiovascular[24], psychiatric[25] and oncology-related medications.[26]

Digital information systems and intelligent computing technologies are transforming modern industries

Practice is being significantly impacted by IT advancements. The creation of computerized prescriptions is one instance.[27] This improves the exchange transferring drug-related details between retail pharmacy professionals and hospital-based pharmacists supports safer therapeutic decisions. As well as among pharmacy professionals and related healthcare providers and physicians, and it guarantees increased safety and dependability in repeated prescriptions for chronic illnesses. AI and IT advancements are creating new opportunities in telemedicine and tele dispensing. Such advancements are not the only factors driving telemedicine; Public health regulations and structured management of medical systems guide the functioning of modern healthcare decisions depending on duties along with the funding demands that arise-effectiveness of various experts also play a role. Therapy algorithms for chronic therapy monitoring have been developed using AI and IT. For example, pharmacists used computerized tools to oversee warfarin procedures.[28]

Prescribing

Rectification of Prescriptions and Care Transfer

Medication-related injury that may be prevented affects about one in thirty people, and in 25% of cases, the harm is potentially fatal. When combined with other techniques, pharmacist screening may aid in the identification of this issue. Medication-related errors are a common clinical occurrence in hospital pharmacies.[29] These mistakes frequently happen when patients are admitted and discharged, which raises concerns about how the clinical pharmacist interacts alongside other medical facility teams employees as well as the patient's community pharmacist. A "Partnered Pharmacist Medication Charting" A systematic design was formulated to guide the process. In Beks et al. study conducted in seven distinct medical establishments situated within Australia During the period from 2016 to 2017, significant developments occurred. In this model, engaged pharmacy professionals actively supported the project. underwent a qualification certification scheme used to assess and recognize professional capability**.** to give them the necessary abilities to engage medication-charting.[30]

Providing Medicines without Prior Medical Orders and Allowing Pharmacists Prescribe

Only act of dispensing is subject the pharmacist's legal responsibility. However, in certain circumstances, accountability extends beyond that, and pharmacists are permitted to legally dispense medications without a prescription. The administration of opioid receptor inhibitors' like Naloxone is a medication used to rapidly counter the dangerous effects of opioid drugs, especially during an overdose. To quickly reverse an opioid overdose means to stop the harmful effects caused by excessive opioid intake and help the person recover normal breathing and consciousness is one example.[31,32] In some circumstances, pharmacists can also write prescriptions for medications. One of the most significant changes to the function of the profession is the introduction of pharmacist prescribing services, which are currently being implemented in nations. The latter necessitates completing a non-medical prescribing curriculum and having several years prior post-registration experience.[33] One instance is when a pharmacist prescribes hormonebased emergency contraception, like levorgestrel.[34]

Antibiotics Resistance

It describes the various ways antibiotics may be used for purposes not directly related to infection control of medical care system. improper prescription also sales practices (particularly in primary care), bacterial genetic alterations, and a lack of funding for the research of novel antibiotics are the main causes of antimicrobial resistance.[35] Since most illnesses in primary care are caused by viruses, antimicrobial resistance is a significant issue. In this regard, pharmacists might be extremely important in initiatives that support antimicrobial stewardship. Antimicrobial stewardship might involve monitoring therapy, advising clients and health practitioners on proper medical use of antibiotics, and optimizing therapy by suggesting a suitable medication regimen, length of therapy, regarding treatment and administration method. Pharmacists may also be involved It describes situations where antibiotics are employed beyond conventional infection treatment, such as for anti-inflammatory purposes or in agriculture. such as when they illegally provide prescription drugs.[36-37]

Additional functions of pharmacists in patient care

Community health

Pharmacists who complete a five to six-year degree program gain extensive knowledge of illness and treatment. Governing bodies are examining the cost-effectiveness of the various players in the global healthcare system as well as strategies to make better use of pharmacy competencies in light of steadily rising healthcare expenditures. As a result of their increased involvement in public health, pharmacists' roles in government policies are evolving.[38,39] Pharmacists' assistance in quitting smoking.[40] limiting excessive alcohol use and managing weight, and exchanging syringes and needles.[41] are a few examples of this. The discipline of pharmaceutical care was created as a result of community pharmacists' shift from providing services that were focused on substances or products to ones that were focused on patients.[42]

For pharmacists with knowledge of organ transplantation, and palliative care. a systematic review of studies from 2007 to 2017 on outcomes of pharmacist-led community interventions. Initiative managing Persistent diseases supported the efficacy of pharmacists.[44] The intervention enhanced Pulmonary function in individuals with respiratory disorders, decreased heart failure hospitalization rates, and increased drug adherence. An integrative analysis of thirty-eight research articles explored the impact of pharmacists in primary care settings [45]. Individuals diagnosed with diabetes or cardiovascular disease were recruited for the questionnaires. Medication reviews were provided in conjunction with the

general practitioner as part of pharmacist interventions. Significant improvements in blood pressure, cholesterol, and glycosylated haemoglobin are the results of these therapies. Pharmacy practice competencies will advance in the framework of an interact current.[46]

Vaccination

Vaccination programs are a current example of how pharmacists are involved in primary care. In addition to working with general practitioners in community pharmacies, pharmacists are now increasingly being included in vaccination campaigns in hospitals and immunization facilities.[47,48] In order to meet inoculation goals and boost immunization rates, pharmacist-led influenza vaccination campaigns are now frequently employed. Just 53% of people over 65 had influenza in the EU in 2012–2013.[49] Rates in over-65s were much higher in regions where community pharmacists were tasked with vaccinating.[50]

The recent COVID-19 epidemic brought attention to responsibilities of pharmacy professionals play combating microbial infections. The quick response actions required to lessen the impact and spread of COVID-19 highlight the significance of pharmacists.[51] Organizing provision and preservation of temperature-sensitive vaccines distributing in additionally delivering Immunizations, reconstituting antigenic preparations, educating patients, and administering vaccinations are all part of the pharmacist's job, according to this latter European study. Many people consider the COVID-19 epidemic's effects on a significant turning point in pharmacy's recent history. Bragazzi and associates.[52]

Aging

In many (but not all) nations, the aging of the population makes it more difficult to adequately manage the chronic illnesses that older adults suffer from, which are frequently neurological and cardiovascular in nature. This entails modifications to the types of medications recommended and the methods of dispensing them in light of the growing complexity of several co-morbidities that result in polypharmacy. One factor contributing to inappropriate polypharmacy (over use of needless medications), particularly in older adults with several comorbidities, is co-morbidity.[53]

Increasing levels of multimorbidity with population aging, prescribing recommendations that are medical-condition-focused instead of individualized for each patient, coupled with insufficient proof to promote deprescription are some of the factors contributing to the rise in polypharmacy for elderly multimorbidity.[54,55] Reduced adherence, undesirable medication effects, higher use of clinical services, reduced resilience, thinking deficits, and fatality rates all influence patient outcomes are some possible negative outcomes of this. Since medications are used to treat the majority of chronic illnesses in the elderly, pharmacists a special part in maximizing drug therapy also reducing therapeutic polytherapy for their in-depth understanding of pharmacotherapy and pharmacokinetics.[56]

The Role of Pharmacists in Responding to Global Warming

For pharmacists, climate change has two dimensions: the ways in which they may combat the effects of climate change on healthcare and how they can combat climate change itself.[57] Hydroxy-fluoroalkane compounds serving as propellants in dosage-metered inhalers, the production from greenhouse gases by pharmaceutical companies during production, transportation, and incineration, "in addition to the degradation of water resources" by human waste and pharmaceutical manufacturing are a few examples.[58]

The secondary effect is illustrated by pandemics originating from animals. Which are triggered diseases resulting from viruses are spreading quickly." that cause influenza, "Serious respiratory illnesses can result in hospitalization if not treated promptly and HIV/AIDS. These pandemics start in animals that are moved due to ecological, behavioural, and/or socioeconomic changes.[59] The evolution and spread of zoonoses will be altered by climate change and the ensuing devastation of mammal habitats. According to models, future climate change would cause mammals to migrate to colder areas, opening up new channels for the spread of viruses. The majority of virus transmission will take place in heavily populated regions like Indonesia and India.[60] Teams working on zoonotic disease prediction, prevention, and treatment benefit greatly from the expertise of veterinary pharmacists in research encompasses physiological processes, pathological conditions, and medical interventions in both humans and animals." Changes may also result from Global warming and population movements that follow.

Changes in population diversity patterns and consequently, within drug response variations influenced by genetics, some patients experience enhanced efficacy." to drugs may also result from climate change and the migrations that follow. It should be mentioned that efforts to address this well-known issue have been difficult, and that clinical studies show limited inclusion of ethnic minority populations for new medications. Once more, pharmacists serve a vital function in patient care." in choosing care recipients might benefit from therapy with medications that aren't necessarily well suited to their ethnic group as a whole. This is due to their expertise in medicinal science, particularly pharmacogenomics.[61]

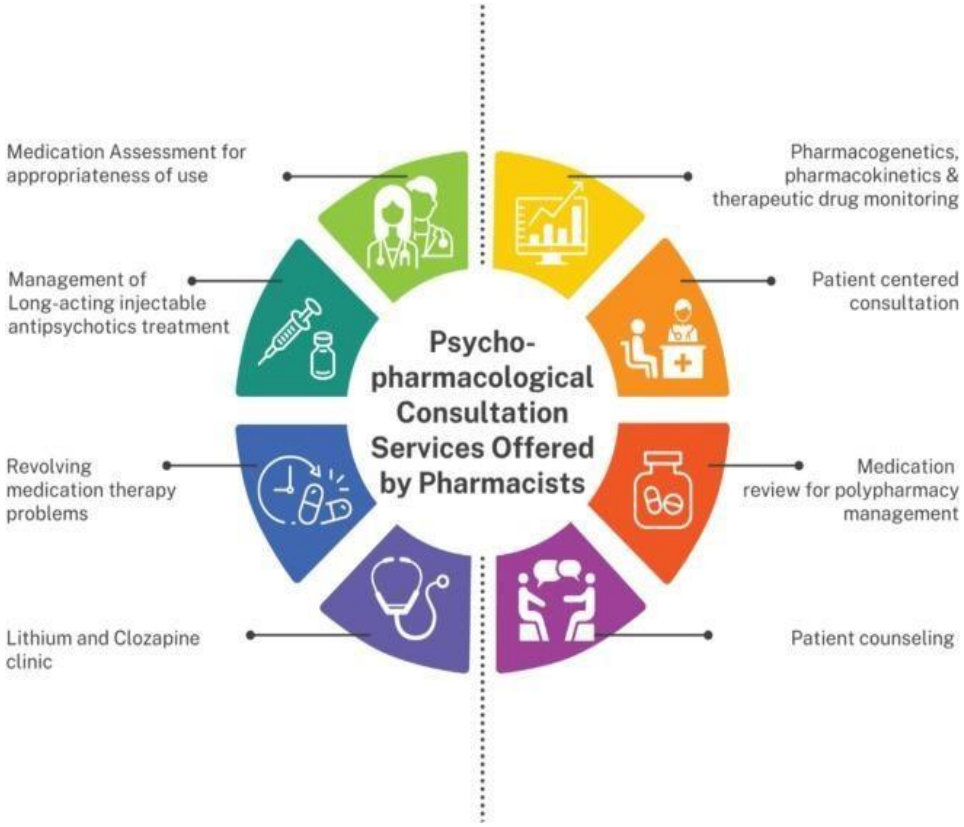

Fig. No. 02: Psychopharmacological Consultation Services Offered by Pharmacists.

CONCLUSION

This review examines the elements shaping the future trajectory of the pharmacy profession, including the advancements in medical biotechnology, the movement toward patient-centred care, the evolving role of medication dispensing, and the emergence of animal-borne diseases linked to climate change." just a few examples of the healthcare system has experienced extensive transformations." Finally, a few observations are pertinent. This review is not meant to be an exhaustive, comprehensive analysis.

This review is meant to be a broad sweep rather than a comprehensive, in-depth examination. The author acknowledges that some readers may become frustrated by what they perceive to be a shallow and insufficient coverage of a specific topic. Numerous references that can be used to expand knowledge in each field are included in the review. The initial chapters on the structure and current practices are informed by the author's European experience (refer to key publications). Switzerland is an exception, as it integrates both national and cantonal governance levels. The majority of European nations have federated legal healthcare systems.

REFERENCES

1. Al Kuwaiti A, Nazer K, Al-Reedy A, et al. A review of the role of artificial intelligence in healthcare. J Pers Med., 2023; 13(6): 951.-955
2. Martiz-Millana A, Saez-Saez A, Tornero-Costa R, Azzopardi-Muscat N, Traver V, NovilloOrtiz D. Artificial intelligence and its impact on the domains of universal health coverage, health emergencies and health promotion: an overview of systematic reviews. Int J Med Inform, 2022; 16 (6): 104-855.
3. Gala D, Behl H, Shah M, Makaryus AN. The role of artificial intelligence in improving patient outcomes and future of healthcare delivery in cardiology: a narrative review of the literature. Healthcare, 2022; 4(18): 77-79
4. Khan O, Parvez M, Kumari P, Parvez S, Ahmad S. The future of pharmacy: how AI is revolutionizing the industry. Intelligent Pharm, 2023; 1(1): 32–40.
5. Ranchon F, Chanoine S, Lambert-Lacroix S, Bosson JL, Moreau-Gaudry A, Bedouch P. Development of artificial intelligence powered apps and tools for clinical pharmacy services: a systematic review. Int J Med Inform, 2023; 172(4): 104983.
6. Grothen AE, Tennant B, Wang C, et al. Application of artificial intelligence methods to pharmacy data for cancer surveillance and epidemiology research: a systematic review. JCO Clin Cancer Inform, 2020; 4(4): 1051–1058.
7. Liu X, Barreto EF, Dong Y, et al. Discrepancy between perceptions and acceptance of clinical decision support Systems: implementation of artificial intelligence for vancomycin dosing. BMC Med Inform Decis Mak, 2023; 23(1): 157.
8. Cortes D, Leung J, Ryl A, Lieu J. Pharmacy informatics: where medication use and technology meet. Can J Hosp Pharm, 2019; 72(4): 320–326.
9. Shanbhogue MH, Thirumaleshwar S, Tegginamath PK, Somareddy HK. Artificial intelligence in pharmaceutical field - a critical review. Curr Drug Deliv, 2021; 18(10): 1456– 1466.
10. Faure, o.Le medicament France au XIXe siècle. Un triomphe inattendu. Bull Dhistoire Depistemologie Sci, 2024; 21: 119-130.
11. Holloway, S.W.F. The apothecaries act, A reinterpretation. Med. Hist, 1966; 10: 107-129.
12. Royal Pharmaceutical Society, UK. Early History and Foundation, 1922; 45(2): 120.

13. Anderson, S.The state of the world's pharmacy. A portrait of the pharmacy profession. Journal of Interprofessional Care, 2005; (19)4: 349-356.
14. World Health Organization. The role of the pharmacist in the health care system. WHO/PHARM. World Health Organization, 2009; (4): 97,599.
15. Wiedenmayer, K.Summers, R.S. Mackie, C.A., Gous, A.G.S., Everard, M., &Tromp, D. Developing pharmacy practice: A focus on patient care. World Health Organization & International Pharmaceutical Federation, 2006; (12): 78-80
16. Smith, M. C. pharmacy practice: A guide to the profession. Williams &Wilkins, 2002; 112.
17. Atkinson, J. Competences for Pharmacy Education and Practice in Europe. In Pharmacy; Multidisciplinary Digital Publishing Institute: Basel, Switzerland, 2018; 34: 112-118.
18. Andrews, L.Ralston, S.Blomme, E.Barnhart, k.A snapshot of biologic drug development. Hum. Exp. Toxicol, 2026; 34: 67-80
19. Ritter, J. M. ;Flower,R.; Henderson,G.; Loke, Y. K.; Rang, H. P Rang and Dale's Pharmacology(Chapter 5 how drugs Act: Biopharmaceuticals and Gene Therapy) Elsevier:London, UK, 2020; 152: 80-85.
20. Chen, Y; Monnard, A; Santos da Silva, J. An Inflection Point for Biosimilars Mackinsey Life Sciences: New York, NY, USA, 2021; 27: 76-89.
21. LEEM: Les Entreprises Medicament. Santé, analysis Prospective de L'innovation Santé, 2021; 64: 67-78.
22. Guy, J.W; Patel, l; Oestreich, J.clinical application and Educational Training for pharmacogenomics. Pharmacy, 2020; 8(163).
23. Reizine, N.M, O'Donnell, P.H.Modern development in germline pharmacogenomics for on cology prescribing. CA Cancer J. Clin, 2022; 72: 315-332.
24. Pardinas, A.F; Owen, M. J.; walters, J.T.Pharmacogenomics: road ahead for precision medicine in psychiatry. Neuron, 2021; 109: 3914-3929.
25. Ganguly,N.K;Saha,G.K.Pharmacogenomics and Personalized Medicine for infectious diseases.In Omics for Personalized Medicine; Barh, D; Dhawan, D; Ganguly, N, Eds; Springer: New Delhi, India, 2025; 603-635.
26. Zhou, Z. Phrmacogenomics in cardiovascular precision medicine. J. Lab. Precis. Med, 2020; 5: 30.
27. Gidley, S.; Scott-Thomas, S.; Anderson, C.; Burton, J. The Future of Pharmacy in Gidley, S.; Scott-Thomas, S.; Anderson, C.; Burton, J. The Future of Pharmacy in a Sustainable NHS: Key Principles for Transformation and Growth. Royal Pharmaceutical Society, 2020; 1-25.
28. LEEM: Les Entreprises du Médicament. Santé 2030, une Analyse Prospective de L'innovation en Santé, 2021; 64: 67-89.
29. Hodkinson, A.; Tyler, N.; Ashcroft, D.M.; Keers, R.N.; Khan, K.; Phipps, D.; Abuzour, A.; Bower, P.; Avery, A.; Campbell, S; Preventable medication harm across health care settings. A. Systematic reviews and meta-analysis. BMC Med., 2020; 18: 313.
30. Beks, H.; Mc Namara, K.; Manias, E.; Dalton, A.; Tong, E.; Dooley, M. Hospital pharmacists' experiences of participating in a Partnered Pharmacist Medication Charting credentialing program:A qualitative study. BMC health services. Res., 2020; 21: 73.
31. California State Board of Pharmacy. (Cal. Code Regs. Tit. 16, § 1746.3) Protocol for Pharmacists Furnishing Naloxone Hydrochloride, 2022: 1-5.

32. Puzantian, T.; Gasper, J.J. Provision of naloxone without a prescription by California pharmacists 2 years after legislation implementation. JAMA, 2018; 320: 1933-1934.
33. Cope, L.C.; Abuzour, A.S.; Tully, M. Nonmedical prescribing: Where are we now? Ther. Adv. Drug Saf., 2016; 7: 165–172.
34. Stone, R.H.; Rafie, S.; Ernest, D.; Scutt, B. Emergency Contraception Access and Counseling in Urban Pharmacies: A Comparison between States with and without Pharmacist Prescribing. Pharmacy, 2020; 8: 105.
35. Marston, H.D.; Dixon, D.M.; Knisely, J.M.; Palmore, T.N.; Fauci, A.S. Antimicrobial Resistance. JAMA J. Am. Med. Assoc, 2016; 316: 1193-1204.
36. Liaskou, M.; Duggan, C.; Joynes, R.; Rosado, H. Pharmacy's Role in Antimicrobial Resistance and Stewardship, 2018: 1-20.
37. Llor, C.; Bjerrum, L. Antimicrobial resistance: Risk associated with antibiotic overuse and initiatives to reduce the problem. There Adv Drug Saf., 2014; 5: 229-241.
38. Tan, E.C.; Stewart, K.; Elliott, R.A.; George, J. Pharmacist services provided in general practice clinics: A systematic review and meta-analysis. Res.soc. Adm.pharm, 2014; 10: 608-622.
39. Thomson, K.; Hillier-Brown, F.; Walton, N.; Bilaj, M.; Bambra, C.; Todd, A. The effects of community pharmacy-delivered public health interventions on population health and health inequalities: A review of reviews.Prev.Med., 2019; 124: 98-109.
40. Hilts, K.E.; Corelli, R.L.; Prokhorov, A.V.; Zbikowski, S.M.; Zillich, A.J.; Hudmon, K.S. Implementing Brief Tobacco Cessation Interventions in Community pharmacies: An application of Roger's Diffusion of Innovation Theory. Pharmacy, 2022; 10: 56.
41. Brown, T.J.; Todd, A.; O'Malley, C.; Moore, H.; Husband, A.; Bambra, C.; Kasim, A.S.; Sniehotta, F.; Steed, L.; Smith, S.; Community Pharmacy-delivered interventions for public health priorities: A systematic review of interventions for alcohol reduction, smoking cessation and weight management, including meta-analysis for smoking cessation. BMJ Open, 2016; 6(1).
42. Sawangjit, R.; Khan, T.M.; Chaiyakunapruk, N. Effectiveness of pharmacy-based needle/syringe exchange programme for people who inject drugs: A systematic review and meta-analysis. Addiction, 2016; 112: 236-247.
43. Sam, S.; Guérin, A.; Rieutord, A.; Belaiche, S.; Jean-François Bussières, J.F. Roles and impacts of the transplant pharmacist: A systematic review can. J Hosp.pharm.50.sam, Guérin, A, Rieutord,A., Belaiche S.,Jean-François Bussières, J.F. roles and impacts of the transplant pharmacist: A systematic review. Can. J.Hosp.pharm, 2018; 71: 324-337.
44. Elyan, J.; Francis, S.-A.; Yardley, S. Understanding the Potential for Pharmacy Expertise in Palliative Care: The Value of Stakeholder Engagement in a Theoretically Driven Mapping Process for Research. Pharmacy, 2021; 9: 192.
45. Newman, T.V.; San-Juan-Rodriguez, A.; Parekh, N.; Swart, E.C.; Klein-Fedyshin, M.; Shrank, W.H.; Hernandez, I. Impact of community pharmacists-led interventions in chronic disease management on clinical, utilization, and economics outcomes: An umbrella review. Res. soc. Adm.pharm, 2020; 16: 1155-1165.
46. Tan, E.C.; Stewart, K.; Elliott, R.A.; George, J. Pharmacist services provided in general practice clinics: A systematic review and meta-analysis. Res. soc. Adm.pharm, 2014; 10: 608-622.

47. Kirkdale, C.; Nebout, G.; Megerlin, F.; Thornley, T. Benefits of pharmacist-led flu vaccination services in community pharmacy. In Annales pharmaceutiques Francaise; Elsevier: Amsterdam, The Netherlands, 2017; 75: 3-8.
48. Paudyal, V.; Fialová, D.; Henman, M.C.; Hazen, A.; Okuyan, B.; Lutters, M.; Cadogan, C.; Alves da Costa, F.; Galfrascoli, E.;pudritzY.M,pharmacists involvement in COVID-19 vaccination across Europe:A situational analysis of current practice and policy. Int. J.Clin. Pharm, 2021; 43: 1139-1148.
49. Mereckienė J, Cotter S, Nicoll A, Lopalco P, Noori T, Weber JT, D'Ancona F, Lévy-Bruhl D, Dematte L, Giambi C, Valentiner-Branth P, Stankiewicz I, Appelgren E, O'Flanagan D, and the VENICE Project Gatekeepers Group. Seasonal influenza immunisation in Europe. Overview of recommendations and vaccination coverage for three seasons: pre-pandemic (2008/09), pandemic (2009/10) and post-pandemic (2010/11). Euro Surveill, 2014; 19(16): 20780.
50. Howard, P. Antimicrobial Stewardship in Community Pharmacy—What Do Commissioners Need to Know?, 2015.
51. Paudyal, V.; Fialová, D.; Henman, M.C.; Hazen, A.; Okuyan, B.; Lutters, M.; Cadogan, C.; Alves da Costa, F.; Galfrascoli, E.;pudritzY.M,pharmacists involvement in COVID-19 vaccination across Europe:A situational analysis of current practice and policy. Int. J.Clin. Pharm, 2021; 43: 1139-1148.
52. Bragazzi, N.L.; Mansour, M.; Bonsignore, A.; Ciliberti, R. The Role of Hospital and Community Pharmacists in the Management of COVID-19: Towards an Expanded Definition of the Roles, Responsibilities,and Duties of the Pharmacist. Pharmacy, 2020; 8: 140.
53. LEEM: Les Entreprises du Médicament. Santé 2030, une Analyse Prospective de L'innovation en Santé, 2021.
54. Davies, L.E.; Spiers, G.; Kingston, A.; Todd, A.; Adamson, J.; Hanratty, B. Adverse Outcomes of Polypharmacy in Older People:Systematic Review of Reviews. J.Am.Med.Dir.Assoc, 2020; 21: 181-187.
55. Khezrian, M.; McNeil, C.J.; Murray, A.; Myint, P.K. An overview of prevalence, determinants and health outcomes of polypharmacy. Ther. Adv. Drug Saf., 2020; 11: 2042098620933741.
56. Ibrahim, A.S.H.; Barry, H.E.; Hughes, C.M. A systematic review of general practice-based pharmacists' services to optimize medicines Management in Older People with multimorbidity and Polypharmacy. Farm.pract, 2021; 38: 509-523.
57. Beechinor, R.J.; Overberg, A.; Brown, C.S.; Cummins, S.; Mordino, J. Climate change is here: What will the profession of pharmacy do about it? Am. J. health Pharm, 2022; 79: 1393-1396.
58. Roy, C. The pharmacist's role in climate change: A call to action. Can. Pharm. J./Rev. Pharm. Can., 2021; 154: 74–75.
59. Morse, S.S.; Mazet, J.A.; Woolhouse, M.; Parrish, C.R.; Carroll, D.; Karesh, W.B.; Zambrana-Torrelio, C.; Lipkin, W.I.; Daszak, P. Prediction and prevention of the next pandemic zoonosis. Lancet, 2012; 380: 1956-1965.
60. Carlson, C.J.; Albery, G.F.; Merow, C.; Trisos, C.H.; Zipfel, C.M.; Eskew, E.A.; Olival, K.J.; Ross, N.; Bansal, S. Climate change increases cross-species viral transmission risk. Nature, 2022; 607: 555-562.
61. Clark, L.T.; Watkins, L.; Piña, I.L.; Elmer, M.; Akinboboye, O.; Gorham, M.; Jamerson, B.; McCullough, C.; Pierre, C.; Polis, A.B.; increasing diversity in clinical trials. Overcoming critical barriers. Curr. probl. Cardiol, 2019; 44: 148-172.